The Institute for Solid State Physics
The University of Tokyo

Activity Report 2015

ISSP

Activity Report 2015

Contents

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Preface

We are pleased to present the annual ISSP Activity Report for the academic year 2015. ISSP (Institute for Solid State Physics) was established in 1957 as a joint-use research institution attached to the University of Tokyo. Since then both in-house research and collaboration with external users have been essential elements of the activities of ISSP.

The research at ISSP has been pursued along two major directions. Synthesis of new materials and nano-structures in search for novel phenomena and functions, as well as their theoretical understanding, by advanced and original methods are at the core of modern condensed matter science. Such activities are being conducted by relatively small independent groups at ISSP and their collaborators. At the same time, importance of large experimental and computational facilities in materials science has been rapidly increasing in recent years. An important mission of ISSP is active participation in the development and operation of some of those large facilities that are difficult to maintain for typical university faculties. Notable achievements in this direction are summarized below.

(1) ISSP has been operating supercomputers dedicated to materials science. In addition, the Center of Computational Materials Science provides technical supports to facilitate use of massively parallel computational resources such as the K and the post K computers. (2) The International MegaGauss Science Laboratory continues to develop both the destructive ultrahigh magnetic field by electromagnetic compression aimed at 1000 tesla and the non-destructive long-pulse magnetic field by a flywheel generator. (3) ISSP has been providing external users access to advanced spectroscopies that use quantum beams such as neutron and synchrotron light sources. It is a pity for the neutron scattering society that the JRR-3 reactor at Tokai has been shut down after the earthquake in 2011 but we are expecting reopening in near future. The pulsed neutron spectrometer at J-PARC developed jointly by ISSP and KEK is now in operation. At the Laser and Synchrotron Research Center, we explore frontier of advanced spectroscopy in ultraviolet and soft X-ray region by combining high power laser being developed in Kashiwa and synchrotron beamline installed in SPring-8.

June, 2016

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Probing a Horizontal Line Node in the Heavy-Fermion Superconductor URu_2Si_2 by Angle-Resolved Heat Capacity Measurements

Sakakibara Group

Identification of the gap structure of anisotropic superconductors (SCs) has been the subject of intensive study over many years. Among various experimental techniques, the heat capacity (C_ϕ) measurement in a rotating magnetic field (H) is quite useful because of its wide applicability. This technique is based on the fact that the field-induced zero-energy density of states, $N(E=0)$, in the superconducting mixed state of a nodal SC is field and its orientation dependent. In the case of a tetragonal SC with vertical line nodes, in particular, C_ϕ shows an angular oscillation when H is rotated in the basal plane, with C_ϕ minima occurring along the nodal directions.

To probe the horizontal line node, however, is not so easy. When H is rotated in the ac plane of the tetragonal crystal, the polar angle (θ) variation of the heat capacity $C_\theta(H)$ is expected to exhibit a twofold oscillation reflecting the gap structure. It should be reminded, however, that because of the tetragonal symmetry of the lattice, the upper critical field H_{c2} would have a substantial twofold anisotropy in the ac plane and give rise to a strong twofold background in $C_\theta(H)$. Hence, the simple argument—the direction of minima in $C_\theta(H)$ corresponds to the nodal direction—does not hold.

Nevertheless, because the θ variation of the field-induced $N(E=0)$ would exhibit local minima as the direction of H passes through the horizontal line node, fine structures may appear in the twofold oscillation of $C_\theta(H)$. We applied this technique to the heavy fermion superconductor URu_2Si_2 [1],

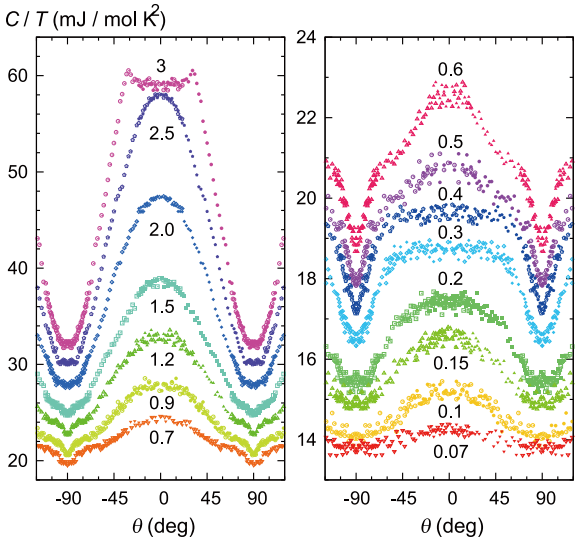

Fig. 1. Polar angle dependence of C/T of URu_2Si_2 measured at 0.2 K in various magnetic fields ranging from 0.07 to 3 T.

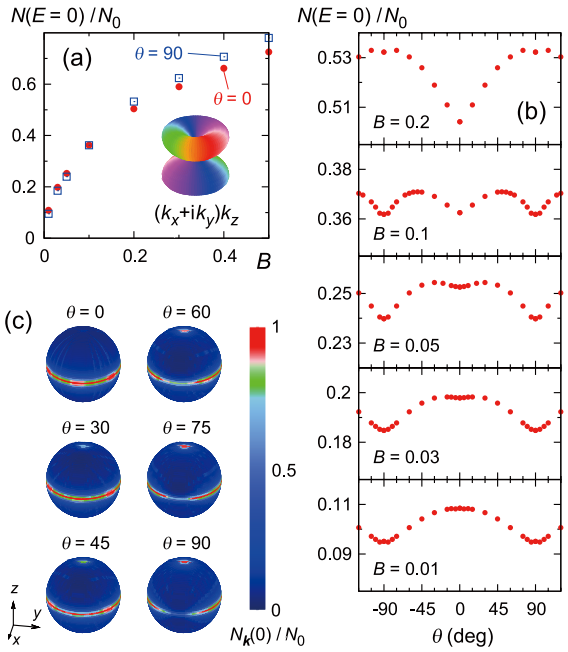

Fig. 2. (a) Field dependence of $N(E=0)$ for $B\|z$ and $B\|x$, obtained by microscopic calculations assuming the $k_z(k_x+ik_y)$ gap. (b) Calculated polar angle variation of $N(E=0)$ at several fields. (c) Angle-resolved density of states, $N_k(0)$, mapped on the spherical Fermi surface. The magnetic field is rotated in the xz plane.

whose gap structure is suggested by previous experiments to be a chiral d-wave, $k_z(k_x+ik_y)$, having a horizontal line node and polar point nodes [2,3].

Figure 1 shows the measured results of $C_\theta(H)$ obtained by rotating H within the ac plane. At high fields, the large twofold oscillation is observed, reflecting the anisotropy of H_{c2} predominantly due to the anisotropic Pauli paramagnetic effect. In the low-field region below 0.15 T, no remarkable anomaly was detected in $C(\theta)$: the data can be fitted by a simple twofold function expected for an effective mass model. By contrast, a striking feature is found in $C(\theta)$ in the region 0.2~1.5 T; a shoulder-like anomaly appears at around θ~45°. With increasing H, this anomaly slightly moves to the higher θ side.

We calculate the θ dependence of the $N(E=0)$ on the basis of the microscopic Eilenberger theory assuming the gap symmetry of $k_z(k_x+ik_y)$ [inset of Fig. 2(a)] and a single-band spherical Fermi surface. For simplicity, the Pauli-paramagnetic effect and the anisotropy of the Fermi velocity are not taken into account. Figure 2(a) shows the field dependence of $N(E=0)$ at θ=0 ($H\|z$) and 90°. For both field directions, $H^{1/2}$ dependence is obtained reflecting the line node. Note that a small anisotropy appears in $N(E=0)$.

In Fig. 2(b), $N(E=0)$ is plotted as a function of θ at several fields. The calculated result at a low field B=0.03 can reproduce the features observed in the present experiment, i.e. the shoulder-like anomaly and the dip structure in $C(\theta)$ observed at moderate fields. With increasing B, a sharp dip develops

at θ=0 and then the anisotropy in $N(E=0)$ is reversed above $B \sim 0.1$, reflecting the H_{c2} anisotropy. The dip at θ=0 and the reversal of the $C(\theta)$ anisotropy in the high-field region, demonstrated in Fig. 2(b), were not detected in the experiment because the actual H_{c2} anisotropy depends on the strong Pauli-paramagnetic effect. Figure 2(c) shows the momentum-resolved density of states, $N_k(0)$, mapped on the spherical Fermi surface. The field B=0.03 is rotated in the xz plane. When $B \| z$ (θ=0), strong quasiparticle excitations occur on the line node as indicated by a red color. As B rotates towards x direction, the quasiparticle excitations at the region k_y=0 are strongly reduced, resulting in a decrease in $N(E=0)$. This effects account the shoulder-like feature in $C(\theta)$ near 45°.

The present results indicate that a horizontal line node exists in URu_2Si_2. Note that among the possible gap structures for a tetragonal even parity SC, only $k_z(k_x+ik_y)$ has the horizontal line node. Thus, the pairing symmetry of URu_2Si_2 is likely to be the chiral d wave [1].

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Solid-Solid Interconversion Coupled by Jahn-Teller-Like Distortion and Bond-Order for the Hydrogen-Bonded Molecular Conductor β'-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$

Mori Group

In the field of molecular functional materials, "π-electronic properties" of (super)conductors and anti/ferromagnets and "protonic properties" of anti/ferro-electrics and proton conductor have been investigated separately and independently. Our aim is to couple "π-electronic properties" and "protonic properties" and to create novel "proton and π-electron coupled (PEC) properties and functionalities". Recently, in the catechol-fused tetrathiafulvalene (TTF) system [1], the metallic state of purely organic single-unit crystal of κ-H_3(Cat-EDT-ST)$_2$ [2], the quantum spin liquid state of κ-H_3(Cat-EDT-TTF)$_2$ [3], and electronic switching induced by deuterium and charge transfer of κ-D_3(Cat-EDT-TTF)$_2$ and κ-D_3(Cat-EDT-ST)$_2$ [4,5] have been unveiled. Here we report unprecedented solid-solid interconversion coupled by Jahn-Teller-like distortion of hydrogen-bond (H-bond) unit and bond-order for the molecular conductor β'-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$ [6].

The present crystal is composed of an H-bonded unit structure $[H_3(Cat\text{-}EDO\text{-}TTF)_2]^+$ and an additional BF_4^- anion (positionally disordered), to give a chemical formula of $[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$. In addition, this H-bond unit, $[H_3(Cat\text{-}EDO\text{-}TTF)_2]^+$, is highly planar, and the H-bond part has an anionic symmetric $[O..H..O]^-$ structure with a short O..O distance (2.455(3) Å), whose H-bonded hydrogen occupies the inversion center of the H-bonded unit. Thus, two Cat-EDO-TTF skeletons in the unit are crystallographically equivalent to each other (Fig. 1). In the present EDO-TTF is +1 state, as estimated from empirical bond length analysis of the TTF skeleton due to the inclusion of the BF_4^- anion in the present system to maintain the charge neutrality of the overall crystal. As a result, the EDO-TFF system is expected to have a larger charge polarization within the H-bonded unit, $[(EDO\text{-}TTF^+\text{-}Cat)\text{-}[O..H..O]^-\text{-}(Cat\text{-}TTF^+\text{-}EDO)]^+$ The present planar H-bonded molecular units form a sheet-like structure including the BF_4^- anions, which is further stacked to construct a so-called β'-type two-dimensional conducting layer composed of Cat-EDOTTF$^+$ molecules. Thus, the high temperature phase (HTP: high temperature phase, 220 K < T) crystal can be called β'-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$. As shown by red dashed circles in Fig. 1, the Cat-EDO-TTF$^+$ molecules are π-dimerized in a head-to-tail manner with an interplanar distance of 3.41 Å, which is much shorter than that between the π-dimers (3.60 Å). Actually, the calculated transfer integral within the π-dimer (134 meV, denoted by

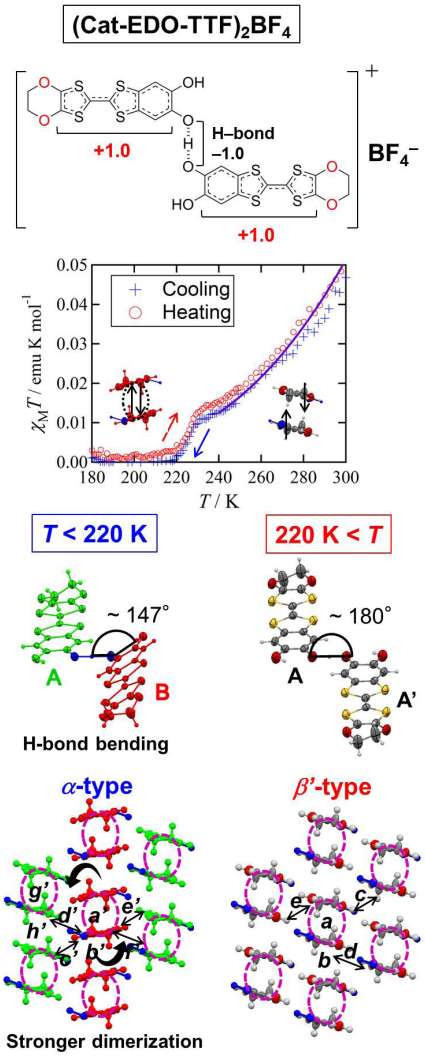

Fig. 1. The solid-solid interconversion from β'- (220 K < T) to α-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$ (T < 220 K) is originated from the interplay of geometric Jahn-Teller-like distortion (from 180° to 147°) of the intra-hydrogen-bond-unit $[H_3(Cat\text{-}EDO\text{-}TTF)_2]$ and magnetic stabilization of Cat-EDO-TTF dimers, where the paramagnetic-to-non-magnetic and low-to-high resistivity transition occurs. The solid line in the temperature dependence of $\chi_M T$ is reproduced by the singlet–triplet (S–T) dimer model with a very strong antiferromagnetic exchange coupling of $2J/k_B$ = -1700 K.

a in Fig. 1) is much larger than that between the π-dimers (4.3 meV, denoted by *b*), suggesting that a very strong dimerization occurs. This type of conductive molecular material composed of a mono-oxidized TTF^+ derivative is very rare due to the strong intermolecular Coulomb repulsion. In the present system, however, the head-to-tail arrangement of the significantly charge-polarized or zwitterionic-like Cat-EDO-TTF skeletons within and between the π-dimer(s) seems to effectively decrease the intermolecular Coulomb repulsions, to allow the construction of the infinite π–π stacking. Also, between the columns, there are some effective intermolecular interactions (*c*–*e* in Fig. 1).

The phase transition occurs around 220 K. Interestingly, upon the transition, the H-bonded unit becomes bent from 180° to 147° at one of the H-bonded oxygen atoms in the H-bond (Fig. 1), which results in desymmetrization of the H-bonded unit: two crystallographically equivalent Cat-EDO-TTF^+ skeletons in the HTP (A and A' molecules) become non-equivalent (A and B molecules), and, simultaneously, the symmetric $[O..H..O]^-$ H-bond is also desymmetrized to an $[O–H..O]^-$ fashion with the O–H and O..H distances of 1.17(4) Å and 1.31(4) Å, respectively. The HOMO energy levels of TTF skeletons are stabilized from -9.310 eV (HTP) to -9.322 and -9.335 eV (LTP: low temperature phase, $T < 220$ K) by extended Hückel calculation based upon crystal structure analyses. The bent of H-bond unit and stabilization of total energy from the HTP to the LTP are noted to be the Jahn-Teller-like distortion of H-bond unit. Curiously, however, the valence on the TTF skeletons in the LTP is fundamentally unchanged from that in the HTP, to maintain the +1 state, as revealed by the bond length analysis and DFT calculation. Also, the BF_4 anions are still positionally disordered, however, notably the molecular arrangement of the Cat-EDO-TTF^+ skeletons in the conducting layer is dramatically changed: the β'-type arrangement in the HTP, composed of a single kind of π-stack inclined in the same direction, transforms to a so-called α-type molecular arrangement in the LTP, where two types of the π-stacking columns with opposite inclinations (columns A and B) are alternately arranged. In this α-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$ crystal, the tilt angle between the adjacent Cat-EDO-TTF^+ skeletons in the columns A and B corresponds to the bend angle of the H-bonded unit, which thus suggests that this unusual molecular arrangement change is based on the transformation of the H-bonded unit between the planar and bent forms.

Temperature dependence of the electrical resistivity and magnetic susceptibility (Fig. 1) of this H-bonded-unit-based conductor $[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$ was measured on the single crystal and polycrystalline sample, respectively. In both the measurements, we observed the phase interconversion between the high-temperature β'-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$ and the low-temperature α-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$, in the almost same temperature region. In the resistivity measurement, the resistivity at room temperature is 50 ohm cm and a semiconductor–semiconductor transition with an abrupt change in ρ was observed at around 210 K, which leads to an increase in the activation energy from 135 meV in the HTP to 165 meV in the LTP. This lowering of the transport property is due to the enhancement of the π-dimerization and the decrease of the inter-columnar interaction, which make the conductive π-electrons further localized within the π-dimer. The magnetic properties are also significantly altered around the anomaly at 220–230 K (Fig. 1): after its gradual decrease from 300 K, the $\chi_M T$ value rapidly dropped at 230 K and recorded 0.0 emu mol^{-1} K below 220 K, indicating that the LTP is a non-magnetic state. Also this temperature dependence was reversibly observed. We note here that the $\chi_M T$ value at 300 K (0.047 emu mol^{-1} K) is much smaller than the expected value for non-interacting two $S = 1/2$ spins (0.75 emu mol^{-1} K), suggesting the occurrence of a strong antiferromagnetic interaction between the $S = 1/2$ radical cationic TTF^+ skeletons in the π-dimer. Actually, the temperature dependence of $\chi_M T$ in the HTP ($T > 220$ K) was well reproduced by the singlet–triplet (S–T) dimer model with a very strong antiferromagnetic exchange coupling of $2J/k_B = -1700$ K (solid line in Fig. 1).

In summary, we have discovered the novel proton-π-electron coupled (PEC) conductor, β'-$[H_3(Cat\text{-}EDO\text{-}TTF)_2]BF_4$, with the solid-solid interconversion from β'- to α-phase accompanying resistivity and magnetic switching of the BF_4 complex. This transition is derived from geometric Jahn-Teller-like distortion from planar to bent form of the composed hydrogen-bonded unit and the magnetic stabilization towards bond-order derived from spin singlet state with stronger dimerization of molecules. Further systematic tuning of proton and π-electron dynamics in this coupled system will afford novel chemical and physical functionalities beyond the framework of π-electronics so far.

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Large Anomalous Hall Effect in the Non-Collinear Antiferromagnet Mn_3Sn at Room Temperature

Nakatsuji Group

In ferromagnetic (FM) conductors, an electric current may induce a transverse voltage drop in zero applied magnetic field: this anomalous Hall effect is observed to be proportional to magnetization *M*, and thus is not usually seen in antiferromagnets in zero field. Recent developments in theory and experiment have provided a framework for understanding the anomalous Hall effect using Berry-phase concepts [1], and this perspective has led to predictions that, under certain conditions, a large anomalous Hall effect may appear in spin liquids and antiferromagnets without net spin magnetization [2]. Although such a spontaneous Hall effect has now been observed in a spin liquid state [3], a zero-field anomalous Hall effect has hitherto not been reported for

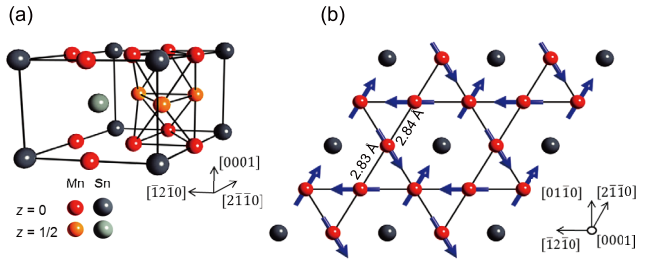

Fig. 1. (a) The crystallographic unit cell of Mn_3Sn. (b) An individual *ab*-plane of Mn_3Sn. Mn moments form an inverse triangular spin structure. Each Mn moment has the local easy-axis parallel to the in-plane direction towards its nearest-neighbor Sn sites.

antiferromagnets.

Mn_3Sn is a hexagonal antiferromagnet (AFM) that exhibits non-collinear ordering of Mn magnetic moments at the Néel temperature of T_N ~ 420 K [4]. The system has a Ni_3Sn-type structure with space group $P6_3/mmc$ (Fig. 1(a)). The basal plane projection of the each *ab*-plane consists of a slightly distorted kagome lattice of Mn, and the associated geometrical frustration manifests itself as an inverse triangular spin structure that carries a very small net FM moment of ~ 2 mμ_B/Mn (Fig. 1(b)) [4]. All Mn moments lie in the *ab*-plane and form a chiral spin texture with an opposite vector chirality to the usual 120° structure. This spin configuration has an orthorhombic symmetry, and only one of the three moments in each Mn triangle is parallel to the local easy-axis. Thus, the canting of the other two spins towards the local easy-axis is considered to be the origin of the weak FM moment [4].

We have carried out detailed transport measurements using high-quality single crystals of Mn_3Sn to reveal the properties associated with the non-collinear antiferromagnetic (AF) ordering [5]. Figure 2(a) presents the field B dependence of the Hall resistivity, $\rho_H(B)$ at 300 K for B ∥ [2-1-10]. $\rho_H(B)$ exhibits a clear hysteresis loop with a sizable jump of $|\Delta\rho_H|$ ~ 6 μΩcm. This is strikingly large for an AFM, and is larger than those found in elemental transition metal ferromagnets (FMs) such as Fe, Co and Ni [1, 6]. Notably, the sign change occurs at a small field of ~ 300 Oe. In contrast, the longitudinal resistivity $\rho(B)$ remains constant except for spikes at the critical fields where the Hall resistivity jumps (Fig. 2(a)). Correspondingly, the Hall conductivity, $\sigma_H = -\rho_H/\rho^2$, for in-plane fields along both [2-1-10] and [01-10] shows a large jump and narrow hysteresis. For instance, with B ∥ [01-10], σ_H has large values near zero field, ~ 20 Ω^{-1}cm^{-1} at 300 K and nearly 100 Ω^{-1}cm^{-1} at 100 K. This is again quite large for an AFM and comparable to those values found in FM metals [1, 7]. On the other hand, the Hall signal for B ∥ [0001] shows no hysteresis but only a linear field dependence.

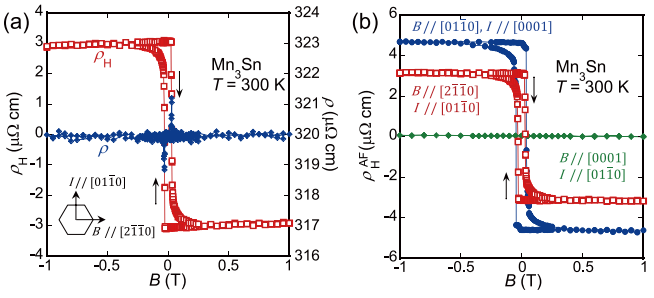

Fig. 2. (a) Field dependence of the Hall resistivity ρ_H and the longitudinal resistivity ρ at 300 K in the magnetic field B ∥ [2-1-10] with the electric current I ∥ [01-10]. (b) Field dependence of the non-collinear AF ordering driven Hall resistivity $\rho_H^{AF} = \rho_H - R_0B - Rs\mu_0M$ at 300 K.

If we label the additional term originating from the non-collinear AF ordering as ρ_H^{AF}, the Hall resistivity in Mn_3Sn can be described by $\rho_H = R_0B + Rs\mu_0M + \rho_H^{AF}$. By subtracting R_0B and $Rs\mu_0M$ from ρ_H, we find that ρ_H^{AF} is nearly independent of B or M, unlike what is found in FMs, as shown in Fig. 2(b). With the reversal of a small applied in-plane field, ρ_H^{AF} changes sign, corresponding to the rotation of the staggered moments of the non-collinear spin structure [4]. Thus, the large AHE, ρ_H^{AF}, must have a distinct AF-driven origin. This soft response of the large anomalous Hall effect in an AFM could be useful for various applications including spintronics—for example, to develop a memory device that produces almost no perturbing stray fields.

Finally, we note that the present exceptionally large AHE found in an AFM with vanishingly small magnetization indicates that a large fictitious field due to Berry phase must exist in momentum space, and is expected to generate various effects including orbital ferromagnetism and the spin Hall effect. Exploration of such effects and their external-field control are suitable subjects for future studies.

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Strange Metal Phase without Magnetic Criticality

Nakatsuji and Uwatoko Groups

In condensed matter physics, it is highly important subject to find a novel state of matter. Through many extensive work performed on strongly correlated electron systems including heavy electron metals, high-Tc superconductors and organic conductors, it has been one of the most intriguing and significant possibility that there should be another class of a metallic phase that cannot be described by the standard frame work of metal, namely, Fermi liquid theory. It has been often called as strange metal phase. However, its strong sensitivity to impurity has made it hard to distinguish it from quantum criticality associated with a singular zero temperature point, namely, quantum critical point.

Nakatsuji and Uwatoko groups at ISSP University of Tokyo and a theoretical group at Rutgers University, USA, have studied the pressure effect on heavy fermion system β-$YbAlB_4$ and found the first evidence of a strange metal phase over an extensive region of pressure by suppressing superconductivity. Just as the melting of ice involves a transition from solid to liquid state, strongly correlated materials exhibit transition between magnetic ordered state and a Fermi liquid state. Among the strongly correlated electron systems, the heavy fermion metals often offer the

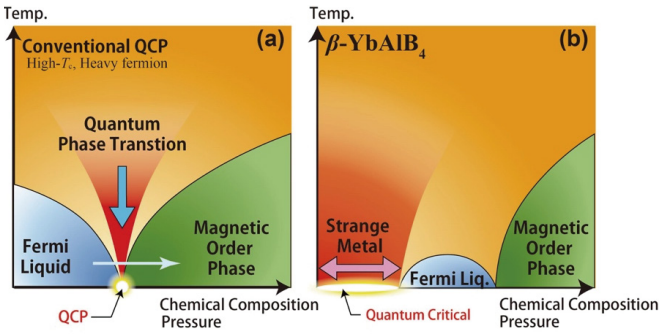

Fig. 1. Conventional quantum critical point and new types of strange metal phase realized in β-$YbAlB_4$

convenient cases where the transition temperature can be easily tuned, for example, by varying a physical parameter, such as magnetic *field*, external *pressure* and chemical composition. In particular, the parameter where the transition temperature is suppressed to absolute zero temperature (minus 273.15 °C) is called quantum critical point (QCP). Nearby the quantum critical point, at low temperatures, a strange metal state is believed to emerge due to quantum critical fluctuations associated with the instability between the magnetic ordered state and Fermi liquid state (Fig. 1(a)). As the quantum critical point is very unstable, the quantum critical phenomena such as the non-Fermi liquid state and superconductivity appear only nearby quantum critical point (conventional QCP in Fig. 1).

Here, we show our experimental study on an ultrapure single crystal of the Yb-based heavy fermion compound β-$YbAlB_4$. β-$YbAlB_4$ is known to have a zero magnetic field and zero pressure quantum critical point and exhibits pronounced strange metal state and superconductivity at low temperatures [1-3]. We applied high pressures and performed high resolution measurements of electric resistivity at low temperatures to investigate its electrical properties. A small magnetic field was used to suppress the superconductivity to reveal the strange metal state. Eventually, we succeeded in elucidating a number of surprising phenomena (Fig. 1(b)) [4]:

1) In the extensive pressure regime ($0 < P < 0.4$ GPa), a strange-metal region with non-Fermi liquid properties exists beneath the superconducting dome.
2) Both the strange metal phase as well as the superconducting (SC) phase ($0 < P < 1$ GPa) are isolated from the border of magnetism ($P > 2.5$ GPa).
3) The strange metal phase can not be described by the standard theory of metals based on spin fluctuations. A new type of mechanism is expected, and is most likely associated with valence fluctuations.

These discoveries imply the existence of a strange metallic phase (Fig. 1(b)), which should be well distinguished from the quantum critical states associated with a magnetic quantum critical point (conventional QCP in Fig. 1(a)). This insight may be useful for clarifying the mechanism for the strange metal phase. It may also contribute to understanding the superconducting mechanisms associated with other classes of strongly correlated materials such as Cu-based and Fe-based high-temperature superconductors.

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Authors
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Field Induced Quantum Metal-Insulator Transition in the Pyrochlore Iridate $Nd_2Ir_2O_7$

Nakatsuji and Kindo Groups

Recently, the iridium oxides (iridates) have attracted tremendous attention for their unique position amongst correlated electron materials, balancing comparable electronic kinetic energy (bandwidth), Coulomb interaction (U), and spin-orbit coupling. This makes them susceptible to novel quantum effects, forming topological phases, and phase transitions. $Nd_2Ir_2O_7$ as a member of pyrochlore iridates, is a rare example of a *weak* Mott insulator, which undergoes a continuous metal-insulator transition (MIT) at $T_{MI} \sim 32$ K, the transition closest to the $T = 0$ quantum MIT in this class of materials. Hence, novel quantum critical Mott transitions, quantum spin liquid phases, and other exotic states are expected to emerge in this weak Mott insulator. Here, we report for the first time a quantum phase transition between a magnetic insulating state and a metallic state driven by magnetic field. Our discovery may be potentially important for applications, showing how to tune the metal-insulator transition by applying magnetic field in a weak Mott insulator.

Anisotropic magnetotransport measurements were performed under high magnetic field up to 50 T using high quality $Nd_2Ir_2O_7$ single crystals. Strikingly, a strongly anisotropic field induced quantum metal-insulating transition was discovered in this *cubic* symmetric material. The insulator state can be suppressed by such a field ~ 10 T to a zero temperature quantum MIT only for fields near the [001] axis, as shown in Fig. 1(a). The strong sensitivity to the field direction is remarkable for a cubic crystal, as is the fact that the MIT can be driven by such a small magnetic field, given the 45 meV gap energy, which is ~ 50 times larger than the Zeeman energy for an Ir^{4+} spin.

We mapped out the temperature-field phase diagram for $Nd_2Ir_2O_7$ under magnetic field along the [001] direction. As shown in Fig. 1(b), a systematic change in the MIT from

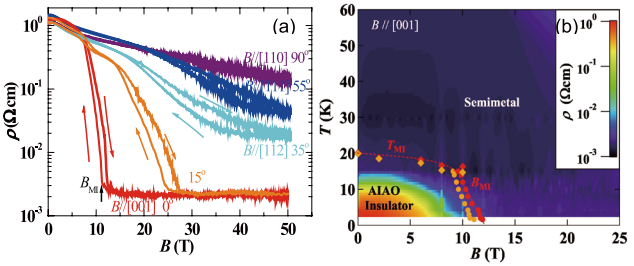

Fig. 1. (a) Field-dependent magnetoresistivity with increasing and decreasing field at T=2 K for various field directions between [001] and [110] directions. The angle Θ is measured from the [001] directions. (b) Temperature-field phase diagram for $Nd_2Ir_2O_7$ under a magnetic field along [001] direction.

continuous near zero field to first order under fields indicates the emergence of possible tricritical point proximate to the quantum phase transition, consistent with the hysteresis seen in the field dependent data shown in Fig. 1(a). Notably, this systematic change across the tricritical point may exist only for the case using high quality single crystals. This new insight contributed to the understanding of quantum MIT behavior. The theorists have constructed a Kondo lattice model considering the strong Kondo coupling between Nd-moments and Ir conduction electron sites, emphasizing the essential role of Nd physics in this quantum MIT picture under magnetic fields.

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Authors

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Emergence of a Kondo Singlet State with $T_K \approx 2000$K in the Proton-Embedded Electron Gas: Route to High-T_c Superconductivity

Takada Group

Physics in heavy fermion superconductors has been understood by the concept of quantum criticality in a Kondo lattice and the spin-fluctuation mechanism is believed to be responsible for superconductivity, as inferred from the strong correlation between T_c and T_K. More specifically, T_c is of the order of $0.1T_K$, as shown in Fig. 1, from which we can conceive an idea that high-T_c superconductivity will be obtained if we can discover a Kondo system with very high T_K. In fact, the recently-discovered plutonium compounds such as $PuCoGa_5$ with T_c=18.5K and $T_K \approx$260K may be regarded as a successful realization of this idea. Thus we should make further pursuit of this idea by searching for a new class of Kondo systems with T_K higher than 1000K. Theoretically, this search can be done by the first-principles quantitative determination of T_K for the composite system of an impurity atom embedded in a metal.

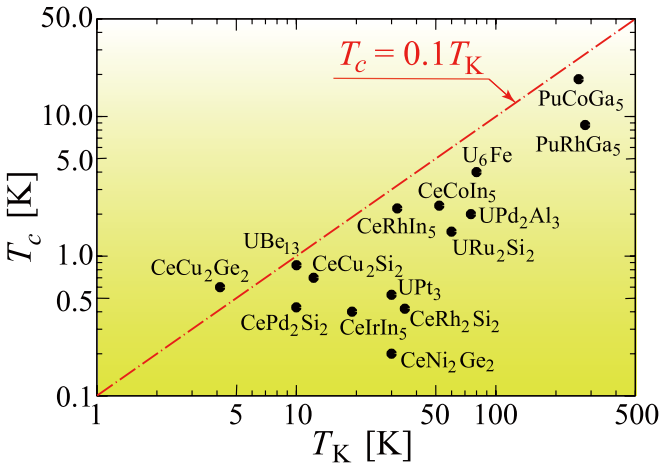

Fig. 1. Superconducting transition temperature T_c versus Kondo temperature T_K (a characteristic energy scale for spin fluctuations) in heavy fermion superconductors.

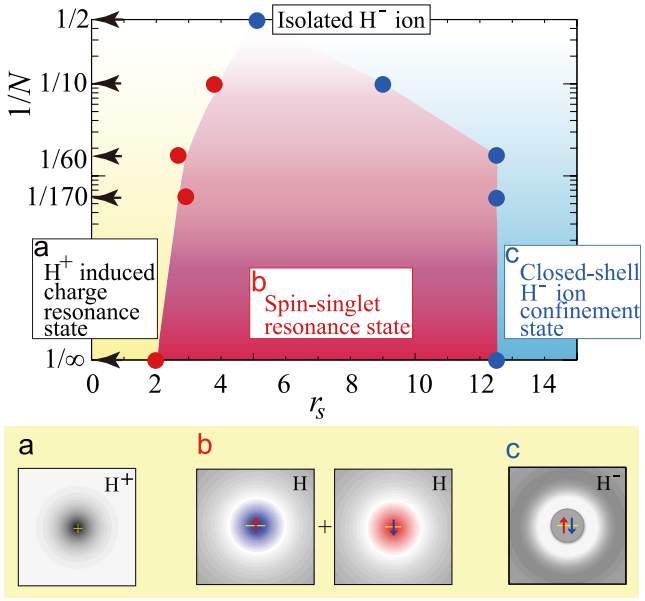

Fig. 2. Phase diagram for sharp sequential transitions among (a) charge resonance, (b) spin-singlet resonance, and (c) closed-shell H^- ion confinement states in the proton-embedded electron gas with N the total number of electrons and r_s the electron density parameter to specify the electron gas.

As first suggested by Debye and Hückel, an atomic nucleus charge $+Ze$ in a metal is screened by accumulation of metallic electrons which is regarded as a charge resonance and well described by the linear response theory. This concept of metallic screening is prevailing for a century, but because Z is not infinitesimally small, we need to consider nonlinear effects in the screening, including the contribution from spin fluctuations. The spin contribution will be enhanced, if Z is an odd integer, such as Z=1 (case of a proton), in which a spin-polarized bound state might appear at the impurity atom.

With the above basic scientific issues in mind, we have concerned with the problem of hydrogen impurity in metals which attracts long attention from a technological point of view, such as hydrogen storage in solids, sensor applications, and catalysis. Its electronic state has been investigated in terms of a proton immersed into the electron gas since 1970s, but no serious attention has been paid so far to the spin resonance effect.

We have studied this system with changing the electron density in a wide range by employing the diffusion Monte Carlo simulations with the total electron number N up to 170 to accurately obtain the ground-state electronic distribution $n(\boldsymbol{r})$ and found a sharp transition at $r_s \approx 2$ from short-range H^+ screening charge resonance to long-range Kondo singlet resonance, the emergence of which is confirmed by the presence of an oscillation-period-shortened Friedel oscillation characteristic to the Kondo singlet state with T_K well beyond 1000K for r_s in the range 3-8. Another transition to the closed-shell H^- confinement state occurs at $r_s \approx 12.5$ (see Fig. 2).

This study not only reveals interesting competition between charge and spin resonances, enriching the century-old paradigm of metallic screening to a point charge, but also discovers a long-sought high-T_K system, opening a new and unexpected route to room-temperature superconductivity in a Kondo lattice made of protons. The metal hydrides, usually

used for secondary batteries, are promising candidates, if the metallic electron density is suitably arranged and the lattice constant is properly tuned to exhibit quantum criticality in the Kondo lattice.

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Chiral Magnetic Effect in Condensed Matter Systems

Oshikawa Group

Relativistic massless fermions in 3+1 dimensions exhibit so-called chiral anomaly where the chiral symmetry, which is a symmetry of the Lagrangian, is broken due to quantum effects. This results in the violation of the individual conservation of the number of left-handed and right-handed fermions, allowing them to change to each other. Chiral magnetic effect (CME), an induction electric current parallel to the applied external magnetic field is one of the most intriguing phenomena related to this chiral anomaly. Due to the time reversal symmetric nature of CME, the current induced through CME is non-dissipative so that it has potential applications to the low-energy consuming electronics.

Recently, it becomes possible to synthesize a family of three-dimensional materials, topological semimetals, where electrons have (3+1) dimensional relativistic band dispersion near the Fermi energy, similar to graphene in (2+1) dimensions. That is, in these materials, the relativistic massless fermions emerge in the low-energy effective theory. It is thus tempting to observe the chiral anomaly and CME in a tabletop experiment with a high-controllability which we cannot have in high-energy physics. Indeed, there are already several experimental reports that claim to have observed the chiral anomaly and CME in topological semimetals through the negative magnetoresistance in the presence of parallel electric and magnetic field. Although the negative magnetoresistance can be an indication of the chiral anomaly, it could arise from other mechanisms and thus is not a smoking-gun evidence for the chiral anomaly, let alone CME

In order to develop a direct and unambiguous probe of

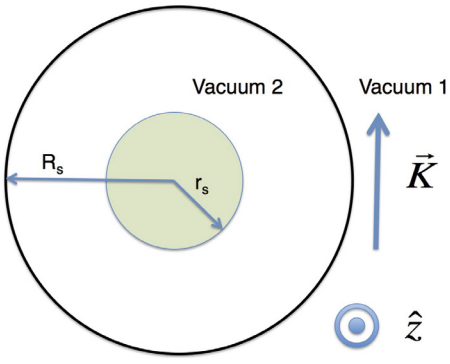

Fig. 1. Schematic picture of our setup. A solenoid (radius R_s) is represented as a surface current K between the two vacua. Inside them, a cylindrical sample (radius r_s) is placed.

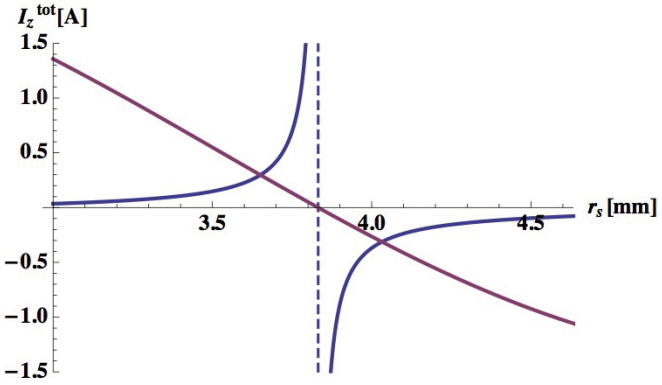

Fig. 2. Blue line: Total current Itotz [A] for parameters $\mu_0\sigma_{ch}$ = 1 [mm], ω=100 [Hz], B = 1 [Gauss]. Red: $J_1(\mu_0\sigma_{ch}r_s)$ in an arbitrary unit. The current is resonantly enhanced for rs satisfying $J_1(\mu_0\sigma_{ch}r_s)$ = 0 represented by a dashed line.

CME, we studied the interplay of CME and electromagnetism in matter. Since CME can be understood as a consequence of an extension of electromagnetism called Chern-Simons electromagnetism, transport properties are governed in a highly non-trivial manner by both electromagnetism and CME. As a concrete example, we performed an electromagnetic field analysis in the setup shown in Fig. 1. We demonstrated that the physically observed admittance is not simply proportional to the chiral magnetic conductivity, even when the transport is governed by the CME. Furthermore, we found that the CME-induced AC current is resonantly enhanced when the cross section matches the "chiral magnetic length" as shown in Fig. 2. Our results imply that the electromagnetism is fundamental for actual transports in topological semimetals and that proposals for their applications to future electronics need careful considerations on this issue.

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Authors
H. Fujita and M. Oshikawa

Optical Conductivity Near an Antiferromagnetic Phase Transition

Tsunetsugu Group

Optical conductivity is one of fundamental dynamical correlation functions in solids and measures a metallicity. A few years ago, we numerically investigated optical conductivity near the Mott metal-insulator transition in the frustrated Hubbard model on a triangular lattice using a cluster dynamical-mean field theory (CDMFT). We found a singularity in its dc value and in contrast to general belief the corresponding critical exponent does not coincide with that of the order parameter [1]. Another important finding was that the vertex corrections are not so important in that case. The Mott transition is driven by strong correlation effects, which may suggest large vertex corrections. However, our numerical data exhibited only a minor contribution of theirs, and it is likely due to two characteristic features in this system. The first is that spin fluctuations depend little on wave vectors because of strong frustration. The second is that quasiparticle scatterings due to spin fluctuations do

not depend so much on their position on the Fermi surface. We have performed a new study to examine if the vertex corrections are more pronounced in an unfrustrated system. To compare with the previous result, we particularly investigated the temperature region near an antiferromagnetic phase transition.

We have used a 4-site CDMFT approach for calculating optical conductivity σ(ω) in the square-lattice Hubbard model at half filling, and studied its temperature dependence both above and below the antiferromagnetic transition temperature T_N for the Coulomb repulsion U=6.5t. Here, t is the matrix element of nearest-neighbor hopping. A real antiferro long-range order is absent in two-dimensional systems, and our results correspond to quasi-two-dimensional systems. To implement the vertex corrections in the antiferromagnetic phase, we have derived a new formula based on our previous one for the paramagnetic phase. We have found that the vertex corrections change various important details in temperature and frequency dependence of conductivity near T_N. This point differs from our previous study on optical conductivity near the Mott transition in a frustrated triangular lattice.

General trends in the temperature evolution of σ(ω) are consistent with expected behaviors near the metal-insulator transition. In the high-temperature paramagnetic phase, σ(ω)

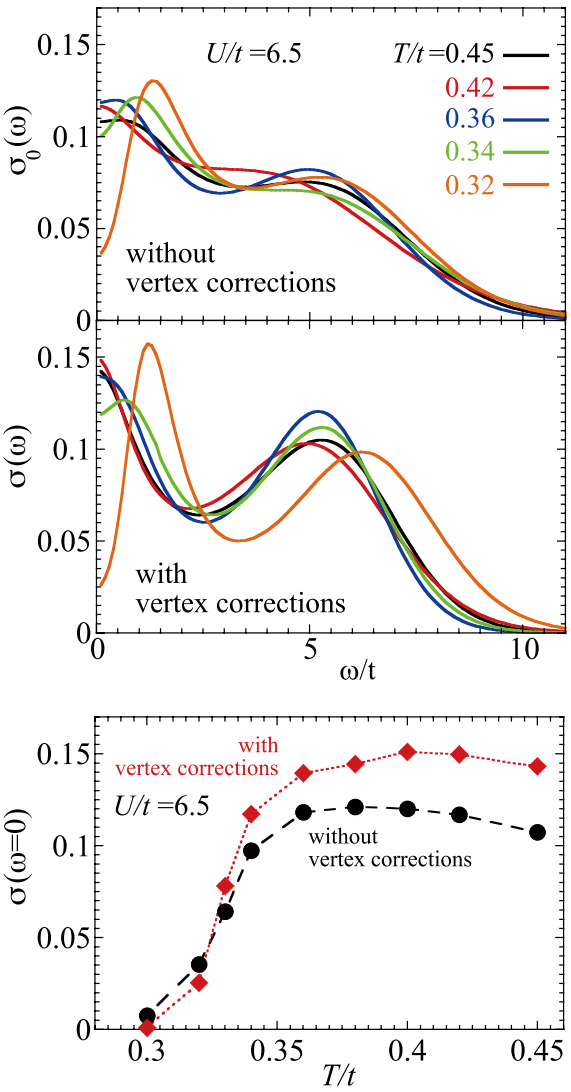

Fig. 1. (Top) Optical conductivity in the square-lattice Hubbard model at half filling. Units are the quantum conductance. (Bottom) Temperature dependence of dc conductivity in the same model.

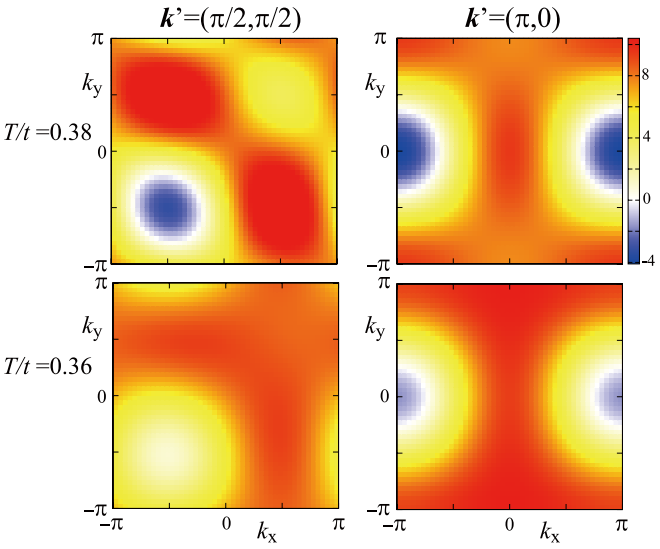

Fig. 2. Momentum dependence of the vertex function Γ that describes the process that a particle-hole pair with momentum and spin (***k***', σ') are scattered to another pair with (***k***, σ). Plotted is the charge part summed over σ and σ' at Matsubara frequency ν_n=0. Dependences on temperature and ***k***–***k***' strongly vary with the initial momentum ***k***'.

has the Drude peak at ω=0 and also a broad peak around ω~U, which is related to excitations to the Hubbard bands. With lowering temperature, an antiferromagnetic phase transition occurs at T_N~0.34t, and σ(ω) changes its frequency dependence below T_N. While the incoherent peak continues to exist, now a dip appears at ω=0 and the low-energy peak shifts to ω~t. Top two panels in Fig. 1 compare σ(ω) with and without the vertex corrections. Most importantly, the vertex corrections enhance variations in the frequency dependence. The Drude peak and the high-ω broad peaks in the paramagnetic phase are both sharpened. This continues in the antiferromagnetic phase and the two peaks are both sharpened by the vertex corrections, whereas the dip at ω=0 is also enhanced. Another important discovery is the behavior in a temperature region just above T_N. As shown in the bottom panel in Fig. 1, dc conductivity decreases in this region with lowering temperature, which is a precursor of the transition. However, the electron excitation spectrum shows no pseudogap behavior and the Drude peak is pinned at ω=0. This temperature region appears before including the vertex corrections, but the corrections extends it quite wide. These are main results directly related to observable properties in experiments.

For better understanding of the vertex corrections, we have also carried out their detailed analysis. The vertex corrections are determined by the vertex function Γ and four single-electron Green's functions. As for the part of the Green's functions, we have found that their spin dependent components provide a dominant contribution in the antiferromagnetic phase. For Γ a predominant contribution is given by the scattering processes of polarization made of a particle on one sublattice and a hole on the other sublattice. We have also examined Γ's momentum dependence. Results in the paramagnetic phase are shown in Fig. 2. In the antiferromagnetic phase, the charge vertex and spin vertex functions have similar momentum dependence but the sign is opposite. A large difference is found in Γ's momentum dependence between quasiparticles at different positions in the Brillouin zone. For those at (π, 0) or (0, π), the momentum dependence is dominated by nearest-neighbor correlations. For those at (π/2, ±π/2), the momentum dependence is quite one-dimensional. It is an important future study to clarify how to relate

these exotic correlations to properties of conductivity.

This work is collaboration with Toshihiro Sato at RIKEN.

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H. Tsunetsugu

Temperature-Driven and Chemical-Potential-Driven Adiabatic Pumping in Coherent Electron Transport

Kato Group

Adiabatic pumping is a process by which a finite charge(heat) current is induced under periodic slow modulation of external parameters. This phenomenon has been studied for a long time as an important issue in time-dependent quantum transport. In addition to charge current, recent developments in the field of nanotechnology have enabled us to measure heat current under temperature bias in a controlled way. This development has stimulated both of the theoretical and experimental investigations of the thermodynamics properties of mesoscopic devices. Recently, adiabatic heat pumping induced by temperature modulation has been discussed in phonon transport via molecule junctions [1], and temperature-induced transport has been discussed in contexts of thermoelectric transport and nonequilibrium thermodynamics [2].

We have studied adiabatic charge pumping driven by modulation of thermodynamic variables of the reservoirs in the *coherent* regime [3]. We have considered charge pumping via a single-level quantum dot (QD) coupled to reservoirs with time-dependent temperatures and chemical potentials (see Fig. 1), and have shown that charge pumping is indeed possible when Coulomb interaction is introduced in the QD. We have calculated pumping current up to the first order of U (the strength of the Coulomb interaction in the QD) by the perturbation theory based on the Keldysh formalism, employing the method of the thermomechanical field to describe temporal changes of the temperatures.

We show the estimated average pumping current in Fig. 2 for a pumping frequency f=1GHz. The upper panel of Fig. 2 shows the pumping current under the chemical-potential modulation described by $\mu_L(t)=\mu_0+\mu_1\cos(2\pi ft)$ and $\mu_R(t)=\mu_0+\mu_1\sin(2\pi ft)$ for $\mu_1=0.5\Gamma$ and $T_L=T_R(=T)=0$, 0.1Γ, 0.3Γ as a function of $(\mu_0-\varepsilon_d)/\Gamma$, where ε_d and Γ are an energy level and a linewidth of the QD, respectively. The lower panel of Fig. 2 shows the pumping current under the temperature modulation described by $T_L(t)=T_0+T_1\cos(2\pi ft)$ and $T_R(t)=T_0+T_1\sin(2\pi ft)$ for $T_1=0.3\Gamma$, $\mu_L=\mu_R=0$, and $\varepsilon_d=0$, 0.1Γ, 0.3Γ as a function of T_0. In the present estimate, we have assumed the symmetric coupling to the two reservoirs, and have set the strength of Coulomb interaction as $U=\Gamma$. As seen in Fig. 2, the estimated pumping current is of order of 1-10pA, which is measurable in a standard experimental setup. The pumping current is proportional to both the frequency f and the Coulomb interaction U in the present calculation, and therefore is reduced if f and U are taken as smaller. In the chemical-potential-driven pumping, we have shown that the pumping current is related to the first energy derivative of the spectral function (the local density of states in the QD) at low temperatures. Similarly, in the temperature-driven pumping, we have shown that the pumping current is related to the second energy derivative of the spectral function at low temperatures; the sign change of the pumping current for $\varepsilon_d=\Gamma$ in the lower panel of Fig. 2 originates from this fact. The insets of Fig. 2 show the time-dependence of the current induced by the modulation at the maximum of the pumping current in the main panel.

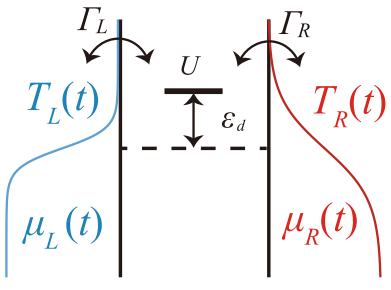

Fig. 1. Schematic figure of the system considered in this study.

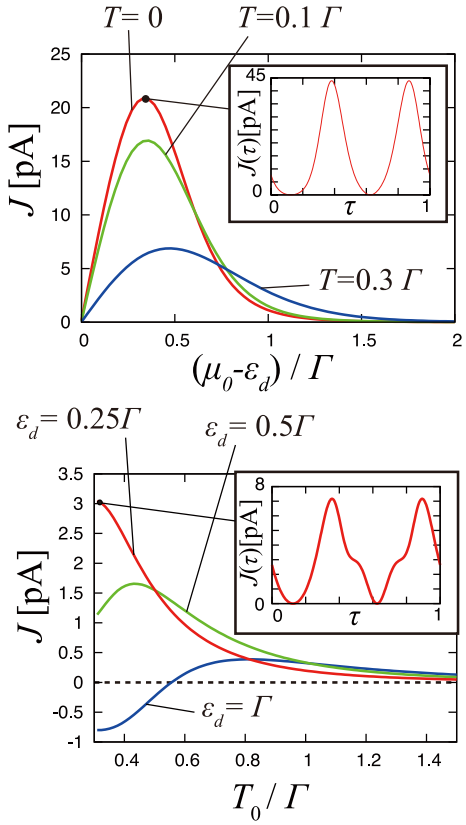

Fig. 2. The upper panel: Estimated pumping current under the chemical-potential modulation described by $\mu_L(t)=\mu_0+\mu_1\cos(2\pi ft)$ and $\mu_R(t)=\mu_0+\mu_1\sin(2\pi ft)$ for $\mu_1=0.5\Gamma$ and $T_L=T_R=0$, 0.1Γ, 0.3Γ as a function of $(\mu_0-\varepsilon_d)/\Gamma$. Here, ε_d and Γ are an energy level and a linewidth of the QD, respectively. The lower panel: Estimated pumping current under the temperature modulation described by $T_L(t)=T_0+T_1\cos(2\pi ft)$ and $T_R(t)=T_0+T_1\sin(2\pi ft)$ for $T_1=0.3\Gamma$, $\mu_L=\mu_R=0$, and $\varepsilon_d=0$, 0.1Γ, 0.3Γ as a function of T_0.

We have also shown that the present charge pumping originates from a time delay in a change of the occupation number of the QD with respect to modulation of the reservoirs. This time delay is understood by a relaxation time determined by circuit elements characteristic of coherent electron transport under external AC modulation of voltages and temperatures.

In this study, we have studied charge pumping in a simple setup with a single-level QD up to the leading order of Coulomb interaction. It is a future problem to formulate adiabatic pumping in the presence of a strong Coulomb interaction. Also, with the present formulation, we would be

able to tackle general pumping in coherent transport from the viewpoint of the nonequilibrium thermodynamic properties of mesoscopic devices.

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"Zitterbewegung" Appeared as Conductance Fluctuation in Transport Between Quantum Point Contacts

Katsumoto Group

For a particle which obeys the Dirac equation, velocity is not a well-defined quantity in that the kinetic motion in real space is the mixed one of particle and anti-particle. Such a quantum mechanical state can be described as a superposition of states with velocities $+c$ and $-c$. Hence in the space of velocity-base, such a particle is in a zigzag motion (trembling motion), which is called "Zitterbewegung" (ZB)

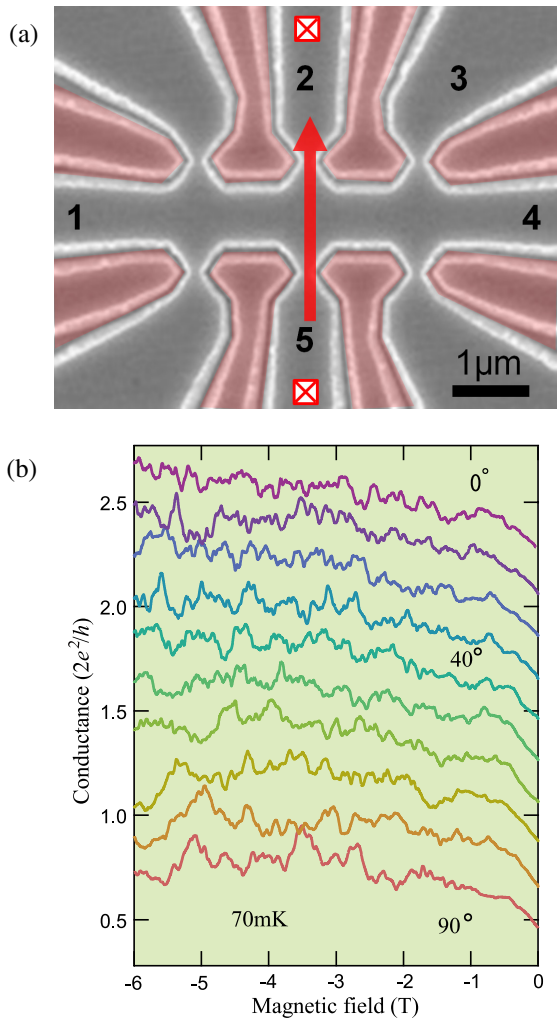

Fig. 1. (a) QPC positioning in the sample. (b) Conductance fluctuation (through QPC 2 to 5) versus magnetic field. The field is rotated from 0° (parallel to the plane) to 90° (perpendicular).

in Germany[1]. A trivial analog in electrons in solids is oscillation in velocity of classical electrons due to periodic lattice potential. Even the experimental observation of such a trivial phenomenon is difficult at present. A bit non-trivial phenomenon closer to the ZB of electrons in vacuum is a zigzag motion of electrons due to the spin-orbit mixing of the two (spin and orbital) freedoms. This is also called ZB and expected to be observable in experiments though no clear observation has been reported yet.

For the observation of ZB in transport, we need to prepare spin-polarized electrons in a system with a simple-form spin-orbit interaction. We have experimentally confirmed that a quantum point contact (QPC) in a system with strong Rashba-type spin-orbit interaction (RSOI) can work as an efficient spin polarizer on plateaus of a half and of a one conductance quantum ($2e^2/h$) [2]. Hence a system of QPCs with RSOI can provide an ideal test-bed of ZB in solids.

Figure 1(a) shows a schematic view of the present system with two sets of three parallel QPCs made from InAs 2DEG. The two are placed face-to-face. The two-terminal conductance through a confronting QPC pair (2-5) as a function of magnetic field for various field directions is shown in Fig.1 (b). Reproducible fluctuations reminiscent of universal conductance fluctuation (UCF) appear in the magneto-conductance. Surprisingly the amplitude nor the characteristic frequency does not change with the field angle. On the other hand in the transport not through QPC (terminal 1 to 4) no fluctuation appears and ordinal Shubnikov-de Haas oscillation appears for vertical magnetic field. In short the fluctuation appears only when the spins of conduction electrons are aligned.

The above results can be well explained within the ZB framework. The external magnetic field modifies the frequency of spin precession thus that of ZB, which results in large variation of scattering cross section. Superposition of various scattering paths leads to the observed conductance fluctuation.

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Distant-Dependent Tunneling Process Observed in Iron Nitride

Komori Group

Scanning tunneling microscopy (STM) is one of the most powerful tools to investigate surface topographic and electronic structures with an atomic resolution. Surface nanostructures are often discussed based on the topographic image. However, its image contrast is mainly based on the electron tunneling processes between the STM tip and the surface local electronic states [1]. Systematic changes of the image contrast as a function of the sample-bias voltage Vs have been widely interpreted in terms of energy-dependent electronic structures. The STM tip-surface distance, d, is

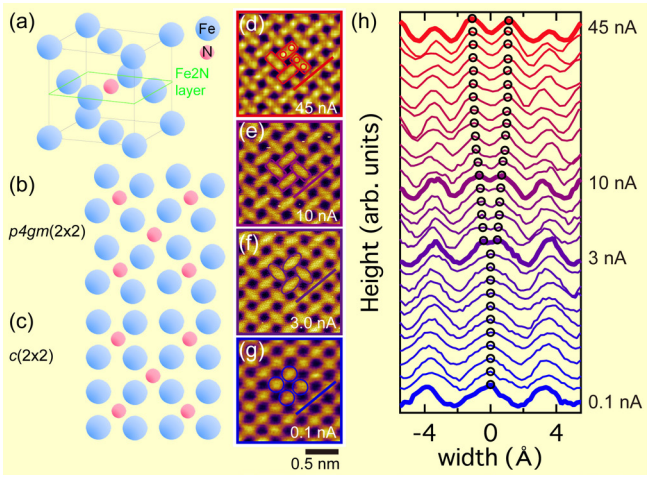

Fig. 1. (a) Schematic model of an Fe_4N crystal. The layer consisting of Fe_2N stoichiometry, indicated by green lines, appears at the surface of the Fe_4N thin films on Cu(001). (b,c) Schematic surface models of the *p4gm*(2x2) reconstruction (b) corresponding to the monatomic Fe_2N layer on Cu(001), and *c*(2x2) reconstruction (c) corresponding to the ideal bulk Fe_2N plane. (d-g) Topographic images taken at Vs = 0.25 V with varying It from 0.1, 3.0, 10 to 45 nA. (h) Line profiles at Vs = 0.25 V, measured along lines indicated in (d-g). From the top to the bottom, I varies as follows: 45, 40, 35, 30, 28, 25, 22, 20, 18, 15, 12, 11, 10, 9.0, 8.0, 7.0, 5.0, 3.0, 2.0, 1.0, 0.9, 0.8, 0.7, 0.6, 0.5, 0.4,.0.3, 0.2, and 0.1 nA, respectively. Empty circles indicate peak positions extracted from one Fe dimer.

an alternative parameter of the image change on the surface consisting of several orbitals with different decay lengths of the wave functions into the vacuum. In such systems, the image can be changed by the shift of the dominant surface orbital contributing to the tunneling process. We have demonstrated the *d*-dependent STM imaging and spectroscopy on the surface of a monatomic layer of iron nitride (Fe_2N) on Cu(001) (see Fig. 1) to characterize the orbital-sensitive tunneling as the origin of the topographic image changes [2].

Figure 1(d-g) shows a systematic change of the topographic images of the Fe_2N layer from a dimerized atomic image reflecting the atomic surface structure to a square lattice of atomic size dots with increasing *d*. The line profiles shown in Fig. 1(h) are systematically changing with the tunneling current. By measuring the images with various V_B values, the threshold distance of the image change was found to be independent of V_B . The tunneling spectrum on the Fe_2N surface has several peaks that well correspond to the peaks of the calculated total local density of states (LDOS) as in Fig. 2(a,b). The observed systematic *d* dependence of the tunneling spectra shown in Fig. 2(c) implied the shift in the dominant electronic states contributing to the tunneling process. The LDOS calculations above the surface by first principles indicate the change of the dominant orbitals detected by the STM tip from the Fe 3*d* states to the *s/p* states with increasing the tip-surface distance.

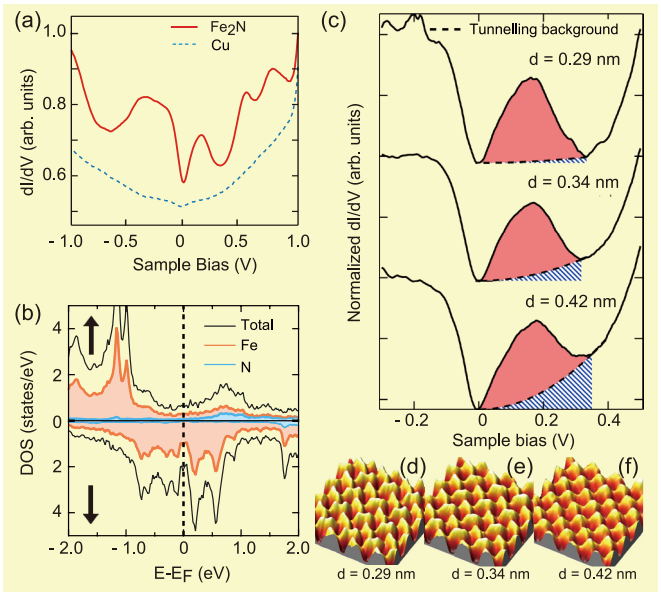

Fig. 2. (a) *dI/dV* spectra of Fe_2N on Cu (001) and the clean Cu(001) surface. The STM tip was stabilized at It = 30 nA and Vs = 1 V. (b) Calculated spin-resolved LDOS of single-layer Fe_2N on Cu(001). Fe and N states are separately shown. (c) Distant-dependent *dI/dV* spectra measured at d = 0.42, 0.34, and 0.29 nm from the bottom to the top. Dashed curves indicate a tunneling background obtained by a Tersoff-Hamann approximation. [1] (d-f) Topographic images taken at Vs = 0.25 V with d = 0.29 nm (d), 0.34 nm (e), and 0.42 nm (f).

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Real-Time Operando Observation of Reaction Processes of CO_2 on Cu(997) by Near-ambient Pressure X-ray Photoelectron Spectroscopy

Yoshinobu and I. Matsuda Groups

Activation of CO_2 is an important topic in the efficient use of CO_2 as a chemical feedstock. Methanol synthesis from CO_2 and H_2 on a Cu/ZnO catalyst has been widely studied. CO_2 is chemically inert, and thus the interaction of the molecule with metallic Cu surfaces plays an essential role for molecular activation. On metallic copper, very low reactivity of CO_2 on low-index surfaces was reported under ultrahigh vacuum conditions. In contrast to the flat surfaces, the dissociation of CO_2 into CO was reported on vicinal Cu surfaces previously. These results indicate that defect sites, such as step and kink, may be important for the CO_2 activation. However, the reaction condition in UHV is far from a real catalytic reaction, which is normally operated at higher temperature and nearly/above atmospheric pressure. Such differences in pressure and temperature may lead to distinct

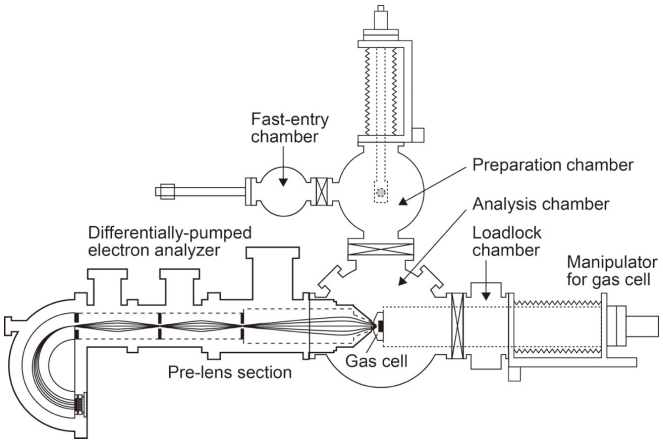

Fig. 1. Schematic of the *operando* AP-XPS system at SPring-8 BL07LSU

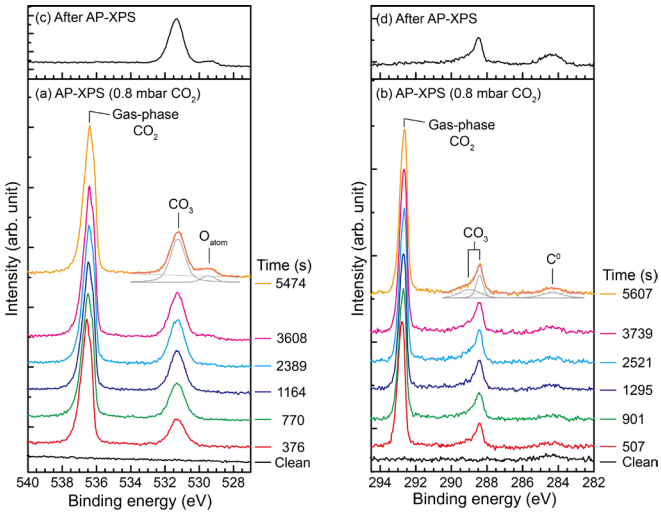

Fig. 2. A series of **(a)** O 1s and **(b)** C 1s AP-XPS spectra of Cu(997) at 340 K under CO_2 pressure of 0.8 mbar as a function of elapsed time together with the assignment of each peak. Only selected spectra from the whole series are shown in the figure. The photon energy was 630 eV. The CO_2 gas was introduced in the gas cell at t = 0 s. The fitting results for the spectra at t = 5474 s (O 1s) and t = 5607 s (C 1s) are also shown in the figure. **(c)** O 1s and **(d)** C 1s XPS spectra after the AP-XPS measurements shown in (a) and (b). The gas cell was evacuated to UHV (~10^{-9} mbar), and then the XPS measurements were performed.

reactivity under ambient conditions from UHV, reflecting thermodynamic and kinetic effects. Ambient pressure X-ray photoelectron spectroscopy (AP-XPS) is a powerful tool for investigating electronic structures and chemical states of adsorbates and a substrate *quantitatively* under reactant-gas pressure.

Here, the reaction of CO_2 on the vicinal Cu(997) surface at 340 K under CO_2 gas pressure of 0.8 mbar was investigated by ambient pressure X-ray photoelectron spectroscopy (AP-XPS). We found that initially carbonate (CO_3) was produced on the surface through the reaction of CO_2 with oxygen formed from CO_2 dissociation; the amount of adsorbed CO_3 was increased and saturated as time elapsed and after saturation of adsorbed CO_3, atomic oxygen appeared on the surface, indicating that CO_2 dissociation into CO and O continued to take place. The estimated saturation coverage of CO_3 from XPS is rather small (0.05 ML).

The experiments were performed using a newly developed AP-XPS apparatus at the soft X-ray undulator beamline BL07LSU of SPring-8. Figure 1 shows a schematic of the present *operando* AP-XPS system at SPring-8 BL07LSU. The AP-XPS system consists of four interconnected UHV chambers; an analysis chamber, a preparation chamber, a load-lock chamber, and a fast-entry chamber. The analysis chamber is used for XPS measurements both in UHV and at ambient conditions. The preparation chamber is equipped with an ion source and low energy electron diffraction optics. The load-lock chamber and the fast-entry chamber allow the introduction of samples from the air into the UHV system.

Figures 2(a) and (b) show series of O 1s and C 1s AP-XPS spectra of the Cu(997) surface at 340 K under CO_2 pressure of 0.8 mbar as a function of elapsed time. Gas-phase CO_2 peaks were initially observed at 536.6 eV in an O 1s XPS spectrum at t = 376 s, and at 292.8 eV in a C 1s XPS spectrum at t = 507 s. These gas-phase peaks were shifted to 536.4 eV and 292.6 eV, respectively, after a lapse of about 5500s. At t = 376 s, a peak of adsorbate was observed at 531.3 eV in the O 1s region. Three peaks of adsorbates were observed in the C 1s spectrum (t = 507 s) at 288.4 eV with a broader shoulder peak at higher binding energy (289.0 eV), and at 284.4 eV (C^0), which is assigned to neutral carbon species such as carbon atoms and hydrocarbons. As discussed later, the other adsorbate peaks at 531.3, 289.0 and 288.4 eV are assigned to carbonate (CO_3). The amount of CO_3 was saturated at t ~ 2000 s, and then a new peak at 529.5 eV appeared in O 1s spectra. This peak is attributed to atomic oxygen. Figures 2(c) and (d) show O 1s and C 1s spectra measured under UHV (~10^{-9} mbar) after a series of AP-XPS measurements. The adsorbates formed in the presence of 0.8 mbar CO_2 were stable at 340 K and remained on the surface even after evacuating the gas cell to UHV. The result indicates that the decomposition of CO_3 does not occur at 340 K.

The composition ratio between oxygen and carbon at the saturation region (t > 2000 s) was calculated from the area intensity of the O 1s peak at 531.3 eV and the sum of the intensities of the two C 1s peaks at 289.0 and 288.4 eV. In the estimation, the O 1s and C 1s intensities of the adsorbate peaks were normalized by those of the gas-phase CO_2 peaks in these spectra to cancel out differences in the analyzer transmission function and the core-election ionized cross section between O 1s and C 1s. The O/C ratio was estimated to be 3.1 ± 0.1. Similar experiments were done using a photon energy (hν) of 740 eV to check the effect of photoelectron diffraction on the estimation of the O/C ratio. The estimated ratio at hν = 740 eV is 3.2 which is within the error in the case of hν = 630 eV. If the observed two peaks in C 1s are due to both CO_3 and chemisorbed CO_2, the O/C ratio should be in the range from 2 to 3. Thus, the peaks at 531.3, 289.0 and 288.4 eV are assigned to CO_3.

The produced CO_3 is stable at 340 K even after evacuation to UHV as shown in Figs. 2(c) and (d). The gas-phase peaks in AP-XPS spectra (Figs. 2a and b) are shifted to lower binding energies with increasing the CO_3 coverage, indicating the increase of the work function by the CO_3 adsorption. Therefore, adsorbed CO_3 is negatively charged by charge transfer from the Cu substrate. The present study clearly shows a facile formation of CO_3 on the stepped Cu surface, and CO_3 may be a key intermediate in CO_2 activation.

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Chiral Spin Spiral Structure Studied by Spin-Polarized Scanning Tunneling Microscopy

Hasegawa Group

Because of the potential application for future spintronics devices, spiral magnetic structures, such as skyrmion lattices, domain walls, and homogeneous spin spiral structures, have been a subject of extensive studies. Various types of spin rotations have been reported; Bloch-type (helical) or Néel-type (cycloidal), left-handed (↑←↓) or right-handed (↑→↓), and chiral or non-chiral. To determine these types, neutron scattering, Lorentz microscopy, *etc.* have been utilized. For

nanometer- or atomic-scale spin spiral structures, often formed in ultrathin films, spin-polarized scanning tunneling microscopy (SP-STM), which detects spin orientations in atomic-scale spatial resolution, is the only method for the determination. We have investigated the types of the spin structure observed in a monolayer (ML) Mn thin film formed on a tungsten substrate using the ultimate spin-probe microscopic method.

In magnetic systems whose inversion symmetry is broken, the Dzyaloshinskii–Moriya interaction (DMI) plays a key role in the formation of chiral spin structures. Since the symmetry is naturally broken at interfaces, several systems composed of 3d magnetic thin films and 5d non-magnetic heavy-elemental substrates showing a strong spin-orbit coupling exhibit DMI-driven chiral spin structures. For the investigation of how overlayers and substrates affect the polarity and strength of DMI a W(110) substrate is one of the ideal systems because various chiral structures have been discovered on it with overlayers. From SP-STM images taken with a tip whose magnetization direction is well controlled, we revealed that the Mn monolayer indeed exhibits a cycloidal spin spiral structure with a left-handed rotation (See a schematic shown in Fig. 1(e)). By comparing with *e.g.* the case of magnetic domain walls observed in Fe thin films, we found that the polarity of DMI is basically determined by the substrate.

The SP-STM experiments were performed with an ultrahigh vacuum STM at 5 K using Fe-coated W tips as a magnetic probe. Since the amount of the tunneling current is proportional to the cosine of the angle θ between the tip and sample magnetization directions, one can obtain the spin or magnetic contrast of the sample using the magnetized tip. A two-axis superconducting magnet was used to align the tip magnetization to the specific orientations of the sample.

A typical STM image taken on monolayer Mn-covered W(110) surface is shown in Fig. 1(a). A cross-sectional

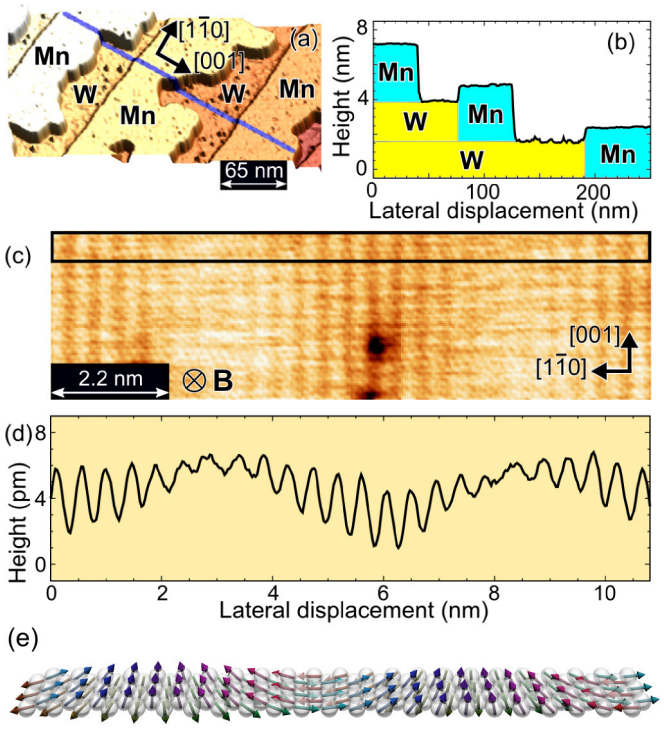

Fig. 1. (a) STM image of a Mn monolayer (ML) formed on a W(110) substrate. (b) Cross-sectional profile taken along the blue line in (a). (c) Spin-polarized STM image of 1 ML Mn/W(110) taken with an Fe-coated W tip magnetized perpendicular to the sample surface. (d) Cross-sectional profile averaged in the boxed area in (c). (e) schematic of the magnetic structure of ML Mn/W(110).

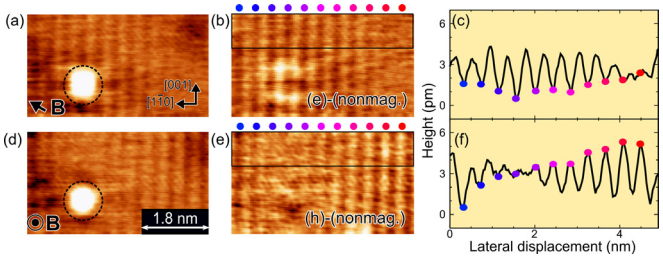

Fig. 2. (a, d) SP-STM images of 1 ML Mn/W(110) taken in the same area with an Fe-coated W tip magnetized in the in-plane (a) and out-of-plane directions (d) The direction of the applied magnetic field is shown by the arrows. (b, e) Images whose nonmagnetic contribution was subtracted from (a) and (d). (c, f) Cross-sectional profiles averaged in the boxed areas of (b, e). The same colored dots indicate the same atomic rows in the images of (b, c, e, f).

profile shown in Fig. 1(b) indicates atomically flat terraces of Mn ML grown from the W step edges. Figure 1(c) shows an SP-STM image taken on an ML region of Mn/W(110) with a tip magnetized perpendicular to the sample surface. Bright and dark rows separated by an atomic distance along the [1$\bar{1}$0] direction indicate antiferromagnetic magnetization of the Mn [001] rows. The contrast vanishes periodically at the Mn rows whose magnetization directions are close to the in-plane direction (i.e., θ is close to 90°), indicating a spin-spiral structure.

There are two possible types of spin spiral structure to explain the observed images; a cycloidal structure whose spins are rotating in the (001) plane and a helical one rotating in the (1$\bar{1}$0) plane. To determine the rotational type of the spin structure, SP-STM images are taken with a tip magnetized along the [001] direction. The obtained images showed suppressed magnetic contrast, indicating a cycloidal spin spiral structure. This result is consistent with the mechanism of the interfacial DMI, which only produces cycloidal spin spiral structures or Néel-type domain walls.

Then, in order to clarify the rotational sense of the cycloidal spin spiral structure, we performed SP-STM measurements with a spin-polarized tip magnetized in two orthogonal directions within the (001) plane. When we focus on every two adjacent spins, the magnetic contrast exhibits a sinusoidal variation. By changing the direction of the tip magnetization from parallel to perpendicular to the surface [*i.e.* from the leftward to the upward direction], we should observe +90° or -90° phase shifts in the sinusoidal profile depending on the rotational sense.

Figures 2(a, d) show SP-STM images taken in the same area with the tips magnetized in the directions shown in the figures. White clusters provide a proof that it is the same area. In order to extract the magnetic contrast, we subtracted the nonmagnetic contributions, which are derived by averaging two SP-STM images taken with the tips magnetized in opposite directions. Cross-sectional profiles shown in Figs. 2(c, f) indicate the direction of the phase shift is consistent with that expected for the left-handed spin spiral structure.

The domain walls in the Fe DL/W(110) were found as Néel-type domain walls with right-handed rotation, which can be explained by the consequence of the competition between ferromagnetic interaction (↑↑) and right-handed DMI (↑→). On the other hand, the left-handed rotation of Mn ML (↑↘←↗↓) is a consequence of the competition between antiferromagnetic interaction (↑↓) and right-handed DMI (↑→). We thus found the consistent role of the substrate on the polarity of DMI in the both cases.

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Nanocomposite Electrodes for Photoelectrochemical Water Splitting

Lippmaa Group

Photoelectrochemical water splitting can be used to harvest solar energy and produce hydrogen gas, which can be stored for later use in a fuel cell to generate electricity or used as a raw material for chemical synthesis. A major obstacle to wide-spread solar hydrogen production is the low efficiency of the energy conversion process due to large recombination losses in typical water-stable oxide semiconductors, such as titanates. In a typical oxide semiconductor, illustrated in Fig. 1a, a band bending region exists at the oxide-water interface, where electron-hole pairs are formed by light excitation and separated by the internal electric field. For an *n*-type semiconductor, photogenerated holes would be transported through a surface depletion layer to the surface, where the oxygen evolution reaction can take place. Hydrogen would be produced on a suitable counter electrode. However, only photocarriers formed within a few tens of nm of the surface can escape from the semiconductor and participate in water splitting, whereas photocarriers formed deeper in the semiconductor are rapidly lost to trapping and recombination. Considering the visible light absorption length, which is closer to micrometer scale in doped titanates, the fraction of incident light that can actually be converted to active photocarriers at the surface is on the order of a percent.

Various strategies exist for improving the charge extraction efficiency from oxide photoelectrodes. Besides a pure materials approach directed at finding more efficient semiconductors and doping schemes, it is also possible to design suitable nanoscale structures that improve charge collection by virtue of geometric effects. In our work, we have developed a method of growing noble-metal-doped titanate semiconductors where some of the noble metal segregates in the form of nanoscale pillars as illustrated in Fig. 1b.

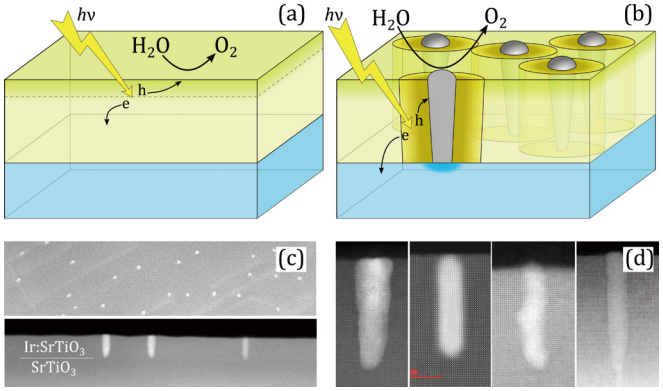

Fig. 1. (a) Operating principle of a photocatalytic energy conversion system where photogenerated charges are extracted only from a thin surface layer. (b) A nanopillar composite electrode where tubular Schottky junctions surrounding metal pillars extend the charge extraction region to the full depth of a thin film electrode. (c) Plan and cross-section STEM views of Ir metal nanopillars in a Ir:$SrTiO_3$ matrix, (d) Examples of (left-to-right) Ir, Pt, Pd, and Rh nanopillars grown in a $SrTiO_3$ matrix. The diameter of all pillars is 5 to 10 nm.

When the nanopillar consists of a high work function metal and the surrounding semiconductor is an *n*-type material, tubular Schottky junctions form around each pillar. The internal field of the Schottky junction ensures efficient charge separation and extraction throughout the thickness of the thin film photoelectrode, while the metal nanopillars provides a low-resistance charge extraction path to the film surface.

The formation of noble metal nanopillars is achieved by considering the kinetic and thermodynamic crystal growth parameters in a pulsed laser deposition process. For several noble metals, it is possible to find a balance between the oxidation rate of the metal and the growth rate of the crystal, where the average background oxygen pressure is low enough for metal segregation to occur at the initial growth stage of a film and the growth rate is balanced with the surface migration rate so that further segregated metal can form vertical pillar structures.

From the point of view of water splitting, the best starting material for the nanopillar composite photoelectrode growth is Ir:$SrTiO_3$. Homogeneously doped Ir:$SrTiO_3$ is an *n*-type semiconductor, while bulk iridium metal is a high workfunction material, ensuring that Schottky junctions form at Ir – Ir:$SrTiO_3$ interfaces. Additionally, Ir and IrO_2 are electrocatalysts that are known to promote the oxygen evolution reaction in water. The formation of segregated Ir metal inclusions in a Ir:$SrTiO_3$ film can be seen in scanning transmission electron microscope (STEM) plan and cross-section views in Fig. 1c. The cross-section image shows that the pillars do indeed nucleate at the $SrTiO_3$ substrate interface, and that approximately 10 nm wide pillars extend through the thickness of the film to the photoelectrode film surface. The spontaneous segregation behavior seen for Ir can be reproduced for a variety of noble metals. Although the particular growth parameters vary from metal to metal, nanopillar formation has been observed for Ir, Pt, Pd, and Rh (Fig. 1(d)).

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The Novel Magnetic and Valence Instabilities Tuned by Pressure in $YbNi_3Ga_9$

Uwatoko Group

In heavy fermion systems, non-Fermi liquid state and/or unconventional superconductivity often appear near a quantum critical point (QCP) where a second order phase transition is suppressed to zero temperature [1]. Therefore, pressure tuning of the ground state from a nonmagnetic state to a magnetic state or vice versa has attracted attention. The anomalous properties in the vicinity of QCP are described by the spin fluctuation theory, especially for most of Ce-based compounds, however, the unconventional critical behavior has been recently reported in several Yb-based heavy fermion compounds. Soon after, several theories have been proposed

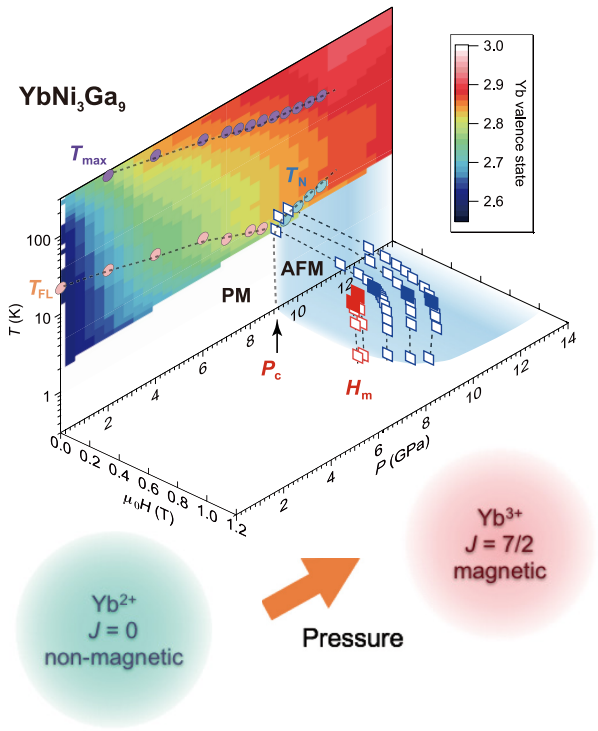

Fig. 1. Contour plot of the Yb valence in the temperature-pressure phase diagram of $YbNi_3Ga_9$. The transition and crossover temperatures are deduced from resistivity (circles) and ac magnetic susceptibility (squares) measurements. Here, closed squares below and above Pc indicate the CP and TCP, respectively. The dashed lines are guides to the eye.

to clarify the origin of the unconventional criticality, nevertheless, it remains an open question. Since the pressure variation of magnetism in Yb systems is accompanied by a valence change from the divalent to the trivalent state of Yb ions, direct observations of Yb valence toward the magnetic QCP is highly desirable. Here we show the realization of the pressure-induced valence crossover and the novel metamagnetic behavior possibly due to the valence instability near the magnetic quantum phase transition in intermediate valence $YbNi_3Ga_9$ [2,3].

Figure 1 shows the temperature-pressure-magnetic field phase diagram of $YbNi_3Ga_9$ together with a contour plot of the Yb valence value in the *T*-*P* plane. We have revealed a clear evolution of the Yb valence toward the magnetic trivalent state as well as the change from the nonmagnetic to the magnetic ground state with increasing pressure. The resulting phase diagram suggests that the occurrence of the pressure-induced first-order magnetic transition in $YbNi_3Ga_9$ is associated with enhanced valence fluctuations. This interpretation is consistent with the observations of a first-order metamagnetic transition below Pc, which is associated with the field-induced valence change from the mixed-valent state to the trivalent state with magnetic degrees of freedom. Our results suggest that the proximity to the critical end point of the first-order valence transition gives rise to the unconventional critical behavior in other Yb systems.

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Coupling of Two Quantum Hall States at Graphene Monolayer/Bilayer Boundary: Bulk-Edge Correspondence between Different Materials

Osada Group

The edge channel transport in the quantum Hall (QH) states has been extensively investigated in graphene systems. The subjects of most studies have been the p-n homojunction of monolayer graphene (MLG) or bilayer graphene (BLG), since they were the first bipolar QH junctions between electron and hole QH states. The graphene p-n junctions are realized using the dual gate FET devices, in which an additional top-gate electrode partially covers MLG or BLG so as to control the carrier number and polarity of the covered part independently. In this case, both sides of the junction are the same material with the same band structure under different potential energy. The main issue was the mixing between the electron and hole QH edge channels propagating parallel along the junction in both sides.

Here, we consider another type of QH junctions in the graphene system, namely, the hetero-junction of MLG and BLG. In this case, the both sides of the junction have the same polarity (n-n or p-p junction), but they are different materials (MLG and BLG) with the different band structures: the low-energy band dispersion is the Dirac cone in MLG, but it shows the quadratic band touching in BLG. Under the perpendicular magnetic field **B**, these energy bands are quantized into the Landau levels (LLs), which have four-fold spin and valley degeneracies. The most characteristic feature is the appearance of the zero-energy LL resulting from the Berry phase of $\pm\pi$ and $\pm 2\pi$ around the band contact points in MLG and BLG, respectively. Note that the zero-energy LLs in MLG and BLG have different degeneracies; four-

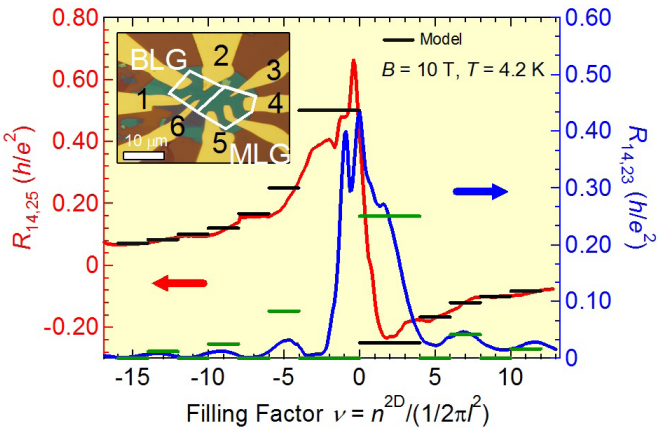

Fig. 1. Hall resistance $R_{14,25}$ and transverse resistance $R_{14,23}$ across the MLG/BLG junction. The horizontal bars indicate the quantized values assuming strong coupling limit. Inset: microscope image of the FET device.

fold in MLG but eight-fold in BLG in which both the n=0 and n=1 LLs degenerate to zero energy. This fact results in the different quantized values of the Hall conductivity; $\sigma_{xy} = N_1e^2/h = \pm(4N + 2)e^2/h$ in MLG and $\sigma_{xy} = N_2e^2/h = \pm(4N + 4)e^2/h$ in BLG (N = 0, 1, 2,$\cdots$). Here, N_1 and N_2 are the Chern numbers of the QH states in MLG and BLG, respectively. The spin or valley splitting is ignored.

In the present work, we have experimentally studied the QH edge transport across the MLG/BLG junction employing hexagonal boron nitride (h-BN) substrate, which remarkably improves sample quality, and we have clarified the edge channel configuration along the MLG/BLG junction. If the both sides of the junction is perfectly decoupled, there are $|N_1|$ and $|N_2|$ edge channels in MLG and BLG sides, respectively, so that they propagate in opposite direction along the junction. If finite coupling exists between both sides, they must show pair annihilation resulting in $|N_1| - n$ and $|N_2| - n$ channels at the boundary. At the strong coupling limit, n = min($|N_1|$, $|N_2|$), $|N_2 - N_1|$ channels with the same direction remains at the boundary. These features are required from the bulk-edge correspondence at the boundary of two QH states, which basically originates from the charge conservation law. The coupling feature is not trivial since MLG and BLG have different crystal and band structures. Whereas electronic states in MLG consist of A and/or B site Wannier states, those in BLG mainly consist of A and/or B' site Wannier states. So, the envelope function is not continuous at the MLG/BLG boundary. The coupling depends on the connection of the true wave functions at the boundary.

Figure 1 shows the observed Hall resistance and transverse resistance across the MLG/BLG boundary of the FET device fabricated on h-BN substrate as functions of the filling factor, which is controlled by the back gate voltage. The carrier densities of the MLG and BLG parts are almost same, since the gate voltages of charge neutrality points coincide in both parts. The horizontal bars indicate the quantized values calculated from the Landauer-Büttiker formula assuming the strong coupling limit. The calculation well reproduces the observed result in the positive filling (n-type) region. Considering the BLG side shows imperfect QH effect in the negative filling (p-type) region in the present device, this agreement indicates that the coupling between two QH states at the boundary is so strong that the minimum number ($|N_2 - N_1|$) of edge channels survives at the boundary of MLG and BLG.

In the figure, we can see another remarkable feature around the zero filling. The transverse resistance shows fine dip structures. They are considered to reflect the degeneracy breaking of the zero-energy LL in MLG and BLG. Although no perfect splitting was observed in MLG or BLG in the present device, this result suggests the splitting of the edge channels along the boundary.

Authors
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One-Third Magnetization Plateau with a Preceding Novel Phase in Volborthite

Hiroi, Kindo, Tokunaga and Takigawa Groups

We have synthesized high-quality single crystals of volborthite, a seemingly distorted kagome antiferromagnet, and carried out high-field magnetization measurements up to 74 T and ^{51}V NMR measurements up to 30 T. An extremely wide 1/3 magnetization plateau appears above 28 T and continues over 74 T at 1.4 K, which has not been observed in previous studies using polycrystalline samples (Fig. 1). NMR spectra reveal an incommensurate order (most likely a spin-density wave order) below 22 T and a simple spin structure in the plateau phase. Moreover, a novel intermediate phase called 'N' phase is found between 23 and 26 T, where the magnetization varies linearly with magnetic field and the NMR spectra indicate an inhomogeneous distribution of the internal magnetic field (Fig. 2). This sequence of phases in

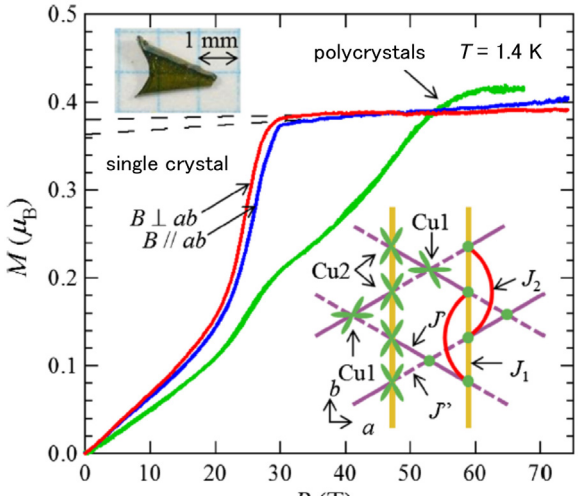

Fig. 1. Magnetization curves of volborthite measured at 1.4 K on two piles of single crystals in magnetic fields perpendicular (red line) and parallel (blue line) to the *ab* plane, and on a polycrystalline sample (green line). Shown also are a typical single crystal of volborthite (upper left) and the arrangement of Cu d_{x2-y2} orbitals projected onto the *ab* plane in the low-temperature $P2_1/a$ structure (lower right). J_1 and J_2 represent the NN and NNN interactions in the Cu2 spin chains, respectively. J' and J'' represent the NN interactions between Cu1 and Cu2 spins.

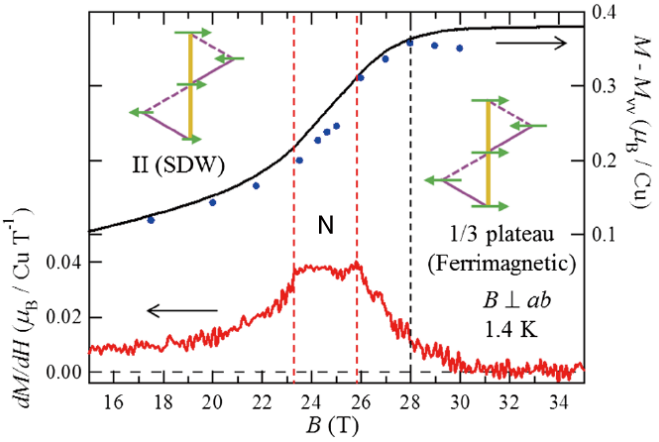

Fig. 2. Magnetization curve of single crystals (top, black line) and its field derivative (bottom) in $B \perp ab$ at 1.4 K after the subtraction of the Van Vleck paramagnetic magnetization (M_{VV}). Magnetization deduced from the center of the gravity of the NMR spectra is also plotted (top, blue circles). Phase 'N' with a linear field dependence of magnetization exists between phase II (SDW) and the 1/3 plateau state.

volborthite bears a striking similarity to those of frustrated spin chains with a ferromagnetic nearest-neighbor coupling J_1 competing with an antiferromagnetic next-nearest-neighbor coupling J_2. This analogy suggests that the N phase is related to a spin nematic order that is expected to appear in "frustrated" ferromagnets.

How do we understand the appearance of this series of magnetic phases in volborthite under magnetic fields? Among the various possible spin models for volborthite, we now consider a $J_1 - J_2 - J' - J''$ model on the distorted kagome net (see Fig. 1) as the most likely. Using DFT + U calculations, Janson and his coworkers evaluated the magnetic interactions and found that J'' is the strongest antiferromagnetic coupling, which results in a coupled trimer model [2]. In this model, the 1/3 plateau phase pertains to polarized magnetic trimers formed by J'' bonds. Their theoretical considerations also predict the presence of a spin nematic phase just before the 1/3 saturation, which seems to correspond to our N phase.

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SU(N) Heisenberg Model with Multicolumn Representations

Kawashima Group

Realization of quantum spin liquid in short-range coupling models has been a popular research target in condensed-matter physics for several decades. One approach to obtain a spin liquid state is to consider a Hamiltonian with higher symmetry, which increases quantum fluctuations. Read and Sachdev generalized the antiferromagnetic Heisenberg into SU(N) symmetry [2]. Based on the 1/N expansion they showed that the ground state of the model with sufficiently large N is a valence-bond-solid (VBS) ordering breaking the lattice rotational or the translational symmetry spontaneously. Recently, in the context of the deconfined quantum criticality [3], their theory attracts renewed attention. In particular, the existence of an intermediate state, which might be a spin-liquid state, was discussed near the boundary of Néel and VBS [4,5].

With the famous example of the Haldane gap states, it is now well-known that the nature of the ground state can strongly depend on the representation of the symmetry group even if the symmetry itself is the same. It also applies to the present problem. We consider SU(N) Heisenberg model with the representation of the Young diagram with a single row and n columns. Previously, it was found [4,5] that the Néel state for small N switches to the VBS state for large N without an intermediate spin liquid state. In the case of n = 2, 3, 4, however, though the Néel order disappears at some value of N, no evidence of VBS order has been found in QMC calculation for the $L\times L$ square lattice up to L = 32

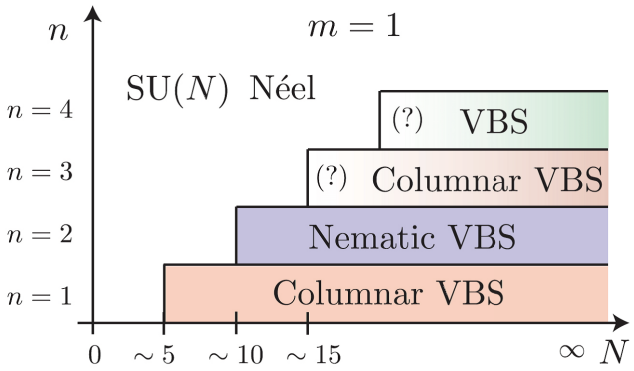

Fig. 1. Schematic phase diagram of the SU(N) Heisenberg model on the square lattice with single-row (m = 1) representations. The phase boundaries for the case of n = 2,3 are determined in the present study. In the case of n = 3,4, we do not see clear evidence of the spontaneous VBS order in the vicinity of the phase boundaries for finite-size QMC simulations.

[5]. At first sight, this result may appear to suggest an intermediate phase between the Néel phase and the VBS phases. In the present work [1], we investigate this problem to clarify whether the intermediate phase exists or not.

First, we examine the case of n = 2. In Fig. 2, we show the Binder parameter of the VBS order parameter for various N and L. The Binder parameter should be 1 when the corresponding order exists and 0 otherwise. From the figure, we see that the VBS order is absent for N = 9 while it exists for N = 11. While the case N = 10 may seem marginal at the first sight, it is approaching the value 1 as can be seen in the inset. From these observations, we conclude that in the case of n = 2 the ground state is the Néel state for $N \le 9$, while it is the nematic VBS state for $N \ge 10$. There is no intermediate phase.

For n = 3 and 4, the problem is harder. In the case of n = 3, while the system size dependence of the Néel order parameter shows that the Néel states end at N = 14, no clear VBS order can be seen in our calculation up to L = 128. To see if this can be regarded as an evidence of the intermediate spin liquid state, we re-examine the prediction of the large-N theory [2], and we find a correspondence between the two cases: (n,N) = (2,10) and (3,15). When the order is small, even if it is finite, the numerical estimate shows apparent 1/L decay for small L regime, and eventually deviates from it. From the known size dependence of the order parameter for the (2,10) case and the correspondence between the two cases, we estimate the cross-over system size at which the size dependence starts to deviate from 1/L behavior in the (3,15) case. It turns out that this cross-over size is around L = 400, indicating that the order is too small to detect even

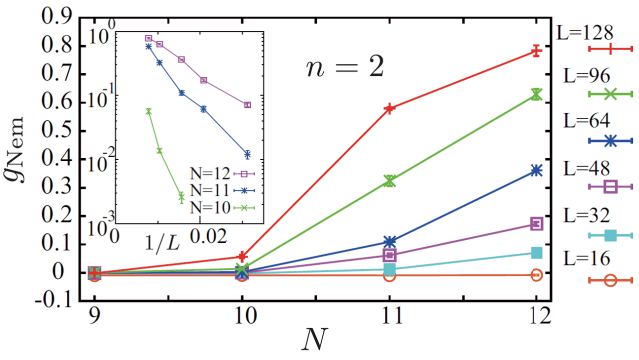

Fig. 2. The Binder cumulant of the nematic order parameter for the model with n = 2 for 16 ≤ L ≤ 128. The inset shows size dependence of the Binder cumulant for N = 10, 11 and 12 in the semi-log scale. The error bars represent the standard errors.

if it exists as the $1/N$ theory predicts. The situation is similar for the $n = 4$ case.

To summarize, none of the existing evidence contradict to the absence of the intermediate spin liquid phase, and the absence is confirmed in the $n = 2$ case while direct confirmation is still missing for larger n.

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Membrane Tubulation and Polyhedral Vesicle Formation Induced by Banana-Shaped Proteins

Noguchi Group

In living cells, membrane morphology is regulated by various proteins. Many membrane reshaping proteins contain a Bin/Amphiphysin/Rvs (BAR) domain, which consists of a banana-shaped rod. The BAR domain bends the biomembrane along the rod axis and the features of this anisotropic bending have recently been studied. We study as to how such a local anisotropic curvature induces effective interaction between proteins and changes the global shape of vesicles and membrane tubes using meshless membrane simulations. The proteins are modeled as banana-shaped rods strongly adhered to the membrane.

Our study revealed that the rods assemble via two continuous directional phase separations in membrane tubes and vesicles unlike a conventional two-dimensional phase separation [1]. As the rod curvature increases, the rods assemble along the azimuthal direction and subsequently along the longitudinal direction accompanied by shape transformation of the membrane tube. In the vesicle, in addition to these two assembly processes, further increase in the rod curvature induces tubular scaffold formation. We also found that the polyhedral vesicles and polygonal tubes are stabilized at high rod densities [2]. The discrete shape transition between triangular and buckled discoidal tubes and between polyhedral shapes are obtained. As line tension of the membrane edge is reduced, the protein adhesion induces membrane rupture leading to high-genus vesicle formation and vesicle inversion [3]. These shape transformations and assemblies are not obtained by isotropic inclusions.

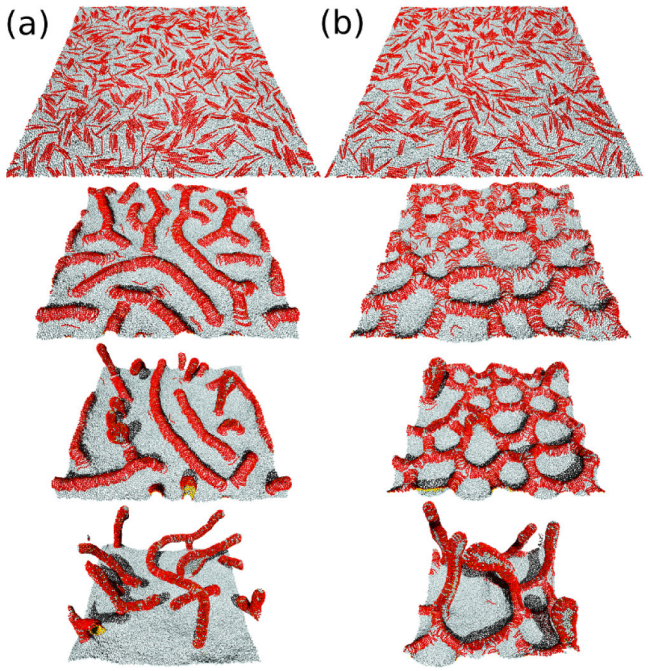

Fig. 1. Sequential snapshots of tabulation from a flat membrane induced by protein rods. (a) Positive perpendicular rod curvature. (b) Negative perpendicular rod curvature.

We also studied the effects of the spontaneous (side) curvature perpendicular to the rod, which can be generated by protein–protein and membrane–protein interactions [4]. We revealed that the perpendicular curvature can drastically alter the tubulation dynamics from a flat membrane at high protein density whereas no significant difference is obtained at low density. A percolated network is intermediately formed depending on the perpendicular curvature. This network suppresses tubule protrusion. Thus, this kinetic trap makes tubule formation significantly slower. The stability of network structures can be explained by a simple geometric model. Positive surface tensions and vesicle membrane curvature can stabilize this network structure by suppressing the tubulation. It is known that tubulation dynamics can be different even for proteins consisting of the same BAR domains. Our finding suggests that the interactions between the rest parts of the proteins can give significant effects.

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H. Noguchi

Formation and Structure of Carbon Dioxide Glass

Yamamuro Group

Glass can be recognized as the ‘fourth state of matter’ following gas, liquid, and solid. Compared with the conventional three states, glass is more mysterious and leaves many unsolved problems from the viewpoint of physics. One of the most important problems is the ‘basic structure of glasses’. Is it similar to the local structure of the corresponding crystal or characteristic of the glass such as an icosahedral cluster? This problem is recently remarked more and more as it has been understood that the mechanism of the glass transition is deeply associated with the local and/or medium-range structures of glasses.

For metallic glasses, a bulk glass of tantalum (Ta) was experimentally obtained recently [1] and its structure was confirmed to be an aggregate of icosahedral clusters from the molecular dynamics simulation [2]. On the other hand, for simple molecular glasses which additionally have an orientational degree of freedom, there have been few structural works since their glass transition temperatures are very low

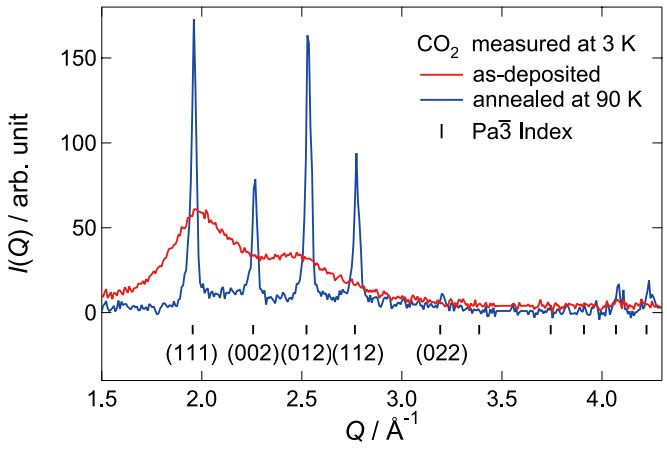

Fig. 1. X-ray diffraction patterns of the vapor-deposited CO_2 measured at 3 K. The red and blue curves represent the data of the as-deposited and 90 K-annealed samples, respectively. The tick marks with Miller indices show the peak positions calculated from the crystalline data [7] with a space group Pa-3.

and they are readily crystallized on cooling. Our group has formed several simple molecular glasses by means of a vapor deposition (VD) method, and investigated their thermal and structural properties [3-6]. The vapor-deposition is the most rapid cooling method, in which molecules at a gas state are condensed on a cold substrate. The cooling rate is estimated to be higher than 10^7 Ks^{-1}. In this work, we have tried to form a CO_2 glass, which has never been vitrified.

The red curve in Fig. 1 shows the X-ray diffraction pattern of the as-deposited sample measured at 3 K. This data clearly exhibits a typical halo pattern characteristic of amorphous structures, indicating that the amorphous form of CO_2 was successfully prepared by the VD method. We would like to emphasize that this is the simplest molecular glass ever realized. On heating the VD sample, many Bragg peaks, which are a direct evidence of crystallization, appeared at 25 K. To obtain the complete crystalline state, the sample was annealed at 90 K for 5 min and then cooled again to 3 K. The blue curve in Fig. 1 presents the diffraction pattern of the annealed sample exhibiting sharp Bragg peaks. The peak positions are well reproduced in terms of the reported crystal structure (space group Pa-3) [7] as shown by the tick marks in Fig. 1.

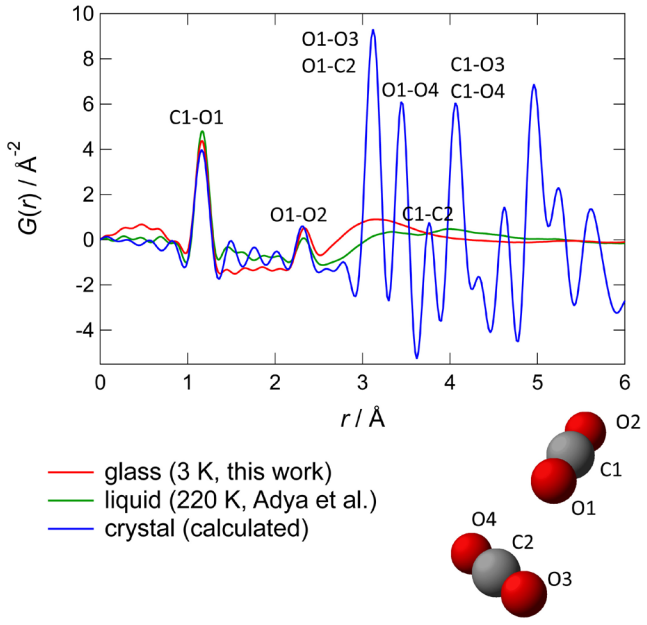

Fig. 2. Pair distribution functions for glassy, liquid, and crystalline CO_2. The nearest neighbor configuration in crystalline CO_2 is schematically shown below the graph. The label corresponding to each atomic correlation is depicted in the graph.

Figure 2 shows the pair distribution functions $G(r)$ of glassy, liquid, and crystalline CO_2. The former two were obtained by the Fourier transformation of the observed diffraction data and previous data on liquid CO_2 at 220 K and 0.85 MPa [8]. The $G(r)$ of crystalline CO_2 was calculated from the crystal data [7]. The configuration of the neighboring two CO_2 molecules in the crystalline state is also depicted in Fig. 2. The peaks around 1.15 Å and 2.3 Å, which are common in all states, correspond to the C-O and O-O correlations within a molecule, respectively. The $G(r)$ of the glassy sample exhibits a peak around 3.1 Å, while that of the liquid sample broader peaks around 3.3 Å and 4.0 Å. It is noteworthy that the peak position of the glassy sample (3.1 Å) coincides with the shortest intermolecular correlation (O1-C2, O1-O3) in the crystalline state. This indicates that the glassy CO_2 has a strong intermolecular correlation which is similar to that in crystalline CO_2. This is the first experimental evidence for the basic structure of glasses.

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Magnetic Model in Multiferroic $NdFe_3(BO_3)_4$ Investigated by Inelastic Neutron Scattering

Masuda Group

Symmetry breaking of time reversal and space inversion allows spontaneous order both in magnetism and dielectricity. The enhanced simultaneous order, multiferroics [1], has been extensively studied since the discovery of its experimental realization in the perovskite manganite $TbMnO_3$ [2]. The microscopic consideration of electronic states taking into account a spin-orbit interaction and symmetry of crystals reveals the relationship between the structures of spin and polarization. So far, in many multiferroic materials, the complex spin structure of the 3*d* transition metal ions has been focused in relation with induced electric polarizations. On the other hand, existence of an interaction between 4*f* and 3*d* ions (*f*-*d* coupling) and its importance on the multiferroic structure has not been in the spotlight. In this context, an easy-plane type antiferromagnet $NdFe_3(^{11}BO_3)_4$ provides a simple and interesting playground in which Nd and Fe moments are simultaneously ordered thorough the *f*-*d* coupling and the polarizations are simply described by a rank two tensor of local magnetic operators. Recently we performed inelastic neutron scattering (INS) measurements on single crystals of hexagonal $NdFe_3(^{11}BO_3)_4$ to explore the magnetic excitations, to establish the underlying Hamiltonian, and to reveal the detailed nature of hybridization between the 4*f* and 3*d* magnetism and its relation to

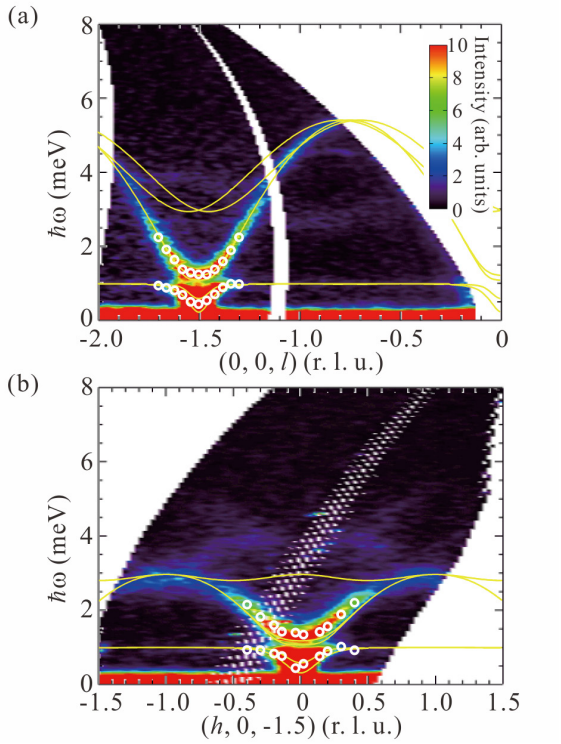

Fig. 1. Inelastic neutron scattering spectra obtained using HRC, along the (a) c^* and (b) a^* directions. The curves are the calculated spin-wave dispersions.

the multiferroic structure by using state-of-the-art neutron spectrometer HRC [3].

The INS spectra projected onto $\hbar\omega$-c^* and $\hbar\omega$ -a^* plane are shown in Figs. 1(a) and 1(b). We clearly observed the spin waves of the Fe^{3+} moments around AF zone center at $\boldsymbol{q}$ = (0,0, −1.5), and the flat excitation at about 1.0 meV from the crystal field of Nd^{3+} ion. Overall spectra are reasonably reproduced by spin-wave calculation including spin interaction in the framework of weakly coupled Fe^{3+} chains, *f*-*d* coupling, and single-ion anisotropy derived from the Nd^{3+} crystal field. Hybridization between the 4 *f* and 3*d* magnetism is probed as the anticrossing of the Nd- and Fe-excitations. The in-plane anisotropy gap at the AF zone center is explained solely by the crystal field of the Nd^{3+} ion in the quantitative level. The magnetic anisotropy of the Fe^{3+} ion allowed in the crystal structure is found to be negligibly small after the consideration on dipole-dipole interaction, single ion anisotropy, and spin nematic interaction as the origin of the in-plane anisotropy. Combination of the measurements and calculations revealed that the hybridization between 4 *f* and 3*d* magnetism propagates the local magnetic anisotropy of the Nd^{3+} ion to the Fe^{3+} network, resulting in the bulk magnetic structure. In the multiferroics of the spin-dependent metal-ligand hybridization type, the local magnetic anisotropy controls the electric polarization, meaning that the local symmetry of the rare-earth ion is a driving force for the nonlocal multiferroicity in $NdFe_3(^{11}BO_3)_4$.

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Magnetic Fields up to 370 T Revealed Aharonov-Bohm Exciton Splitting in Carbon Nanotubes

Takeyama Group

Rolled graphene with a certain chirality vector (n, m) forms a single-walled carbon nanotube (SWNT), possessing different electrical properties depending on the chirality, changing from semiconductors to metals. The penetration of magnetic flux quanta into a SWNT breaks the time-reversal symmetry of the electronic states, and the effect is known as the Aharonov-Bohm (A-B) effect. The quasi-one dimensionality of SWNTs enhances the effects of exciton as well as electron correlation in the band-edge optical properties. Owing to the A-B effect, a magnetic flux penetrating the cross section of a SWNT induces the valley splitting between the *K* and *K'* points in the Brillouin zone, along with a mixing of the exciton wave functions, and eventually the bright exciton and its dark counter part are converted into two independent bright *K* and *K*' point excitons in a limit of strong magnetic fields. The $k \cdot p$ theory by Ando [1], has predicted magnetic field evolution of the *K* and *K*' point exciton absorption spectra differently, depending on the relative energy-level ordering of the bright and dark band-edge excitons.

We have observed a discernible linear peak splitting of the *K* and *K*' point exciton absorption spectra of SWNTs in magagauss magnetic fields above the field where the exciton wave function mixing is over. Highly-selected (6,5) single-chirality SWNTs synthesized by a single-surfactant multicolumn-gel-chromatography method [2] were further processed to highly alignment of the tubes to yield average 29 degrees alignment by a polyvinyl alcohol thin film stretching.

The thin stretched film sample was set inside of the flux-compression coil with input and output optical fibers in such a way that magnetic field was oriented along the film stretching direction (the Voigt configuration). The transmission light was detected by a streak camera equipped with a CCD camera. A streak image of absorption spectra was obtained in magnetic fields up to around 370 T generated by

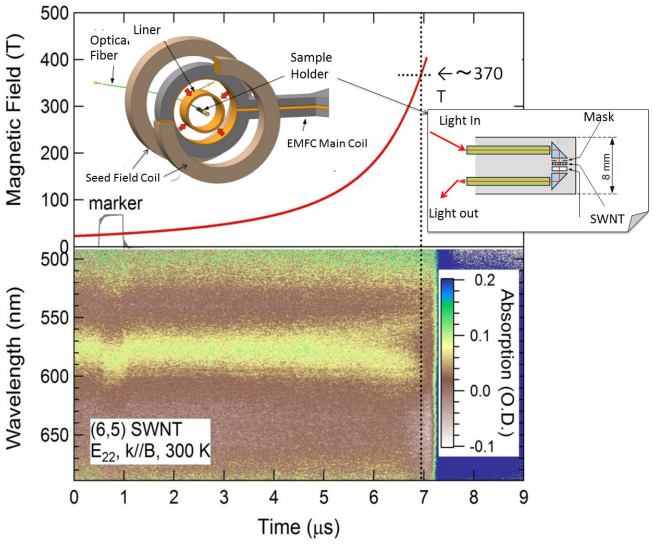

Fig. 1. A streak 2-dimensional image of the E_{22} second sub-band absorption of (6,5) SWNTs with a signal of magnetic field measured at 300 K. The inset illustrates sample setting with optical fibers inside a EMFC coil.

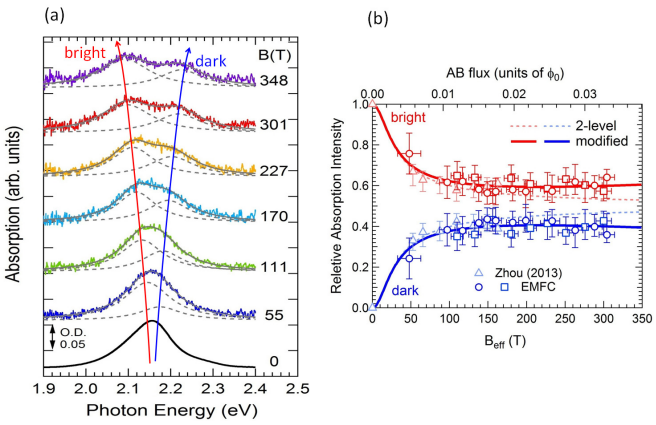

Fig. 2. (a) The band-edge absorption spectra at each magnetic field obtained from Fig.1. (b) The absorption intensity evolution in magnetic fields. The solid lines are the results of fitting using a two-energy level model (dotted line) modified with a linear B term. Triangles are obtained by the single-turn coil ultra-high magnetic field generator in magnetic fields up to 160 T.

the electro-magnetic flux compression ultra-high magnetic field generator, and the result was shown for the E_{22} second sub-band transition of a sample of (6,5) chirality SWNTs in Fig. 1. Absorption peak centered at 575 nm showed clearly a splitting when the magnetic field exceeds 170 T. The absorption spectra were plotted at each magnetic field strength from Fig. 1, and plotted in Fig. 2(a) with those of Lorentzian de-convolution spectral lines (dotted line). The peak energy splits linearly with magnetic field with the splitting $\Delta_{ab} = \mu B_{eff}$ (where, μ: exciton splitting coefficient = 0.5, B_{eff} = Bcos(29), and B is the strength of an external magnetic field) above 150 T. The integrated intensity of the absorption spectrum of each K and K' splitting component exhibited linear magnetic field dependence above 200 T, but with their intensity recovers to that of the original peak, respectively, as seen in Fig. 2(b). Simple two-energy level mixing model does not hold anymore [3], but should be modified with a linear B term. All these phenomena evolve quite similarly with those presented by the theory of T. Ando [1]. We have figured out that the linear term is correlated to the environmental static dielectric constant, and found that the value amounts to 50, which arises likely from residual water molecules in hydrophilic PVA film [4].

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Generation of Flat-Top Pulsed Magnetic Fields at ISSP

Kindo Group

Pulsed magnetic fields are commonly used where extremely strong magnetic fields are required. However, pulsed magnetic fields only persist for a short period of time which makes a scientific research difficult to conduct. The most commonly used pulsed field is driven by a capacitor bank and its field duration is typically from 1 to 100 milliseconds. Because of the extremely short timescale, most of experiments are difficult to perform, and only selected measurement techniques (such as magnetization and electronic resistivity) have been applied in pulsed magnetic fields. To solve this problem, some facilities in foreign countries start to utilize a flywheel generator and produces a "long" pulsed magnetic field that has ~1 second pulsed field duration. In 2008, International MegaGauss Science Laboratory at ISSP also installed the 51.3 MW DC flywheel generator and successfully produced long pulsed magnetic fields. The use of flywheel generator also enables us to generate a flat-top pulsed magnetic field (FTPMF) which has a constant field region around the maximum field. Since the FTPMF is the most demanding field profile for performing a precise experiment, we are now trying to generate highly stabilized FTPMFs with a homemade feedback controller. In this report, we would shortly describe our recent achievement of generating a FTPMF and its application to a scientific research.

Our homemade feedback controller consists of a FPGA (field programmable gate array) devise and a mini-coil circuit and is used in conjunction with a commonly used pulsed magnet[1]. The mini-coil is inserted into a pulsed magnet and modifies the original pulsed field profile to obtain a FTPMF. In Fig. 1 and 2, we show the generated field profiles of FTPMFs (60.64 ± 0.005 T for 2 ms and 35.5 ± 0.01 T for 90 ms) which are obtained with the mid-pulsed magnet (36 ms, 60 T) and the long-pulsed magnet (1.2 s, 36 T), respectively. In both cases, an extremely high field stability (±0.005~0.01 T) were obtained with feedback control of magnetic fields (see black curves). Since there is currently no alternative way to produce a FTPMF with high stability of the magnetic field, these FTPMFs can be used for improving the resolution of data with signal averaging or for performing a slow measurement (such as NMR and specific heat) at unprecedented high magnetic fields. The FTPMF shown in Fig. 2 is already utilized to perform a collaboration research and some specific heat data have been obtained. As shown as the green curve in Fig. 2, the temperature of the sample was recorded as a function of time. During the stabilized FTPMF, we applied heat pulses (ΔQ) to the sample and observed the resultant temperature jumps (ΔT). From each

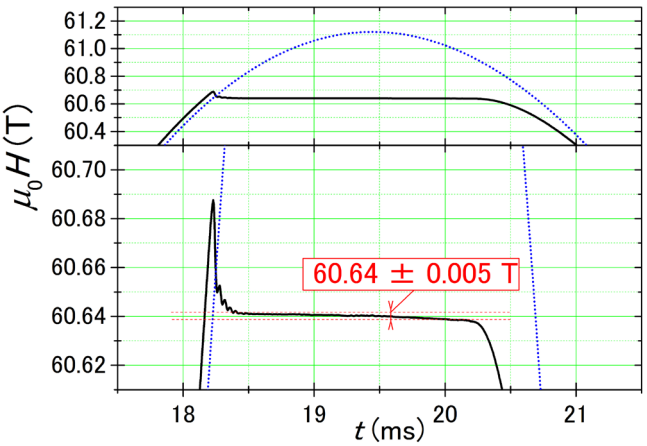

Fig. 1. Flattop pulsed field profile generated by 60 T user-coil and 1.2 T mini-coil. The user-coil and mini-coil were driven by the conventional capacitance banks and the lead batteries, respectively. The magnetic field generated by mini-coil is regulated by a homemade feedback controller and makes the pulsed field profile flat on the top of pulsed fields. The black (blue) curve is obtained with (without) the feedback control.

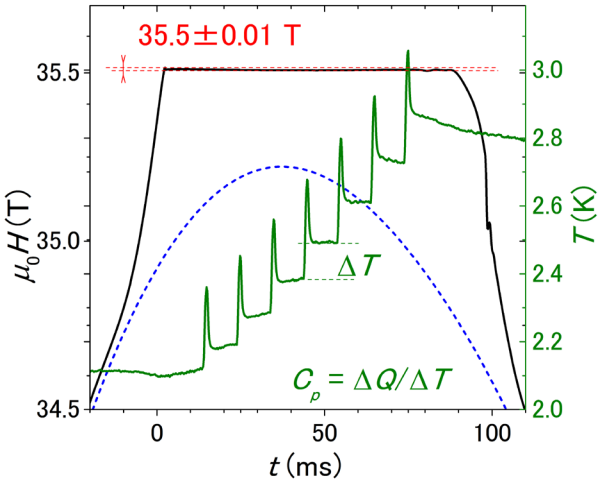

Fig. 2. Flattop pulsed field profile obtained with 36 T long pulsed magnet and 1.1 T mini-coil, which were driven by the DC flywheel generator and the lead batteries, respectively. The black curve indicates a field profile of a stabilized FTPMF. The field profile generated only with 36 T long pulsed magnet (no feedback control) is shown by a blue dashed curve. The temperature (green curve) and heat power (not shown) were recorded for the specific heat measurement.

temperature jump, we successfully estimated the specific heat ($C_p = \Delta Q/\Delta T$) and obtained several specific heat data points from a single pulse of magnetic fields.

We are planning to extend the time duration of FTPMF by a factor of 2 to 3 in 2016. Adding to the specific heat measurement, the generation of a highly stabilized FTPMF may open the way to perform a precise measurement that has never been possible in pulsed magnetic fields.

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Magnetic Field Induced Polar Phase in the Chiral Magnet $CsCuCl_3$

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Among the triangular lattice antiferromagnets, hexagonal $CsCuCl_3$ has been studied for a long time because of its interesting crystal and magnetic structures, and magnetic field induced phenomena. Owing to the Jahn-Teller distortion, Cu chains along the c axis are displaced helically in the triangular ab plane and form helices with a six-ion periodicity. This distortion makes the Dzyaloshinskii-Moriya (DM) interaction active with the D vector pointing to the c axis. The S = 1/2 spins of Cu^{2+} ions are ferromagnetically and antiferromagnetically coupled within and between the helical chains, respectively. The competition of ferromagnetic exchange and DM interaction induces the helical spin configuration with an incommensurate (IC) magnetic propagation vector (1/3, 1/3, δ = 0.085) below T_N ~ 10.7 K at zero field, in which spins lie on the triangular ab plane [1]. The magnetic field (H) applied normal to the c axis induces a plateau-like behavior in magnetization between 10.5 and 14.5 T before the spin saturation at 30 T, while for H // c axis magnetization shows a jump at 12.5 T [2]. With increasing $H \perp c$, the IC wave number δ decreases to ~ 0.05 at the beginning of the plateau [IC1 phase in Fig. 1(a)], remains constant in the plateau region (IC3), and decreases to zero on entering a commensurate (C) phase [3]. Using a pulse magnet developed at ISSP, we discovered a new multiferroic (MF) phase and discussed the origin of the emergence of the electric polarization in the chiral magnet $CsCuCl_3$ [4].

Figure 1(b) represents the magnetization (M) of $CsCuCl_3$ at 1.4 K as a function of H applied along the a, b^* and c axes, where b^* is perpendicular to the ac plane. In addition to the reported anomalies, we newly observe a jump of M above the plateau region for H // a or b^* axis, which is clearly seen as a sharp peak in the dM/dH curve in Fig. 1(c). This field corresponds to the phase transition to the C phase. The most intriguing observation is that the electric polarization along the a axis (P_a) becomes finite just above the IC3 phase and disappears in the C phase for $H \parallel b^*$, as shown in Fig. 1(c). The induced P is as small as ~ 0.25 μC/m^2. Figure 1(a) is the magnetoelectric phase diagram for the H_{b^*}-T plane. The MF phase is located at H between the upper bound of the M plateau and the lower bound of the C phase. According to a classical calculation [5], spins in each chain are expected to form a chiral soliton lattice in this field region. Observation of higher harmonics in neutron diffraction supports this theoretical prediction [6]. The chiral soliton lattice state comes to attract considerable attention after its discovery in metallic $CrNb_3S_6$ that belongs to the same point group (622) as that of $CsCuCl_3$ [7]. The present insulating material exhibits finite electric polarization in the relevant field region. The helical arrangement of Cu ions results in finite local electric polarization normal to the c axis through the spin current mechanism even in the proper screw-type spin order because of the non-zero $\boldsymbol{e}_{ij} \times (\boldsymbol{S}_i \times \boldsymbol{S}_j)$ term as shown in Fig. 1(d) [4]. This local polarization will be cancelled out if the helical spin arrangement is incommensurate with the lattice period. In the soliton lattice state, however, distance

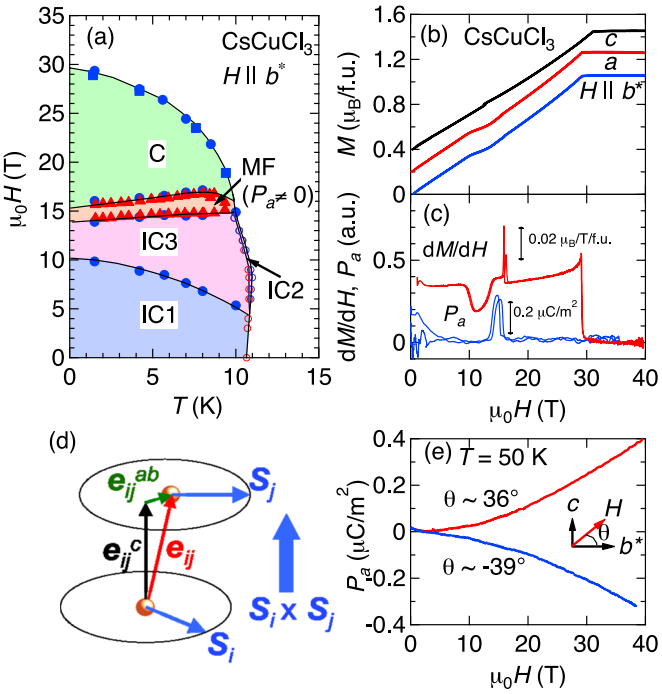

Fig. 1. (a) Magnetoelectric phase diagram of $CsCuCl_3$ in the H_{b^*}-T plane. (b) Magnetic field (H) dependence of magnetization (M) of $CsCuCl_3$ for H parallel to the a, b^*, and c axes at 1.4 K. (c) H dependence of dM/dH and electric polarization along the a axis, P_a, of $CsCuCl_3$ for H // b^* at 1.4 K. (d) Schematic of the two nearest interlayer Cu ions (spheres). Two adjacent spins $\boldsymbol{S}_i$ and $\boldsymbol{S}_j$ are connected with a unit vector $\boldsymbol{e}_{ij}$. (e) $P_a(H)$ curves for the H angle θ ~ –39° and ~ 36° in the paramagnetic region T = 50 K.

between the spin helices (solitons) becomes extremely large, and as a result, a small perturbation like magnetoelectric effects of the second order may align the local electric polarization to one direction. This second order effect, which is called as a paramagnetoelectric effect, is actually resolved by our accurate high-field experiments of the magnetoelectric effects in the paramagnetic phase as shown in Fig. 1(e). The emergence of electric polarization is thus explained by the cooperation of the local electric polarization on the chiral solitonic spin arrangement and the paramagnetoelectric effect. Therefore, we interpret this MF phase in $CsCuCl_3$ as the polar solitonic phase [4].

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Novel Spin State Ordering in $LaCoO_3$ Discovered at above 100 T

Y. H. Matsuda and Kindo Groups

In transition metal oxides (TMO), various exotic phenomena emerge such as superconductivity, colossal magnetoresistance, metal-insulator transition, multiferroics and so forth. All these phenomena are considered to originate in the electron correlation that gives rise to the quantum many body effects. Then, the emergent orders appear due to the coupling of multiple degrees of freedom in solids such as spin, charge, lattice. Among TMO, cobaltites are regarded unique for their spin state degree of freedom. For example in the case of the most intensively studied $LaCoO_3$, the electronic state of the trivalent cobalt ion ($3d^6$) is classified into low spin (LS), intermediate spin (IS) and high spin (HS) state according to the total spin angular momentum S = 0, 1, 2, respectively, based on the single ion picture.

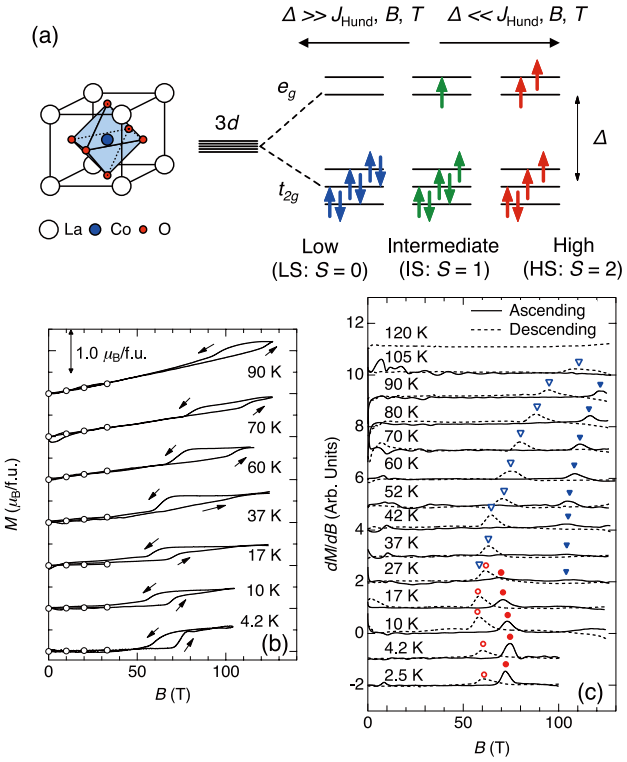

Fig. 1. (a) Schematic drawing of the perovskite structure and electronic configurations of spin state of $LaCoO_3$ (b) Magnetization (M) and (c) dM/dB curves of $LaCoO_3$ measured using induction method up to 130 T generated with the single turn coil method.

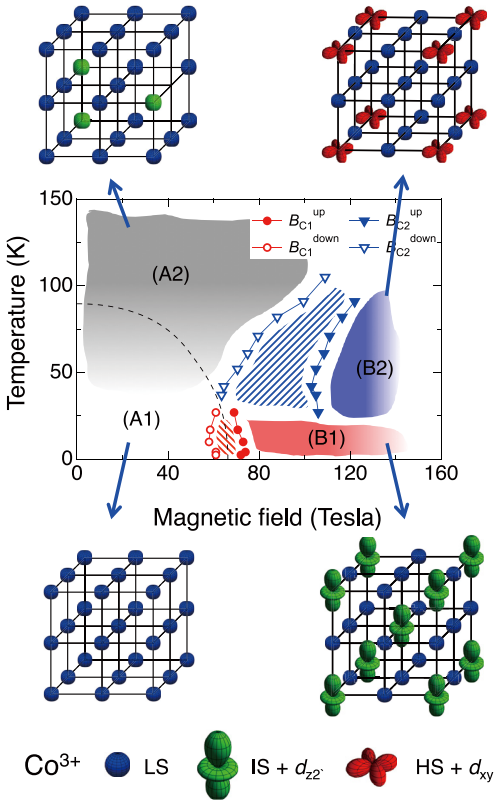

Fig. 2. (a) Magnetic field – Temperature phase diagram of $LaCoO_3$ determined by the magnetization measurements. (b) Tentatively proposed configurations of the spatial ordering of the spin state and orbitals in $LaCoO_3$.

One of the most interesting phenomena expected in cobaltites is the ordering of spin states, which is, however, not observed in general except for the limited cases such as thin films or special materials. Actually, in the case of $LaCoO_3$, no order of spin state has been found for more than half a century. $LaCoO_3$ undergoes the anomalous change in the magnetic and electric properties in the thermal evolution. In fact, even what kind of spin states are involved is still a major matter of debate.

Recently, it becomes clear that high magnetic fields can be used to directly observe the magnetic excited state of $LaCoO_3$. At ISSP UTokyo in 2009, the magnetization jump of 0.5 μ_B/Co at about 60 T was found [1]. At Los Alamos High field laboratory in 2012, another magnetization jump at 70 T was found by measurements up to 100 T [2]. It has been proposed that the spatial ordering of different spin state called spin state crystalline (SSC) phase is realized at high magnetic fields. However, for the confirmation of the SSC, the study up to even more high temperature and high magnetic fields is needed.

In Fig. 1 (b) and (c), we present the measured magnetization (M) and dM/dB up to 130 T and up to 110 K. We found an obviously new magnetic phase at above 100 T and at above 35 K along with the previously found phase of above

65 T and below 35 K in Fig. 2 (a) [3]. We at this moment are considering the origin of the novel phase as follows. At the phase (A1), all Co ions are in LS state. With increasing temperature at the phase (A2), thermally induced IS or HS of Co ions appears with spatially disordered manner. With increasing magnetic field, the phase transition from (A2) to (B2) takes place accompanied with the sudden increase of the number of IS or HS species and also accompanied by the formation of the spatial ordering or IS or HS and LS species, namely, the SSC. In (B2), further order such as orbitals may also be possible on the background of the SSC. With decreasing temperature, another phase transition takes place between (B2) and (B1) without changing the magnetization. At this moment, it is difficult to clarify what is happening in the phase transition between (B1) and (B2). We note that the representative possibilities are the order-disorder phase transition of orbitals, the switching between the different orbital order, the switching between the different SSC. Tentative schematics of such spin state and orbital order are depicted in Fig. 2 (b).

Actually, the origin of the discovered high field phases (B1) and (B2) in $LaCoO_3$ is still an open question. Besides the possibilities mentioned above, the possibilities of the field induced excitonic condensate and the SSC are investigated very recently with the calculations based on the dynamical mean field theory motivated by the present result [4,5]. For further investigation of the origins of the phase (B1) and (B2), different kind of experimental efforts such as the magnetostriction, magnetoresistance, x-ray diffraction at even higher magnetic fields, and the exploration of family materials are quite in demand.

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High-Resolution Three-Dimensional Spin- and Angle-Resolved Photoelectron Spectrometer Using Vacuum Ultraviolet Laser Light

Komori and Shin Groups

Spin-polarized electrons in solids have been intensively studied not only for fundamental scientific interests but also for technological applications such as to spintronic devices utilizing the spin degree of freedom. Recently, highly spin-polarized surface states have been discovered under the topological concepts associated with the electronic band structure of materials with strong spin-orbit interaction. Spin- and angle-resolved photoelectron spectroscopy (SARPES) is a powerful technique for investigating such spin-dependent electronic bands. We have constructed a SARPES apparatus

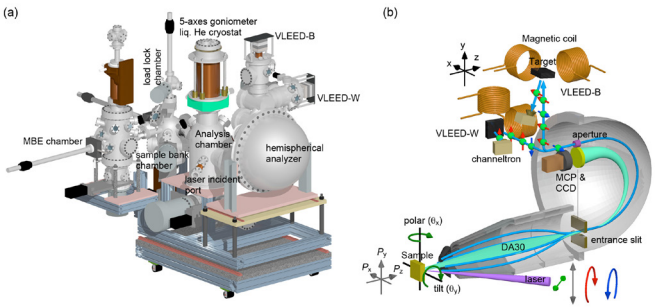

Fig. 1. (a) Overview of the laser-SARPES system developed at the Laser and Synchrotron Research Laboratory. [1] (b) Schematic drawing of the photoelectron detection part of laser-SARPES. The angle between the laser and the analyzer is fixed at 50°. Twin VLEED spin detectors arranged with orthogonal geometry are connected to the hemispherical photoelectron analyzer. The spectrometer is also equipped with electron deflectors at the multi-electron-lens part between the sample and the entrance slit.

[1] with high energy (1.7 meV) and angle resolutions (0.7°) by combining a very-low-energy-electron-diffraction-type (VLEED) spin detector using the oxygen-adsorbed Fe surface [2] and a high-photon-flux vacuum-ultraviolet (VUV) laser, the 6th harmonic of a basic wave of Nd:YVO_4 quasi-continuous wave laser with a non-linear optical crystal KBe_2BOF_2. (hν = 6.994 eV) [3]. The spectrometer consists of a hemispherical photoelectron analyzer equipped with a photoelectron deflector function and twin VLEED detectors, as shown in Fig. 1. The latter allows us to analyze the spin vector of a photoelectron three-dimensionally.

We have shown that the present laser-SARPES machine realizes a quick SARPES on the spin-split surface band structure of a Bi(111) film even with 7 meV energy and 0.7° angular resolutions. Figure 2 demonstrates three-dimensional detection of the spin polarization on the Bi(111) surface. We performed three-dimensional SARPES at a point between Γ and K where we can expect non-zero spin polarizations in the x, y, and z directions because of the absence of mirror symmetry on the ΓK line of the Bi(111) surface. In Figs. 2(a)-(f), two spin-polarized surface states, labeled S_1 and S_2, are clearly seen, and the amplitude of the spin vector is summarized in Fig. 2(g). From the spin polarization analysis, we can draw the energy dependence of the spin vector as in Fig. 2(h).

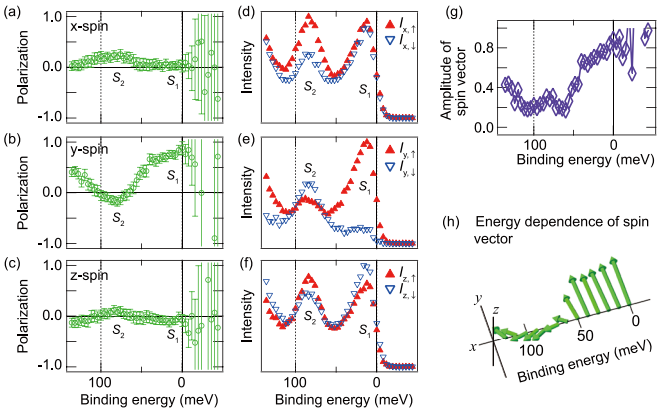

Fig. 2. Spin-polarized surface bands at a point between Γ and K on the Bi(111) surface detected by the three-dimensional laser-SARPES. (a-f) The x (a,d), y (b,e) and z (c,f) components of the spin polarization and the spin-resolved spectra. (g) Amplitude of the spin vector of the photoelectron emitted with the present experimental geometry shown in Fig. 1b. (h) Schematic drawing of the spin vector of the photoelectron emitted from the point between Γ and K as a function of the binding energy. The length of the arrows is proportional to the amplitude of the spin vector.

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Ultrafast Spin-Switching of a Ferrimagnetic Alloy at Room Temperature Traced by Resonant Magneto-Optical Kerr Effect Using a Seeded Free Electron Laser

I. Matsuda, Wadati, and Shin Groups

Ultrafast spin dynamics in femtosecond timescale, so-called the femtomagnetism, has been one of the central issues in the frontier science and technology for the last two decades. To capture the nature of the non-equilibrium dynamics, ultrafast time-resolved experiments have been carried out using an ultra- short laser pulses. Recently, the developed EUV-X-ray free electron lasers (FEL) and high harmonic generation (HHG) lasers have opened the opportunity for exploring dynamic phenomena with element selectivity by tuning the photon energy of the laser pulses to the absorption edges of a material. Moreover, since the electron exchange interactions, the most fundamental origin of the magnetism, occur in the femtosecond time-scales, ultrafast experiments using FELs and HHG lasers are expected to add the missing knowledge in condensed matter physics that should bring technological innovation in ultrafast spintronics.

One of the famous ultrafast magnetization phenomena is reversal of GdFeCo ferrimagnetic alloy by optical pumping. GdFeCo is known as a ferrimagnetic metallic alloy, composed of rare-earth (RE) and transition metal (TM) sublattices. The two sublattices couple each other anti-ferromagnetically and spin-switching, induced by a femtoseconds-pulse of either circularly or linearly polarized infrared light, has already been reported. However, there is controversy in the suggested dynamical mechanisms and it was proposed recently that the magnetization reversal process is thermal and the reversal can be explained in terms of the angular momentum conservation when the material is irradiated by circular polarized light. More experimental data, in particular using linearly polarized light, are needed to understand the nature of these opto-magnetic phenomena. In the present study, we extended our resonant magneto-optical Kerr effect (RMOKE) technique for FELs to trace the spin in the Fe (TM) site in a GdFeCo crystal.

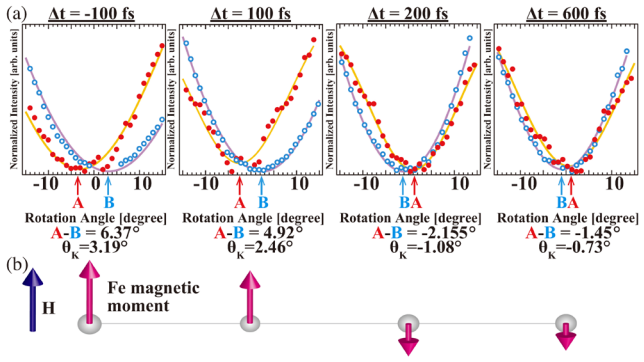

Fig. 1. (a) Experimental results (circles) of the intensity variation with rotation angle taken at hv = 53eV for FEL at each delay time shown in each figure with fitting by cosine curve (solid lines). (b) A schematic diagram of the magnetization reversal dynamics of the Fe magnetic moment with respect to an external field H. The length of the arrows is scaled to the magnitude of the Kerr rotation angle at each delay time shown in (a).

The experiment was performed at FERMI@ELETTRA in Italy by bring our homemade measurement system to the FEL end-station. The Kerr-rotation angle of RMOKE was determined by rotating-analyzer ellipsomtry (RAE) method and time-resolved measurement was carried out by the pump (Ti:S laser) and probe (seeded FEL) technique. Before optical pumping, a sample was set at room temperature, which is above the magnetic compensation temperature of GdFeCo at 250 K and the external magnetic field was applied in the direction of the initial Fe magnetization. Then, the Fe magnetization reversal was traced in *real time* by tuning the photon energy (hv = 53 eV) to the Fe M-absorption edge, which added the element-selectively.

Figure 1(a) shows the results of time-resolved measurements. Each panel shows the RAE results at each indicated delay time. The vertical axis denotes the normalized photon intensity. The two curves (blue and red) correspond to the measurements under the applied magnetic field in up and down direction along the sample surface normal. The solid lines are cosine fitting to the experimental results. The angle zero in each panel corresponds to the extinction state without external field. The Kerr rotation angle at each delay time can be extracted from the phase difference between the two curves. The initial Kerr rotation angle was 3.2 degree at -100 fs (before pumping), which was also measured in the static RMOKE (not shown). Since a polar geometry is used in this TR-RMOKE measurement, the Kerr rotation angle indicates the out-of-plane magnetic moment of Fe in GdFeCo. Figure 1(b) schematically depicts the magnetization dynamics with respect to the external field resulting from the time dependent Kerr rotation angle. The length of the arrows in the figure corresponds to the magnitude of the Kerr rotation angle for each delay time. At 200 fs after the intense laser irradiation, changes of sign of the Kerr rotation angle indicate reversal of Fe magnetization. This reversal mechanism is classified in thermal process, being different from the process involving the inverse Faraday effect in the previous studies using circularly polarized light. Considering the FEL repetition rate of 10 Hz at FERMI@ELETTRA the Fe magnetic moment is recovered at least 100 ms after the pump. Since linearly polarized IR pump laser was used there is no coupling in terms of the exchange of angular momentum between photons and spins in the material. This means that the path for angular momentum transfer is closed between the sub-lattices of Gd and Fe. The timescale of magnetization reversal of TM sublattice is the same as observed in preceding research using time-resolved XMCD, in which transient ferromagnetic-like coupling has been observed due to different demagnetization times for RE and TM sublattices. Our measurement of TR-RMOKE reveals its compatibility with FEL for tracing ultrafast spin dynamics.

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Optically Detecting Edge-State of Topological Insulator under the Ambient Condition by Ultrafast Infrared Photoluminescence Spectroscopy

Suemoto and I. Matsuda Groups

Three-dimensional topological insulators (TIs) are materials characterized by insulating bulk bands and metallic surface states resulting from a nontrivial topology of the bulk wave functions. The surface states form a Dirac cone structure with electron spins locked perpendicular to their momenta within the bulk band gap. The helical spin structure, which suppresses electron backscattering induced by nonmagnetic impurities, proposes electronic and spintronic device applications of TIs. The robustness of topologically protected surface states under exposure to air furthermore offers to realize versatile TI devices operating under the ambient environment. It is therefore crucial for the device applications to investigate dynamical properties of surface carriers in TIs particularly under the ambient condition. Recently the surface carrier dynamics has been explored with ultrafast time-resolved techniques allowing for distinguishing the bulk and surface response, involving time- and angle-resolved photoemission spectroscopy (TrARPES), optical pump mid-infrared probe spectroscopy (OPMP), and optical pump THz probe spectroscopy (OPTP). TrARPES has been utilized to observe directly the transient electron population with the high momentum and energy resolution, providing knowledge about the electron-phonon scattering and the bulk-surface interband transition in TIs. TrARPES, however, needs the ultra-high vacuum condition to prevent the surface contamination of samples due to the surface sensitivity. In contrast, OPMP and OPTP have delivered insights into the low-energy electronic transition in the surface Dirac cone even under the atmospheric condition with larger penetration depth than that in TrARPES experiments, while being incapable of direct access to excited states over a wide energy range from the surface states to the bulk bands.

Time-resolved photoluminescence spectroscopy (TrLS) overcomes their drawbacks with the bulk sensitivity and the wide-range detection of excited states in visible to infrared regions. TrLS combined with time-resolved photoemission spectroscopy (TrPES) has been applied to graphite, providing deep understanding on the carrier dynamics in the Dirac cone [1]. TrLS is therefore urgently expected to be a practical approach even to surface carrier transitions in TIs under the ambient consition; however, no TI research with TrLS has been reported. Here, we report an application of the infrared TrLS technique to a TI $TlBiSe_2$ under the ambient condition (inset in Fig.1).

A TI $TlBiSe_2$ is known to feature the Dirac point located near the middle point of the bulk band gap of 0.35 eV at the $\bar{\Gamma}$ point, which is a large value among TIs. We used $Tl_{1-x}Bi_{1+x}Se_2$ (x = 0.025) synthesized by the Bridgman method as the sample, where the Fermi-level is located near the Dirac point. The infrared time-resolved luminescence measurement was performed with the up-conversion technique under the ambient condition. The $TlBiSe_2$ sample was excited by 70 fs pulses at a wavelength of 800 nm (1.55 eV) from Ti:sapphire regenerative amplifier operating at a repetition rate of 200 kHz. The spot size on the sample was approximately 300 μm in diameter and the fluence was estimated to be 0.34 mJ/cm^2. The visible light was generated by sum-frequency mixing of the infrared luminescence light and the gating pulses at 1.55 eV in an optical nonlinear crystal $LiIO_3$, and detected by a photomultiplier tube coupled with a double grating monochromator. The time resolution estimated by autocorrelation of the pump pulse reflected by the sample and the gating pulse was 168 fs. The energy resolution was approximately 70 meV. The up-conversion measuring system had sensitivity for the luminescence photons between 0.23 eV and 1.3 eV. The spectral sensitivity of the system was calibrated by using the sum-frequency signal between the light from a tungsten lamp with a sapphire window and the gating pulses at 1.55 eV.

Figure 1 shows time evolution curves of the luminescence intensities from the $TlBiSe_2$ crystal at emission photon energy ranging from 0.25 eV to 1.0 eV under the 1.55 eV-photoexcitation. The decay profiles exhibit specifically different shapes with the photon energy. As photon energy decreases from 1.0 eV, the peak position time becomes longer with decrease of the photon energy. This behaviour can be explained in terms of the bulk insulating property: the carriers are accumulated at the bottom of the

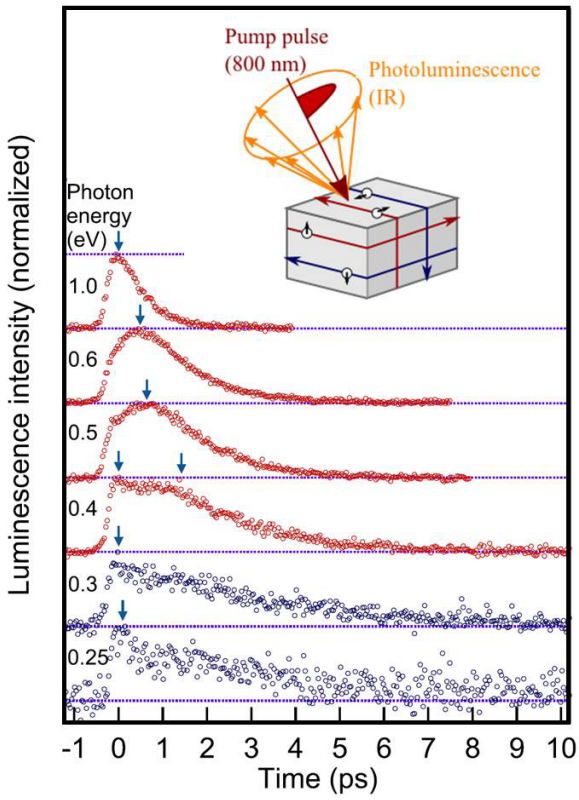

Fig. 1. Time evolution curves of the luminescence intensities from $TlBiSe_2$ at emission photon energy ranging from 0.25 eV to 1.0 eV under 1.55 eV-photoexcitation. The curves are normalized at their own maxima and offset for clarity of display. The curves at lower photon energy than bulk band gap of 0.35 eV are shown in blue. The green arrows indicate the peak position of each curve. The inset shows schematic drawing of the infrared photoluminescence measurement under 1.55 eV (800 nm) pulse excitation.

bulk bands due to the energy band gap, which obstructs phonon-mediated recombination between electrons and holes. The longer decay time at lower photon energy is attributed to slower relaxation of the carrier population at lower energy, reflecting the cooling dynamics of the carriers *via* carrier-phonon interactions. On the other hand, when the photon energy is lower than the bulk band gap of 0.35eV, distinctive decay profiles with much longer decay times (approximately 4 ps) are found at 0.25 eV and 0.3 eV. The decay profile at 0.4 eV, which corresponds to the turning point of the shape change of the decay profiles, consists of two components similar to each decay profile at 0.3 eV and 0.5 eV.

The distinctive shape change of the luminescence decay profiles and the bimodality of the time-resolved luminescence spectra elucidate that the luminescence originates from different energy bands. According to the band calculations, no bulk state resides in the energy band gap region less than 0.6 eV, except each one around the $\bar{\Gamma}$ point (0.35 eV) and the $\bar{M}$ point (0.3 eV)[2]. The bulk band around the $\bar{M}$ point might contribute to the luminescence at photon energy even below the bulk band gap of 0.35 eV; however, the decay profile at the photon energy of 0.3 eV that matches the energy band gap at the $\bar{M}$ point does not exhibit a rapid rise expected from the bulk insulating property[3]. The decay profiles at the photon energy below the bulk band gap of 0.35 eV are therefore attributed to the luminescence predominantly derived from the surface states. The quantitative analyses, based on the rate-equation model, also confirmed this assignment [3].

The topologically protected surface states were optically detected even under the ambient condition, and the relaxation rate of the surface carriers was determined, distinguished from the bulk contribution simply with the emission photon energy. Our results present the availability of the infrared TrLS technique as a novel approach to the dynamical properties of the surface carriers in TIs toward their application to electronic and spintronic devices operating under the ambient environment.

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Development of Sub-300 fs, 100-W Class, Yb-Fiber Based CPA Laser System at 1-MHz

Kobayashi Group

High repetition rate (>MHz) high harmonics generation (HHG) based vacuum ultraviolet (VUV) laser source is highly desirable for photoelectron spectroscopy, for space-charge-free measurement by limiting the number of emitted electrons per pulse, which can lead to higher signal-to-noise-ratios and achieve high energy resolution. Traditionally, Ti:sapphire laser systems were adopted as the driver, which, however, typically have a repetition rate on the order of a few kilohertz, or hundred kilohertz at the expense of the pulse energy. That is mainly limited by the poor thermal conductivity of the Ti:sapphire crystal itself. Even with the state-of-

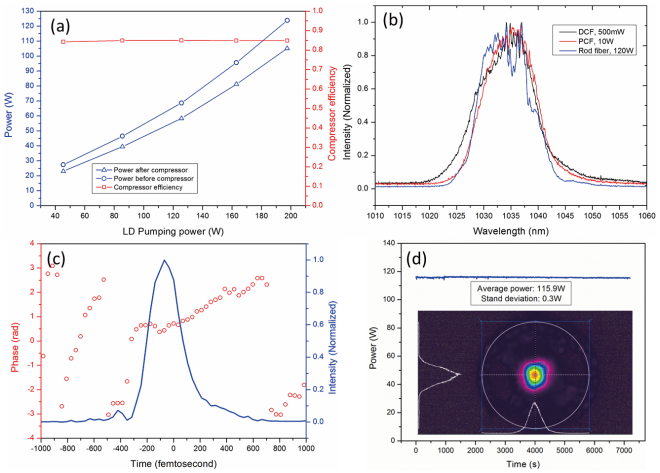

Fig. 1. (a), Power performance of the FCPA system; (b), Spectra taken from different stages of amplification; (c), Pulse intensity and phase obtained from the SHG-FROG measurement; (d), Power stability of the fiber CPA laser system and beam profile.

the-art cryogenic configuration, the average power is limited at a few tens of watts.

As far as high repetition rate, high average power lasers are concerned, Yb-based fiber, slab, and disk lasers are leading the trend in this field and all three have enabled >1 kW of average output power, due to their advanced heat dissipating ability. Comparatively speaking, slab lasers and disk lasers give pulse duration on the order of few picosecond or sub-picosecond. While, fiber lasers, due to the broader gain bandwidth they can support, can give shorter pulse duration. Unfavorably, due to the small core diameter of gain fibers, the peak powers reached inside the fiber are high and unwanted nonlinear effects, such as self-phase modulation, tend to occur. Hence, in order to avoid possible nonlinearities, the pulse duration of a seed laser needs to be stretched before it is amplified by a fiber amplifier. Although there have been some reports on high average power 1-MHz fiber chirped pulse amplification (FCPA) lasers, their pulse duration were limited to ~500 fs.

Here we report on a FCPA laser system, which delivered 100 W of output power after a pulse compressor, at a repetition rate of 1 MHz, corresponding to a pulse energy of 100 μJ. The compressor efficiency was as high as 85% thanks to the special large scale transmission gratings. The pulse duration was measured to be 270 fs using second harmonic generation frequency-resolved optical gating (SHG-FROG) method. To the best of our knowledge, this represents the shortest pulse duration achieved by a hundred-watt-level fiber chirped pulse amplification laser system at few MHz repetition rate, without resorting to any means of post-compression and SLM-based phase compensation. The excellent beam quality was guaranteed by the rod fiber itself and by careful alignment into this fiber to effectively excite the fundamental mode alone.

The FCPA system started from a mode-locked 64-MHz Yb:fiber oscillator with an average power of 5 mW. This seed laser was then directed to a grating based pulse stretcher, and stretched to be ~1 ns. A single mode Yb pre-amplifier followed the stretcher to boost the power up to ~100 mW. An acoustic optical modulator (AOM) was used to lower the repetition rate down to 1 MHz. Meanwhile, the average power was decreased to 0.5 mW. Additional two-stage pre-amplifiers increased the average power to 500 mW, which then seeded the following 40/200 photonic crystal fiber (PCF) amplifier that was pumped in the backward

direction by a 25 W laser diode at 976nm. The final stage amplifier was a straight 55 cm rod fiber from NKT Photoncis, pumped by a fiber coupled 350-W laser diode centered at 976 nm. With a seed laser of 13W, more than 120 W average power was extracted when backward pumping at ~200 W was used, shown in Fig.1(a). The optical-to-optical efficiency was in excess of 60%. After compressor, more than 100 W of average power were obtained, corresponding to an efficiency of ~85% for the compressor. Fig.1(b) shows the spectrum taken after different amplifier stages. Only minor gain narrowing effects were visible. Figure 1(c) shows the measured pulse duration of ~270 fs. Figure 1(d) shows 2-hours operation of the system.

In the future, we would like to use this laser system to drive HHG process. By that, high repetition rate VUV laser could be expected soon.

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Observation of a Devil's Staircase in the Novel Spin-Valve System $SrCo_6O_{11}$

Wadati Group

Combining different materials in artificial nanostructures is a most important approach to create improved or even completely new electronic functionalities for technological applications. A very prominent example of this is the giant magnetoresistance (GMR), which was first realized by multilayers of alternating nonmagnetic and ferromagnetic metals [1] and which now is an indispensable part of today's information technology. In these GMR systems the electrical resistance is high for an antiparallel alignment of the magnetization in the neighboring magnetic layers, while it is low for a parallel alignment of those magnetizations. For this reason such systems are also referred to as spin valves.

Here we report on a high-resolution resonant soft x-ray scattering (RSXS) study of $SrCo_6O_{11}$ bulk single crystals as a function of temperature (T) and applied magnetic field (H) [2]. $SrCo_6O_{11}$ is a particularly interesting material with intrinsic magnetoresistance. Figure 1 (a) shows the lattice structure, which is believed to realize a GMR multilayer system at the atomic scale [3]. One of the most striking magnetic features of $SrCo_6O_{11}$ observed so far are plateaus in the magnetization as a function of the applied magnetic field along the *c* axis as shown in Fig. 1 (b). These plateaus correspond to 1/3 and 3/3 of the saturated moment and were found

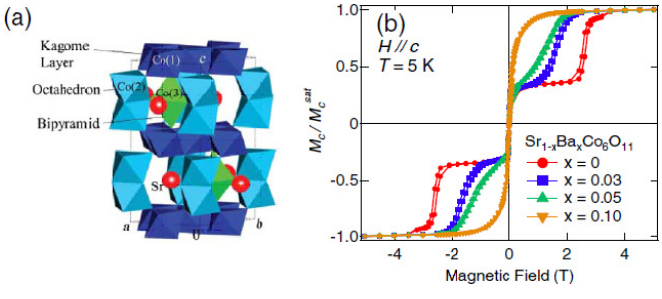

Fig. 1. (a) Crystal structure of $SrCo_6O_{11}$. (b) Out-of-plane magnetization of $Sr_{1-x}Ba_xCo_6O_{11}$ as a function of magnetic field (H // c) at 5 K.

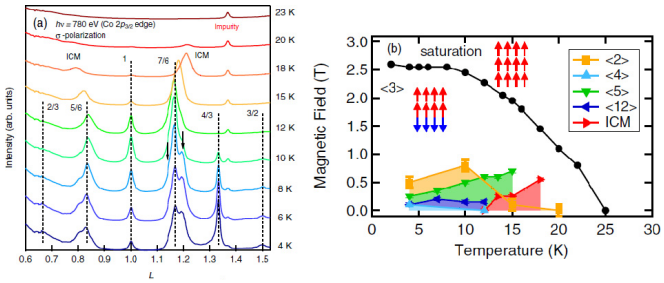

Fig. 2. (a) Magnetic peak profile of $SrCo_6O_{11}$ at various temperatures at zero magnetic field. (b) Magnetic phase diagram of $SrCo_6O_{11}$.

to reflect different stackings along *c*, namely, an up-up-up structure for the 3/3 phase and an up-up-down configuration for the 1/3 phase.

Figure 2 (a) shows the diffraction peaks of $SrCo_6O_{11}$ at zero field for various temperatures. Quite surprisingly and very uncommon for RSXS experiments, a large number of superlattice reflections at L = n/6 with n = 4, 5, 6, 7, 8 and 9 is observed. L = 1 commensurate (CM) peak and two incommensurate (ICM) peaks around L = 0.8, 1.2 appear at 20 K (T_{c1}). These ICM peaks move to L = 5/6 and 7/6, respectively, as the temperature is decreased, and finally are locked at these values at 12 K (T_{c2}), respectively. At T_{c2}, there appear L = 6/5 and 8/7 shoulders of the L = 7/6, and, simultaneously, L = 2/3, 4/3, and 3/2 peaks. These results therefore directly reveal that a large number of magnetic phases coexist in zero magnetic field.

Figure 2 (b) shows the entire H-T diagram of $SrCo_6O_{11}$ determined by RSXS measurements under magnetic fields. Here, <n> represents the magnetic periodicities. The phase diagram demonstrates that various magnetic orderings with different periodicities are formed in the low temperature and low field region. Obviously, the energies of these magnetic structures are quite close, and the corresponding energy differences sensitively depend on temperature and magnetic fields. This phenomenon is called "the devil's staircase," where, in principle, an infinite number of commensurate superstructures can be realized by tuning an external parameter. As these corresponding eigenstates (magnetic orderings in this case) have similar energies, they can be switched from one to another by small perturbation. In this case of magnetic ordering, the mechanism is described by the axial next-nearest-neighboring Ising (ANNNI) model. The ANNNI model describes competing interactions between nearest (J_1) and next-nearest (J_2) Ising spins, which yields various magnetic orderings with close energies in the phase diagram of temperature and J_2/J_1. However, in order to explain ordered structures with long periodicities, one needs magnetic interactions that go well beyond the nearest neighbors. A plausible explanation can be provided by the Ruderman-Kittel-Kasuya-Yosida (RKKY) interaction via the metallic planes.

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Quadratic Fermi Node in a 3D Strongly Correlated Semimetal

Kondo, Nakatsuji, and Shin Groups

Strong spin–orbit coupling fosters exotic electronic states such as topological insulators and superconductors, but the combination of strong spin–orbit and strong electron–electron interactions is just beginning to be understood. Central to this emerging area are the 5*d* transition metal iridium oxides [1-4]. Here, in the pyrochlore iridate $Pr_2Ir_2O_7$, we identify a non-trivial state with a single-point Fermi node protected by cubic and time-reversal symmetries, using a combination of angle-resolved photoemission spectroscopy and first-principles calculations. Owing to its quadratic dispersion, the unique coincidence of four degenerate states at the Fermi energy, and strong Coulomb interactions, non-Fermi liquid behavior is predicted, for which we observe some evidence. Our discovery implies that $Pr_2Ir_2O_7$ is a parent state that can be manipulated to produce other strongly correlated topological phases, such as topological Mott insulator, Weyl semimetal, and quantum spin and anomalous Hall states.

The experimental evidence for a quadratic Fermi node state in $Pr_2Ir_2O_7$ is demonstrated in Fig. 2. In the panel (d), we observe that a parabolic energy-dispersion approaches E_F with increasing photon energies (or k_z values), and finally touches it at the Γ point (a red curve). We have confirmed that, with further increase of k_z, the dispersion gets away from E_F again, which signifies that the 3D band structure of $Pr_2Ir_2O_7$ has a single Fermi point (Fig. 2(b)). Other scans

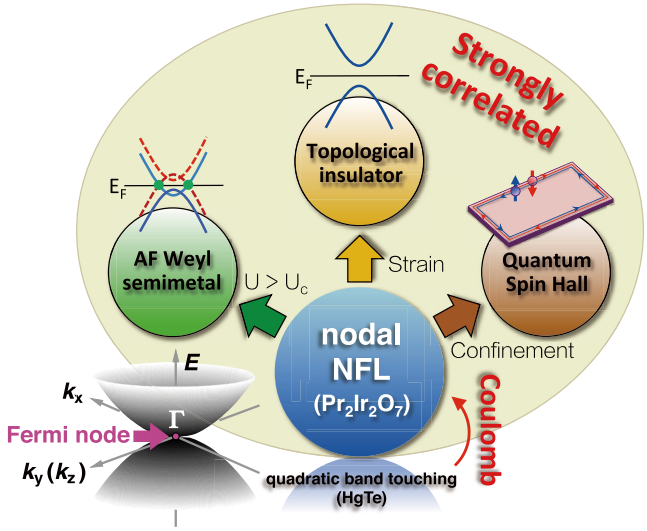

Fig. 1. Quadratic Fermi node state of $Pr_2Ir_2O_7$ tunable into interacting topological phases. In the lower part of the diagram, the bottom half of the blue circle and its reflection form a caricature of the quadratically dispersion conduction and valence bands touching at the zone centre, while at the same time the darker-blue upper circle suggests how $Pr_2Ir_2O_7$, with non-negligible Coulomb interactions, is a strongly correlated non-Fermi liquid analogue of HgTe, shown as a pale-blue reflection. Arrows indicate the perturbations that convert the nodal non-Fermi liquid state to diverse topological phases.

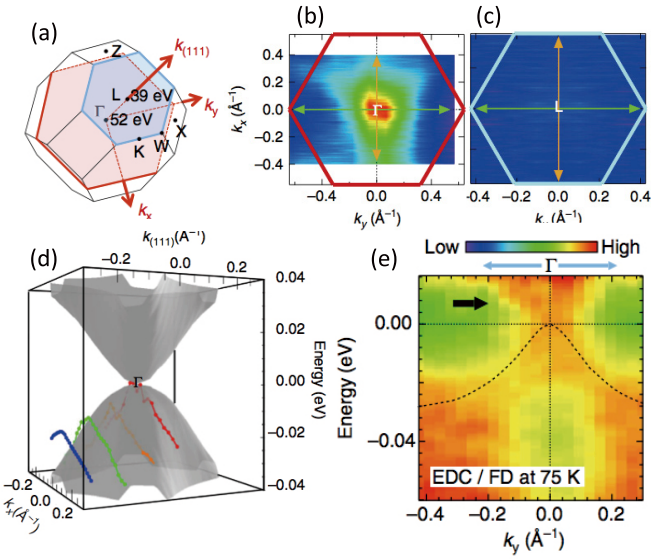

Fig. 2. Fermi node state of $Pr_2Ir_2O_7$ revealed by ARPES with synchrotron radiation source. (**a**) Brillouin zone, showing measured momentum sheets. (**b,c**) ARPES intensities at E_F in the k_x-k_y sheet crossing Γ and L measured at $h\nu$=52eV and 39eV, respectively. The calculated band dispersion in the k_x-$k_{(111)}$ sheet. Energy dispersions determined by ARPES are plotted on it. (**e**) ARPES dispersion map crossing Γ, measured at an elevated temperature (T=75K).

of different k_z values up to the L point (Fig.(c)) revealed no other states touching or crossing E_F. This circumstance satisfies the charge neutrality, and it could be a further evidence for the realization of nodal state. We also find that the broad spectral weight emerges beyond E_F as seen in the Fermi-function-divided image for the 75K data (arrow in Fig. 2(e)). This observation is compatible with the predicted existence of a quadratic band touching on the unoccupied side.

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Joint Research Highlights

Observation of the Orbital Quantum Dynamics in the Spin-1/2 Hexagonal Antiferromagnet $Ba_3CuSb_2O_9$

M. Hagiwara and S. Nakatsuji

In condensed matter physics, exploration of a novel quantum liquid state, such as Bose-Einstein condensation of cold atoms, superconductivity and quantum Hall state of electron systems, has been a subject of intense research both experimentally and theoretically. While many candidates of "quantum spin liquid" in which spin degrees of freedom does not freeze even at very low temperatures have been reported, almost no example has been found for an orbital liquid state, where the orbital degree of freedom remain fluctuating without lattice deformation down to a very low temperature. In our previous studies on the copper oxide 6H- $Ba_3CuSb_2O_9$ with a perovskite structure, we reported the first observation of striking absence of the static Jahn-Teller distortion down to the lowest temperature in this oxide based on copper (II), which is known as a strong Jahn-Teller active ion [1,2]. However, to date, the orbital dynamics have never been investigated.

In the present study, we have determined the frequency of the orbital quantum fluctuation in this compound by multi-frequency electron spin resonance (ESR) measurements in high magnetic fields [3]. We report the first determination of the orbital fluctuating frequencies, namely dynamic Jahn-Teller frequencies, at wide temperature range between 1.5 K and 100 K. The aforementioned results pave the way to investigate the dynamics of a new quantum liquid state named "quantum spin-orbital liquid" by multi-frequency ESR in high magnetic fields. The results demonstrate how high magnetic fields are useful for the studies on a quantum spin-orbital-liquid state.

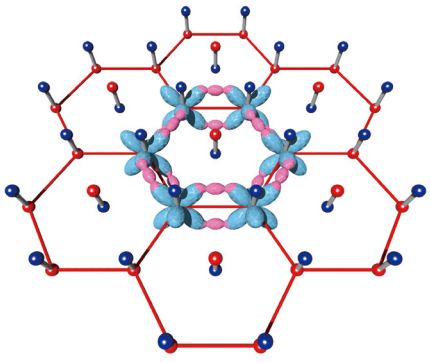

Fig. 1. The possible dynamic orbital states in the hexagonal sample, which form resonating singlet dimers in the honeycomb-based lattice. The light blue ovals show the temporally averaged special distribution of the copper orbitals.

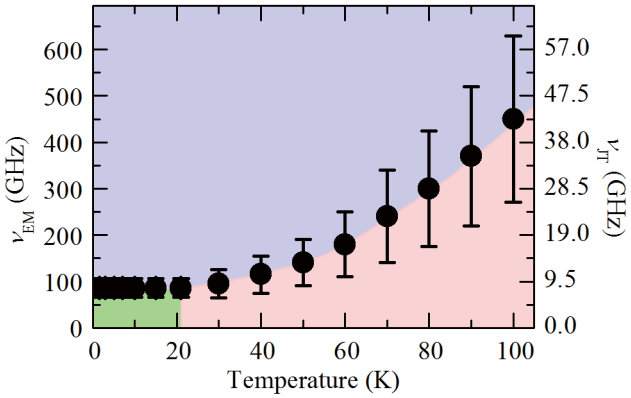

Fig. 2. Temperature dependence of the dynamic Jahn-Teller fluctuating frequency (ν_{JT}) determined from the observed electromagnetic frequency (ν_{EM}) where the ESR signal line shape changes from symmetric to asymmetric. The solid circles show the fluctuating frequencies at measurement temperatures, and the frequencies become constant (about 10 GHz, 100 picosecond) below 20 K, indicating the formation of the quantum liquid state.

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Copper Oxide with No Static Jahn-Teller Distortion

N. Katayama, H. Sawa, and S. Nakatsuji

The quantum spin liquid (QSL) state has been intensively pursued since Anderson proposed the resonating valence bond model. For realizing a novel QSL state, orbital degree of freedom has been considered as a nuisance because orbital ordering usually appears at high temperature accompanying with a cooperative Jahn-Teller (JT) distortion and spin ordering. Therefore, the QSL candidates found so far have been mostly in spin only systems without orbital degree of freedom.

Perovskite-type 6*H*-$Ba_3CuSb_2O_9$ is a novel candidate material for the spin-orbital liquid state, which we have reported recently [1]. In the material, spin-orbital short-range ordering occurs in the short-range honeycomb lattice of Cu^{2+} with e_g orbital degrees of freedom, as shown in Fig.1(a). Powder x-ray diffraction experiment shows that even at low temperatures, the hexagonal components remain along with some orthorhombically distorted components. In the hexagonal phase, three-fold symmetry exists for the Cu^{2+} sites which are surrounded by octahedrally coordinated oxygen, indicating the absence of a cooperative JT distortion.

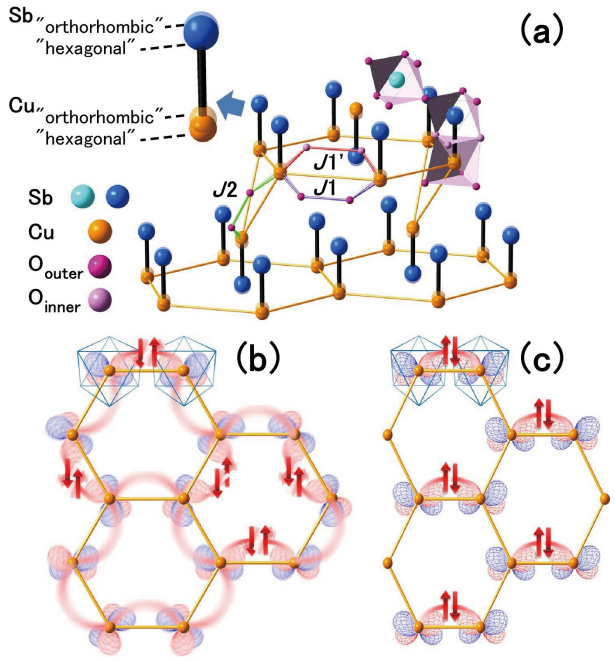

Fig. 1. (a) Schematic view of the local structure for hexagonal and orthorhombic samples. (b) Schematic picture of a *non*-cooperative static JT distortion. (c) and (d) Schematic pictures of spin-singlet formation in short-range honeycomb lattices of Cu^{2+} for (c) hexagonal and (d) orthorhombic samples.

To explain this unusual feature, we proposed two possible scenarios. (i) Orbital glass state with a *non*-cooperative static JT distortion. In this scenario, the local symmetry is lowered by a static JT distortion, as schematically shown in Fig.1(b), but the overall hexagonal symmetry remains. (ii) Spin-orbital liquid state. The static JT distortion is absent and instead, a dynamic JT distortion appears, leading to a novel spin-orbital liquid state, as depicted in Fig. 1(c). These two possible scenarios cannot be distinguished by experimental results using powder specimens alone. A thorough structural study using a single crystal without orthorhombic components is required.

Our progress in preparing single crystalline samples enabled us to obtain single crystalline samples without any orthorhombic components down to the lowest temperature. Figures 2(a) and 2(b) show single crystal x-ray diffraction

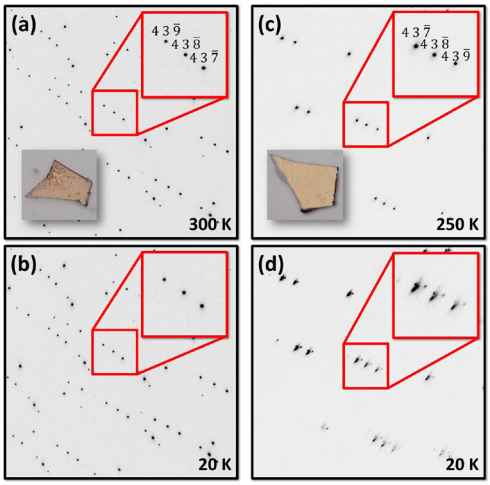

Fig. 2. Single crystal x-ray diffraction profiles for (a-b) hexagonal and (c-d) orthorhombic samples. The insets in (a) and (c) are photographs of the transparent brown single crystals for the hexagonal and orthorhombic samples, respectively. The hexagonal samples are darker than the orthorhombic samples.

experimental data. The peaks show no signs of splitting or broadening down to 20 K, the lowest temperature of our measurements ("hexagonal sample"). The hexagonal sample can be well refined by using the centro-symmetric space group $P6_3/mmc$ for all temperatures. For $P6_3/mmc$, the three-fold symmetry is retained for Cu^{2+} sites, indicating the absence of the cooperative JT distortion. These observations are in sharp contrast with our previous single crystal x-ray diffraction study of 6*H*-$Ba_3CuSb_2O_9$. There, we reported that the Bragg peak splits into several separate reflections upon decreasing temperature, as shown in Figs. 2(c) and 2(d). This result indicates that the hexagonal $P6_3/mmc$ symmetry is lowered to the orthorhombic *Cmcm* symmetry ("orthorhombic sample"). We attribute this effect to a cooperative JT distortion induced by uniform ferro-orbital ordering of Cu^{2+} ions (Fig.1(d)).

While x-ray diffraction experiment gives us the averaged structural information, the electron spin resonance (ESR) enables us to study the local orbital configuration. Using the single crystals, we confirmed the isotropic *g* factors are realized within the in-plane directions in the hexagonal samples down to 3.5 K, clearly indicating that the *non*-cooperative JT scenario is not realized and instead, a dynamic JT distortion appears [2]. Further studies using the crystals will address the open questions on the quantum spin-orbital liquid state, such as the orbital dynamics and the mechanism to stabilize such an exotic liquid state.

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Shot Noise Measurement of Local Fermi Liquid Out of Equilibrium

R. Sakano, M. Ferrier, and K. Kobayashi

Nine years after Millikan's monumental work on first observation of the elementary charge of the electron *e* in the famous oil drop experiment in 1909, Schottky also proposed an idea of measuring electric charge from the electron flow generated between two electrodes in a vacuum tube, by using statistical properties of electron counting and its fluctuation. For electric current generated by rare events (Poissonian process), the average current (*I*) is proportional to its fluctuations, namely, the shot noise (*S*), through the relation $S = 2e^*I$ where e^* is the effective charge of the current carrying state.

Particularly, in condensed matter physics, many-body effect in conductor can generate nontrivial effective charges of their quasiparticle state, which has been studied in nano-sized electronic devices. For instance, fractional charges of Laughlin's quasiparticle in fractional quantum Hall systems, and double charge of cooper-pair in normal metal-superconductor junction were already detected in noise experiments.

By means of ultrasensitive current-noise measurement techniques, we recently succeeded in observing the shot noise and formation of effective charge states due to the spin Kondo effect in a carbon-nanotube quantum-dot, which is another typical many-body effect [1]. Applying small bias voltages between two electrodes connected to the quantum

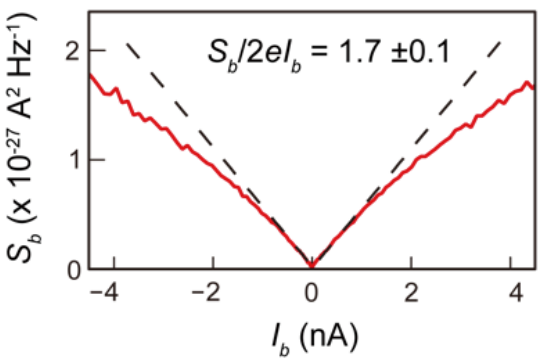

Fig. 1. The red solid line is the measured shot noise S_b as a function of the backscattering current I_b at 16 mK. The black broken line is $S_b = 2(1.7)eI_b$.

dot containing a single electron, enhancement of current noise due to emergence of the Kondo effect in the quantum dot at low temperatures, is observed.

The averaged current and current noise in the Kondo dot can be described by the local Fermi liquid which is an extension of the Landau's Fermi liquid to impurities or quantum dots and the ground state of the Kondo effect. Tuning the dot level and the lead-dot mixings to hold the particle-hole symmetry, the bias-voltage linear response current shows perfect transmitting current due to the formation of quasiparticle's resonant level at the Fermi level, and this current does not fluctuate since no scattering occurs. Then, the leading nonlinear current is third order in bias voltages due to very small backscattering current (I_b). Thus, the current fluctuation from this nonlinear current (S_b) is found to follow the statistics of the Poissonian process. Theoretically, the noise emerges from three type of scattering processes described by the local Fermi liquid. First is the free quasiparticle's backscattering by the linewidth of the resonant level, with effective charge e. Second and third are backscattering of single quasiparticle and quasiparticle's pair by the residual interaction with effective charge e and '$2e$,' respectively. In particular, the quasiparticle's pair scattering enhances the shot noise and effective charge of the non-equilibrium current through the Kondo quantum dot. The difference from fractional Hall states or superconducting states is that the Fermi liquid state has no energy gap at low energies. Thus mixture of the three scattering states with different effective charges composes the non-equilibrium current through the Kondo dot. As a consequence of two different effective charges in current, it is theoretically predicted that the noise-average ratio for the backscattering current takes the value $\frac{S_b}{2eI_b} = \frac{5}{3}$ in the Kondo limit [2-4].

The figure shows the observed shot noise as a function of the averaged backscattering current at 16 mK. For small currents noise-current ratio takes the values of $\frac{S_b}{2eI_b} = 1.70 \pm 0.1$, which is in very good agreement with the theoretical prediction. As mentioned above, this result corresponds to direct detection of quasiparticle pair creation in excited states of the local Fermi liquid. Furthermore, we investigate bias-voltage linear noises in the dot with particle-hole asymmetry and Fermi liquid parameters appearing in the averaged current, to ensure the accuracy of our shot noise measurement.

To conclude, our work offers a new approach to analyze excited states of electron correlated states though shot noise measurement in out of equilibrium systems.

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Electron-Beam-Patterned Lateral Schottky Gates on Atomically Thin MoS_2

Y. Katagiri, T. Nakamura, and J. Haruyama

MoS_2 is now attracting researchers' attention among so-called "two-dimensional materials" because it has a direct bandgap of 1.5-1.8 eV in the semiconducting phase (2H, trigonal prismatic D_{3h}). In the device application, the metallic phase (1T, octahedral O_h) part is indispensable for ohmic junctions or capacitor electrodes. The transition between the two phases does not have very high potential barrier and comparatively easily driven. Transition from 2H-phase to 1T phase caused by electron-beam (EB) irradiation has been recently observed [1].

For practical device installation, a lateral Schottky barrier (SB) forming at 2H-1T interface is desirable. Hence, the EB irradiated top-down fabrication of in-plane SB field effect transistors (SB-FETs) would be promising for MoS_2 based optical-electrical integrated circuits. Here we report forma-

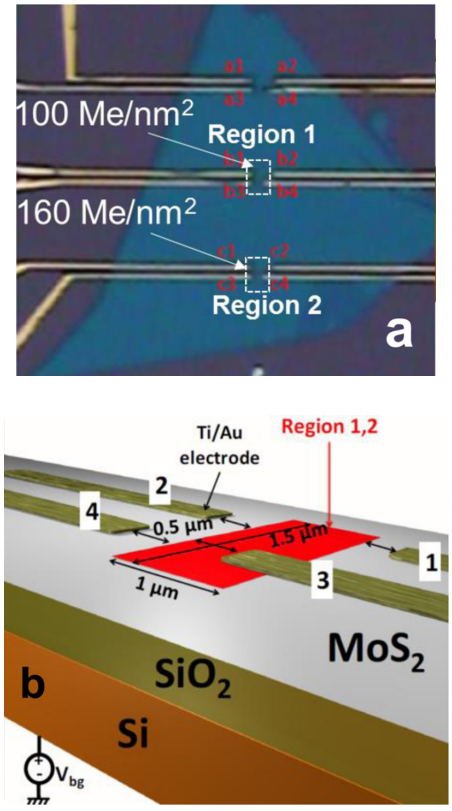

Fig. 1. (a) Optical microscope image of few-layer MoS_2, mechanically exfoliated from bulk, with two EB irradiation regions and two electrode pairs patterned on individual regions. (b) Schematic view of an electrode pair on one EB-irradiated region of (a).

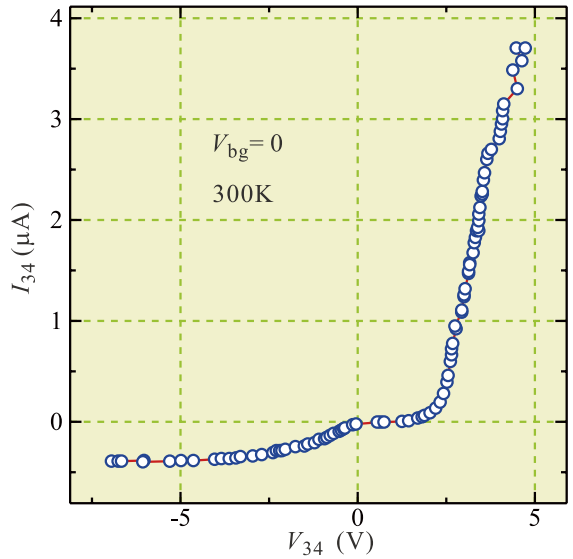

Fig. 2. Current-voltage characteristics between electrodes 3 and 4 in Fig. 1(b). The EB dose is 100 Me/nm^2.

tion of such a lateral SB junction with EB irradiation. From the current-voltage (I-V) characteristics, we believe the SB is formed at the designed position, which opens the way to 2D material integrated circuits.

Figure 1 (a) shows an optical micrograph of the sample. The MoS_2 layer can be observed as a blue triangular shape. Yellow lines are Ti/Au electrodes fabricated by EB-lithography. The rectangular regions indicated by the white-broken lines are for EB irradiation, the doses of which are also indicated. The detailed electrode configuration is illustrated in Fig.1 (b). Electrodes 1 and 2 are separated from the region of irradiation while electrode 3 is attached. Hence the SB diode characteristics should appear in the transport between electrodes 3 and 4. Figure 2 shows the I-V characteristics between electrodes 3-4. Clear single SB diode characteristics appears manifesting that the SB is formed between the irradiated region and electrode 4. Note that the SB between electrode 4 and MoS_2 has comparatively low resistance due to the large area and the high resistivity for the reverse bias region comes from the high quality lateral SB between the EB-irradiated 1T phase and 2H phase. The result indicates that we can make wirings and form SB-FETs at desired positions with this technique.

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Scanning Tunneling Spectroscopy Study of Quasiparticle Interference on Dual Topological Insulator $Bi_{1-x}Sb_x$

F. Komori, I. Matsuda, and Y. Ando

Three-dimensional (3D) topological insulators (TIs) are characterized by a nontrivial topological invariant, which is protected by symmetry and the presence of a bulk band gap [1]. So far, two types of topological invariants have been found to be useful for finding 3D TIs. One is called Z_2 index and the other is mirror Chern number. A nontrivial Z_2 topology of the bulks state gives rise to spin-polarized metallic surface sates, which are protected by time-reversal symmetry. A nontrivial mirror Chern number defines a 3D topological crystalline insulator, which is associated with metallic surface states protected by mirror symmetry of the crystal and robust against TRS breaking. Insulators belonging to both of the topological phases may be called "dual" TIs. Bulk BiSb alloy is well known as a 3D Z_2 TI for x ~ 0.1-0.2, and this material has actually been predicted to be a dual TI. Although the electronic structure of the occupied surface states in BiSb has been well studied by means of angle-resolved photoemission spectroscopy (ARPES) [2], the structure of the whole surface bands including the unoccupied states has not been observed in pristine samples.

Measurements of the quasiparticle interference (QPI) using the Fourier-transform scanning tunneling spectroscopy (FT-STS), as shown in Fig. 1, is useful for elucidating the mirror Chern number of the BiSb alloy from the whole band structure [3]. The BiSb alloy would be suitable for the studies of both the spin texture and the change caused by surface magnetic impurities because the disorder in the electrostatic potential due to the alloying gives rise to QPI on the pristine surface. We clarified the dispersions of the unoccupied electronic states via the analysis of the QPI on the clean cleaved surface of BiSb as shown in Fig. 2. The absence of band crossing between Σ_1 and Σ_2 was elucidated, and the mirror Chern number is unambiguously determined to be -1. Co atoms deposited onto a clean surface lead to the

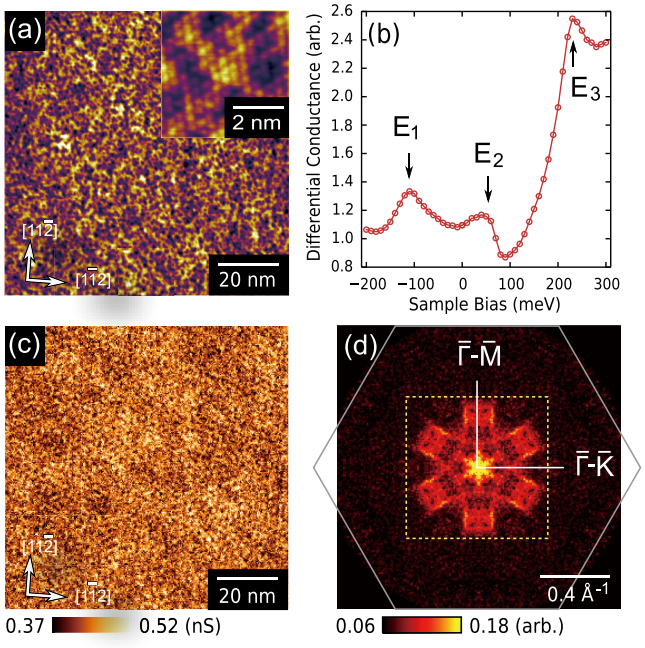

Fig. 1. (a) STM image of a region (93 x 93 nm^2) on a clean surface of $Bi_{1-x}Sb_x$ obtained at a constant current mode. (Setpoint: I_t =200 pA at V_b = 500 mV) The inset shows the close up image of a region (5 x 5 nm^2) revealing the hexagonal lattice of surface atoms. (Setpoint: 500 pA at 500 mV) (b) Average of 256 x 256 tunneling spectra measured on the same region. The peaks at E1, E2, and E3 are the van Hove singularities related to the surface bands. (Bias modulation: 7 mVrms at 396 Hz; Setpoint: 500 pA at 500 mV) (c) Spatial mapping of dI/dV at V_b = +80 mV of the same region. (d) FT image calculated from the dI/dV in (c). All the equivalent points are averaged to increase signal-to-noise ratio. The hexagon represents the size and the orientation of the surface Brillouin zone. The dashed square represents the area displayed in the FT images in Fig. 2(a)-(d).

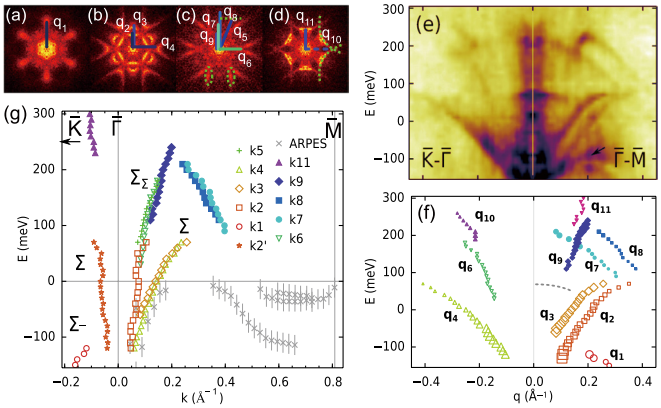

Fig. 2. (a)-(d) Fourie-transformation (FT) of dI/dV maps at E = -140 (a), -40 (b), +160 (c), and +260(d) meV on a clean surface of $Bi_{1-x}Sb_x$. The scattering vectors corresponding to the observed FT peaks are labeled by q_1-q_{11}. (e) Profiles of the FT images in the Γ-M and the Γ-K directions plotted in grayscale. The arrow at around -100 meV in the Γ-M direction indicate an artifact which disappears in the FT of (dI/dV)/(I/V) maps. (f) Peak positions of the FT profiles. The size (area) of each marker is proportional to the peak intensity. Dashed line around 70 meV is a possible FT peak corresponding to QPI within the pocket along Γ-M, but not analyzed in detail. (g) Surface band structure of the clean surface of $Bi_{1-x}Sb_x$ reconstructed from our QPI data. Previous ARPES data [3] with an energy resolution of 18 meV are also plotted.

appearance of clover-leaf-like impurity states at around 80 meV above E_F. In spite of the deposition of the Co atoms on the surface, the results of QPI show no significant changes in the band dispersion from those for the clean surface. An enhancement of spin-conserving scatterings was detected through stronger QPI peaks in the FT spectrum.

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Oxygen Molecules Physisorbed on Ag(111) Surface: A two-dimensional Quantum Spin System

Y. Kim, Y. Yoshida and, Y. Hasegawa

An oxygen molecule (O_2) is one of the smallest molecular magnets with an S = 1 quantum spin, and thus an building block for attractive low-dimensional quantum spin systems, *i.e.*, quantum spin liquid phases and the Haldane phase. Recent development of scanning tunneling microscopy (STM) and spectroscopy (STS) has enabled direct access to the properties of single atoms and molecules and even their manipulation to fabricate artificial nanostructures, providing an ideal playground for bottom-up fabrication of the low-dimensional spin systems.

A well-known problem for O_2 adsorption on a substrate is that O_2 often loses its spin through the strong interactions with the substrate. However, it has been reported that the interaction between the physisorbed O_2 and Ag(111) surface is substantially weak and that structures almost identical to solid oxygen phases can be realized on the surface. Here we report the direct visualization of O_2 physisorbed on Ag(111) by using low-temperature STM/STS. Physisorption of the observed monolayer O_2 islands was confirmed by their thermal stability. We observed a well-ordered O_2 structure and found that the lattice was slightly distorted from an isosceles triangular shape, which can be explained by the presence of the exchange interactions between the O_2 spins. No Kondo resonance was observed in the differential tunneling conductance (d*I*/d*V*) spectra. Based on these observations, we conclude that the system is an S=1 two-dimensional antiferromagnetic quantum spin system

Figure 1 shows an STM image of O_2 on Ag(111) taken at 4.7 K. Because of the reduced local density of states monolayer O_2 island structures are observed as a depressed area. After the sample annealing up to 40 K, most of the O_2 islands disappeared, indicating physisorbed nature of the adsorbed molecules. The upper right panel of Fig. 1 shows a molecular-resolved image of the O_2 layer that exhibit a well-ordered lattice structure. One of the peculiar things we found is that the molecules form a scalene triangular lattice (i.e., AB < AC); the dimensions of the O_2 unit cell were measured as AB = 0.421 nm and AC = 0.435 nm based on real-space STM images taken on three different O_2 islands.

Since the O_2 lattice was incommensurate with the Ag(111) substrate, the surface corrugation of the substrate affects the O_2 lattice only as random perturbations, and thus does not seem to affect the shape of the O_2 lattice. Actually, an almost identical scalene triangular lattice was reported for low-coverage phase of O_2 physisorbed on HOPG, which is also incommensurate to the substrate. The similarity of the O_2 structures on two different substrates indicates that the distorted lattice structures are intrinsic to the O_2 molecules.

There should be some reason for the lattice distortion observed in the physisorbed O_2 layers. Here we considered exchange interactions between the O_2 spins. The energy of the exchange interactions between the O_2 spins was estimated as ~6 meV from the magnetization of solid oxygen. This was less than the van der Waals interactions (~30 meV) but significant enough to contribute to the total energy of the system. Indeed, the high-coverage phase of O_2/HOPG and solid oxygen showed lattice distortions coinciding with antiferromagnetic ordering, which indicates that the softness of the O_2 lattice allows the magnetic interaction to be involved in the lattice formation. With the magnetic ordering, the system can be stabilized by shortening the sides of the isosceles triangle at which spins are antiferromagnetically aligned, as schematically shown in Fig. 2. In order to confirm the scenario, we performed Monte Carlo simulations for the 2D freestanding O_2 lattice. Using

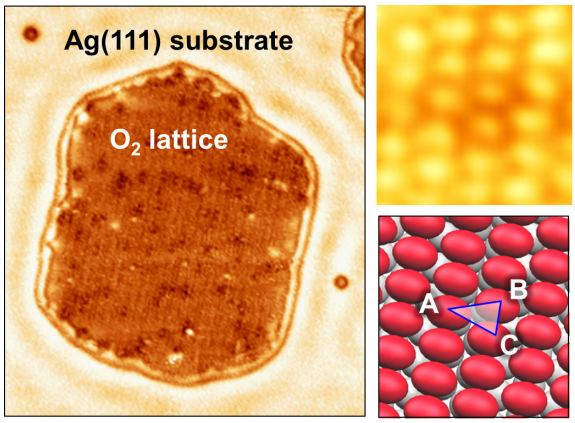

Fig. 1. (left) STM image acquired on O_2/Ag(111) at 4.7 K. An island structure is observed as a a depressed area. (upper right) Molecular resolved STM image in an O_2 island, (lower right) Schematic of O_2 lattice (red ellipsoids) on Ag(111).

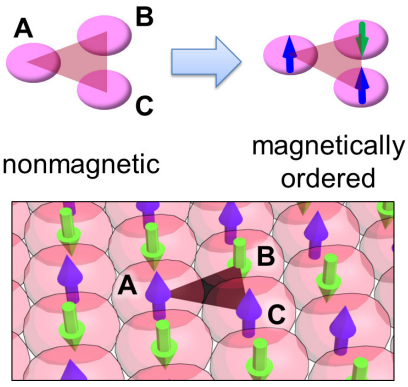

Fig. 2. Lattice distortion induced by antiferromagnetic ordering. The blue and green arrows denote the directions of the O_2 spins.

a set of the parameters that were used for the high-coverage phase of the O_2/HOPG, we successfully reproduced the distortion, confirming the validity of the scenario. We thus concluded that the antiferromagnetic ordering of the O_2 spins played a crucial role in the distortion of the O_2 lattice on Ag(111).

In order to verify the preservation of the intrinsic S=1 spin of O_2 on the Ag(111) surface, we also checked the dI/dV spectra taken on the O_2 island and observed no specific evidence of the Kondo resonance around the Fermi level, in stark contrast with the case of O_2 molecules on Ag(110), which exhibits a clear Kondo resonance at 18 K. The O_2 spins are thus little influenced by the itinerant electrons of the substrate, and would be expected to form an S = 1 quantum spin system. These results imply that our system is an example of a 2D S = 1 antiferromagnetic quantum spin system and the potential for a brand-new approach of constructing low-dimensional quantum spin systems in a bottom-up fashion.

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Novel Pressure Dependence of the Superconductivity in Non-Centrosymmetric $LaNiC_2$: Evidence of Strong Electronic Correlations

S. Katano and Y. Uwatoko

Since the discovery of the heavy-fermion superconductor $CePt_3Si$ [1], superconductivity of non-centrosymmetric systems has attracted great interest. The non-centrosymmetry causes the antisymmetric spin-orbit coupling (ASOC) that leads to the indistinguishability of spin-singlet and spin-triplet electron pairings. $LaNiC_2$ forms a non-centrosymmetric structure (space group: orthorhombic *Amm2*), and exhibits superconductivity below the transition temperature T_c of about 3 K. On this superconductivity a recent muon spin relaxation (μSR) experiment indicated the breaking of the time-reversal symmetry (TRS) in the superconducting state, which leads to non-unitary *p*-wave spin-triplet pairings [2]. However, a NQR study suggested an enhancement of the nuclear spin relaxation rate ($1/T_1$) just below T_c, implying

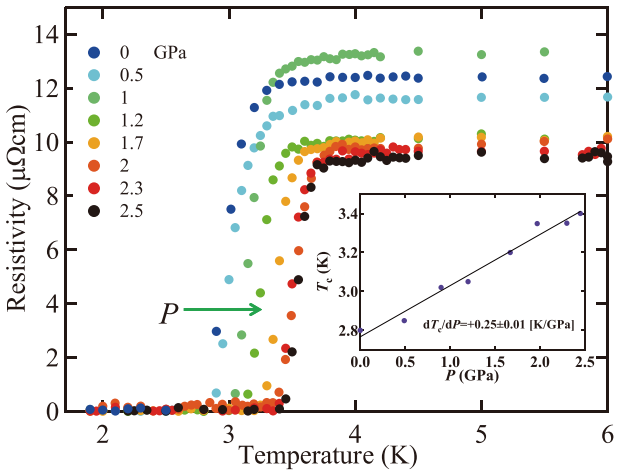

Fig. 1. Electrical resistivity under high pressures up to about 3 GPa. The inset shows that pressure enhances the superconducting transition temperature T_c substantially.

a conventional BCS-type superconductor [3]. Therefore its superconducting mechanism is still unclear. Furthermore, this system is not magnetic, and thus it has been considered that its electronic correlations would be weak in contrast with other heavy fermion systems. To get further information on this superconductivity, pressure effects on the superconducting state of $LaNiC_2$ have been studied.

Figure 1 shows the temperature dependence of the electrical resistivity of $LaNiC_2$ under high pressures up to 3 GPa. Under these pressures, T_c is enhanced greatly at the rate of 0.25 K/GPa. For normal conventional metals pressure contracts their lattices, and generally the electron density $D(E_F)$ at the Fermi energy E_F decreases. In the BCS theory, therefore, T_c would decrease with increasing pressure. The results obtained here thus suggest that the superconductivity of this system is possibly changed under high pressure by some novel mechanism.

Above the pressure of 3 GPa, the superconductivity enhanced once is heavily suppressed. As shown in Fig. 2, the pressure of 8 GPa extinguishes its superconductivity completely. At the higher temperatures, on the other hand, the resistivities above 5 GPa show clear anomalies over 100 K, as displayed in the inset of Fig. 2. The temperature observed as an anomalous hump increases with pressure up to room temperature at the rate of 51.5 K/GPa. These results show that a new state (NS) is evidently induced under high

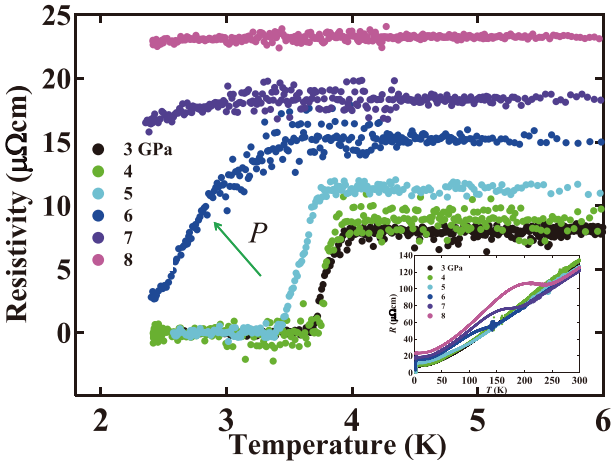

Fig. 2. Electrical resistivity under high pressures up to 8 GPa. The inset indicates that the resistivity at high temperatures shows an anomaly with a clear hump, implying an emergence of a new state.

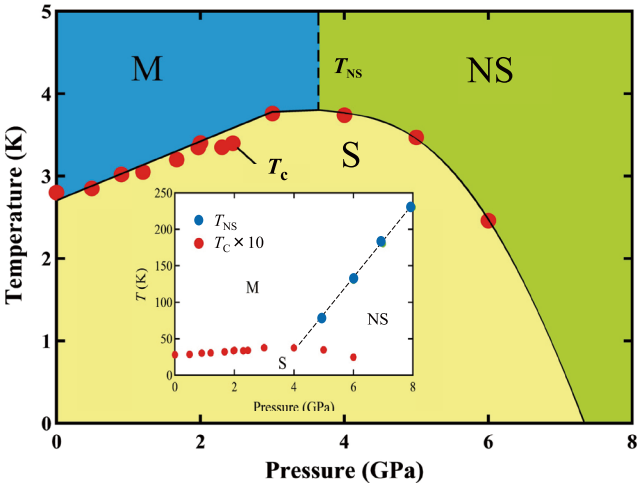

Fig. 3. *P-T* phase diagram of $LaNiC_2$. The mark M and S denote metal and superconductivity, respectively; and NS indicates 'a new state' induced under pressure. In the inset, the superconducting transition temperatures are multiplied by the factor of 10.

pressures. With such an emergence of the NS state, the superconductivity is intensely suppressed. Figure 3 shows the phase diagram obtained. It is noted that this diagram shows a dome for T_c but is *mirror symmetric* to those of many other systems like heavy-fermion and high-*T*c superconductors.

For this NS state it remains that some $RNiC_2$ (*R* = rare-earth) systems show charge density wave (CDW) states at high temperatures. Thus, it might be natural that the anomalous hump observed at the temperatures over 100 K originates from the phase transition to the CDW state. This newly induced state is enhanced strongly under high pressures; further, that is quite robust up to the highest pressure of 30 GPa investigated in this work.

With the disappearance of the superconductivity a new state (NS) with a high energy scale is dramatically emerged. These results indicate that the system is not a simple normal metal but is highly correlated with strong electronic interactions such as CDW, which correlations may contribute to the superconductivity of this unique system [4].

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Correlation Effects in Topological Insulators

N. Kawakami

We report our recent studies on correlated topological insulators using ISSP supercomputer. We first investigate a topological Mott insulator in one dimension (1D) to discuss how the edge Mott states emerge due to the interplay of topology and correlation [1]. We then address how the topological state is restored by the temperature in the presence of strong correlations in two dimensions (2D)

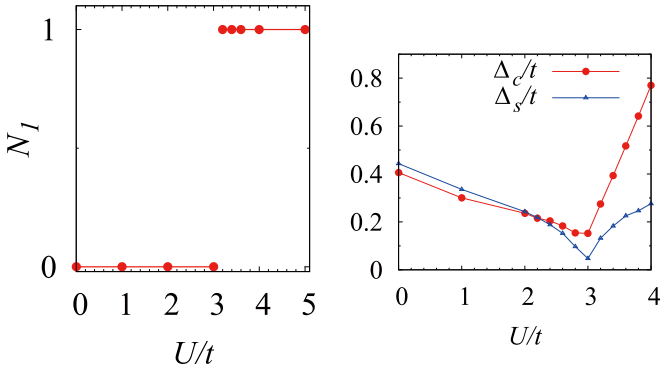

Fig. 1. Left panel: winding number N_1, Right panel: spectral gaps for edge states:Δ_c, (Δ_s) for the one-particle (spin excitation) spectrum [1], as a function of Hubbard interaction *U* (*t* denotes nearest neighbor hopping). It is seen that the topological phase transition occurs, but Δ_c does not vanish in contrast to a noninteracting topological transition. Instead, we see the gap closing for collective spin excitations Δ_s.

[2]. We demonstrate that such restoration of topological properties is rather generic, by exploring another correlated topological insulator [3]. We also mention some issues related to topological insulators [4-6].

(A) We first summarize the results obtained for a 1D topological Mott insulator [1]. By examining the bulk topological invariant and the entanglement spectrum of a correlated Su-Schrieffer-Heeger model, we clarify how gapless edge states in a non-interacting topological band insulator evolve into spinon edge states in a topological Mott insulator. Furthermore, we propose a new type of topological Mott transition. In Fig.1, we show a topological Mott transition driven by the Hubbard interaction *U* [1]. As seen from left panel, a transition from a trivial phase (N_1=0) to a nontrivial one (N_1=1) occurs, and at this transition a one-particle gap (Δ_c) is not closed but only a spin excitation gap (Δ_s) becomes gapless (right panel). This unconventional transition occurs in a spin liquid phase and is accompanied by zeros of the single-particle Green's function and a gap closing in the spin excitation spectrum [1].

(B) We elucidate how a topologically nontrivial phase evolves at finite temperatures [2,3]. Specifically, we study a Kane-Mele Kondo lattice model at finite temperatures with dynamical mean field theory. The obtained phase diagram shows three phases at zero temperature [2]: an antiferromagnetic topological insulator, an antiferromagnetic trivial insulator, and a trivial Kondo insulator. We find a restoration of topological properties at finite temperatures due to the interplay of a topologically nontrivial structure and electron correlation. In order to address this phenomenon, we analyze the bulk and edge properties. In the bulk, the spin-Hall conductivity which is almost zero around zero temperature increases with increasing temperature. At the edge, the gapless edge modes emerge with increasing temperature.

(C) We finally summarize some issues related to topological phase transitions, which will be realized in new platforms such as cold atomic systems, photonic systems, etc. We clarify non-equilibrium topological phase transitions in 2D optical lattices [4]. We unveil hidden topological phases in a 1D quantum walk [5]. We clarify topological properties of cold bosons in 1D quasiperiodic optical lattices [6].

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Investigation of Average and Local Structures, and Electron-Density Distribution of Lithium Transition-Metal Oxide

Y. Idemoto and N. Kitamura

In recent years, the lithium-ion battery has been expected to be applied for not only portable electronic devices such as a mobile phone but also a vehicle and a storage device and so on. From such background, many researches have devoted their efforts to develop new lithium transition-metal oxides with superior cathode performances. For the development, crystal and electronic structures of the cathode materials must be determined precisely since the structures are well known to affect the cathode properties. Moreover, it is considered recently that local orderings of transition metals in the crystal play an important role for charge and discharge processes. Therefore, it is highly expected to discover local structures hidden in crystal structures. In our recent works, we paid special attention on $LiNi_{0.8}Co_{0.2}O_2$-based materials [1] and $Li(Li_{1/6}Mn_{1/2}Ni_{1/6}Co_{1/6})O_2$ [2] with the layered structure, and investigated the average and local atomistic structures, and electron-density distribution by using neutron and synchrotron X-ray sources.

As for $LiNi_{0.8}Co_{0.2}O_2$-based materials, we refined the average structure by the Rietveld analysis using neutron diffraction patterns. The data were measured under ambient condition with HERMES installed at JRR-3. Fig. 1 shows the Rietveld refinement pattern of $LiNi_{0.79}Zn_{0.01}Co_{0.2}O_2$. In the analysis, we assumed the space group as R-3m, and optimized an exchange amount of Li and Ni, which is the so-called "cation mixing". As a result, the average structure could be successfully refined, and the Ni content at Li site was estimated as 0.056 (3). We could also refined average structures of other $LiNi_{0.8}Co_{0.2}O_2$-based materials with partial Cu substitution and without any substitution (the pristine sample) in the same manner. For the purpose of electronic-structure analysis on the samples, we carried out the maximum-entropy method (MEM) using synchrotron X-ray diffraction patterns. When X-ray diffraction data are used, it is quite difficult to obtain accurate information on light element such as Li and O generally. Therefore, the average structures refined with the neutron diffractions were utilized as the initial structures in the analytical processes. By this strategy, electron-density distributions could be estimated successfully, and then it was found that both the Zn and Cu substitution for $LiNi_{0.8}Co_{0.2}O_2$ tended to reduce a bond strength between the transition-metal and oxygen sites.

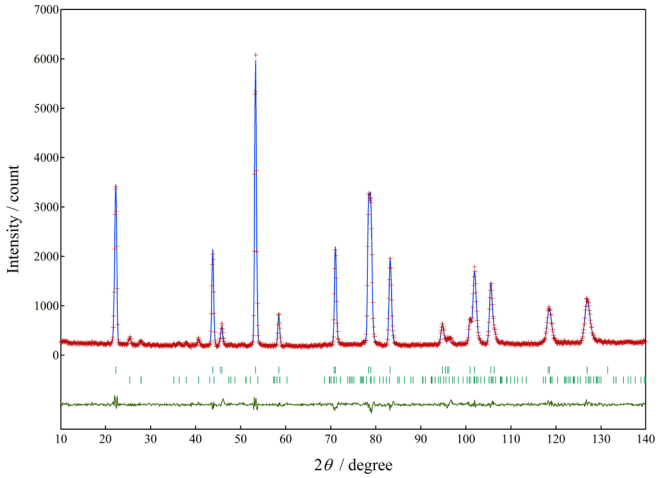

Fig. 1. Rietveld refinement pattern of $LiNi_{0.79}Zn_{0.01}Co_{0.2}O_2$. Red pluses and a blue solid line represent observed and calculated intensities, respectively. Vertical marks indicate positions of allowed Bragg reflections (upper marks for $LiNi_{0.79}Zn_{0.01}Co_{0.2}O_2$, and lower marks for Li_2CO_3). A curve at the bottom is a difference between the observed and calculated intensities in the same scale.

In order to investigate the local structure of $Li(Li_{1/6}Mn_{1/2}Ni_{1/6}Co_{1/6})O_2$ with the layered structure, we firstly performed the average structure refinement (S. G.: $C2/m$) using neutron Bragg profile recorded at HERMES, and then analyzed the reduced pair distribution function, $G(r)$, which was derived from neutron total scatterings. Prior to the PDF fitting, we constructed the some local-structure models with different metal arrangement which satisfied the site occupancies refined by the Rietveld method, and then relaxed atomic configurations of the models by the density functional theory (DFT) calculation. On the basis of the results, we carried out the PDF fitting only for an energetically-stable model. The PDF analysis indicated that a $LiMn_6$ ordering was formed within the transition-metal layer in the same way as Li_2MnO_3. In addition, the detailed investigation suggested a local distortion along the c axis which is perpendicular to the layer.

The our works described above demonstrate that the structure analysis using both the neutron and synchrotron X-ray diffractions gives us fruitful information the electronic structure as well as the crystal structure of the cathode materials for the lithium-ion battery. Moreover, a combination of the Rietveld and PDF analyses enable us to gain deeper understanding the atomic configurations of the functional oxides.

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Extremely Large and Anisotropic Upper Critical Field inIon-Gated MoS_2

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Superconductivity is a quantum phenomenon characterized by zero electrical resistance and complete expulsion of the magnetic flux. The extraordinary properties arise from the condensation of the Cooper pair that consists of a pair

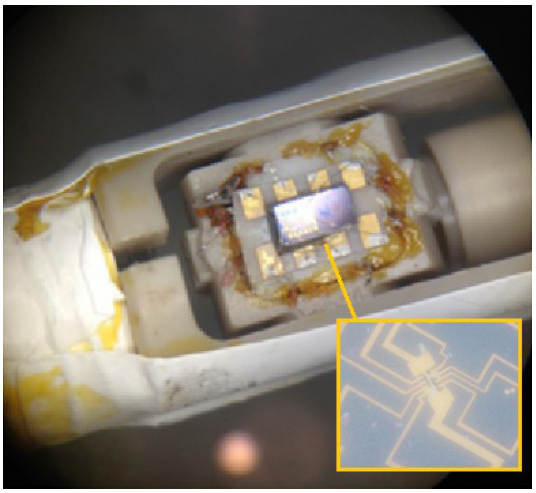

Fig. 1. MoS_2 EDLT transistor on the rotator probe.

of free electrons with opposite spins. The application of strong magnetic fields tends to arrange spins in one direction, therefore the ordinal superconductivity cannot be survived above the certain limit of magnetic fields, called the Pauli limit "H_{Pauli} ~ 1.86 T_c". Nevertheless, our recent collaboration work performed at International MegaGauss Science Laboratory (IMGSL) has experimentally revealed that an ion-gated molybdenum disulphide (MoS_2) transistor exhibits an extremely large upper critical field (H_{c2}) that is 4-5 times more than the Pauli limit of ~ 12 T [1].

The H_{c2} were directly estimated from the magnetoresistance measurement on superconducting MoS_2 samples that were prepared by using an electric-double-layer transistor (EDLT) configuration [2]. Since the H_{c2} is extremely large and shows a high degree of anisotropy, we developed a specially designed plastic rotator (see Fig.1) and performed magnetoresistance measurements in pulsed magnetic fields up to 55 T. The rotator probe was made of a plastic material, and thus the eddy current related problems, such as Joule heating and mechanical vibration, were completely eliminated even in a pulsed field environment.

The obtained H_{c2} vs T plot is shown in Fig.2, which provides the experimental evidence of anisotropic and extremely large upper critical fields on the MoS_2-EDLT. We interpret that the large anisotropy can be understood as a consequence of the two-dimensional electric property of MoS_2-EDLT, namely the completely different orbital motion

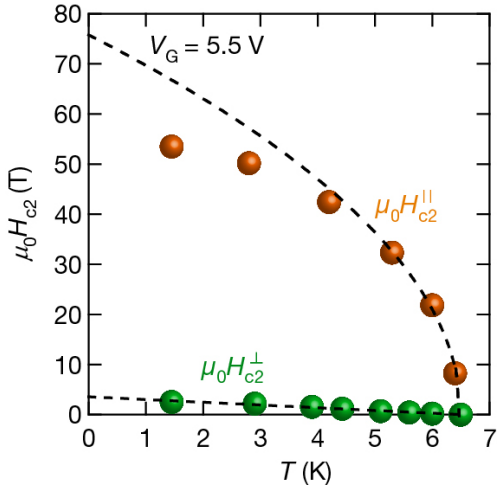

Fig. 2. Upper critical fields (H_{c2}) vs Temperature (T). The orange and green dots are the H_{c2} when the external magnetic fields are applied to parallel ($H_{c2}^{\parallel}$) and perpendicular ($H_{c2}^{\perp}$) to the plane, respectively. The upper critical fields were deduced from the magnetoresistance measurements.

for the in-plane and out-of-plane configurations. On the other hand, the exceptionally large H_{c2} for the in-plane configuration is due to an enhancement of the Pauli limit, caused by the strong spin-orbit interaction and the non-centrosymmetric nature of MoS_2 single layer. Indeed, our numerical calculation based on realistic tight-binding calculations demonstrate that the Cooper pairs are protected by the strong spin-orbit interaction, and are thereby very robust against external magnetic fields for the in-plane configuration. The robustness of H_{c2} against external magnetic fields might make MoS_2-EDLT an ideal platform for investigating noncentrosymmetric superconductors.

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Quantum Transport of Dirac Fermions Coupled with Magnetic Order in $EuMnBi_2$

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Dirac materials, characterised by linear energy-momentum dispersion near Fermi level, have attracted much attention for their unique transport properties such as half-integer quantum Hall effect, observable even at room temperature in graphene. To expand potential application of their distinct quantum transport, it is highly desirable to control the conduction of Dirac fermions by magnetic moments in solids as well as external fields. Despite recent discoveries of a number of new bulk Dirac materials, quantum transport features have been elucidated mostly in nonmagnetic materials, as exemplified by so-called Dirac/Weyl semimetals, such as Cd_3As_2, Na_3Bi, and TaAs.

We here report novel magneto-transport features for a

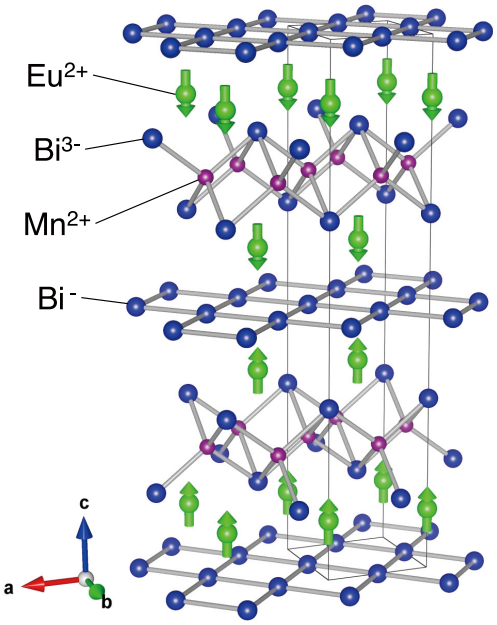

Fig. 1. Schematic illustration of the crystal and magnetic structure for $EuMnBi_2$ at zero field, together with the formal valence of each ion. The magnetic moments of the Mn sublattice are not shown for brevity.

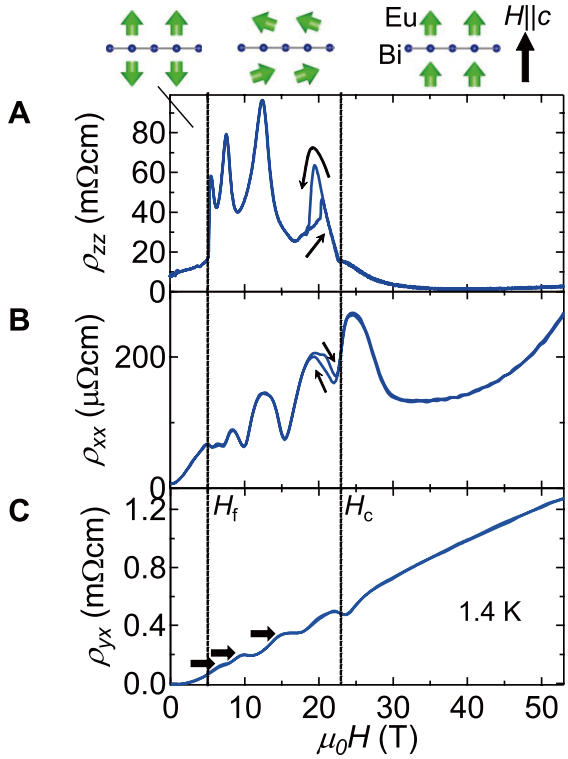

Fig. 2. Field profile of (A) interlayer resistivity ρ_{zz}, (B) in-plane resistivity ρ_{xx}, and (C) Hall resistivity ρ_{yx} for $EuMnBi_2$ at 1.4 K for the field parallel to the *c* axis. Schematic illustration of variation of the ordered Eu moments adjacent to the Bi layer is presented above the panels.

new multilayer Dirac fermion system $EuMnBi_2$. Recently, layered magnets $AMnBi_2$ (A=Sr^{2+} [1-3] and Eu^{2+} [4,5]) were found to host anisotropic 2D Dirac fermion, providing an ideal arena to reveal the interplay between Dirac fermions and ordered magnetic moments. The crystal structure consists of the conducting layers of Bi square net hosting quasi two-dimensional (2D) Dirac fermions and the insulating magnetic layers consisting of the Mn-Bi and *A* layers (Fig. 1). To explore quantum transport phenomena associated with magnetically-controllable Dirac fermions, we have investigated the detailed magnetic and transport properties by applying field up to 55 T at the International MegaGauss Science Laboratory at the Institute for Solid State Physics [6].

The magnetization dominated by the Eu sublattice shows typical behaviour of uniaxial antiferromagnet. We observed a spin-flop transition for the field of ~ 5.5 T (H_f) along the *c* axis, followed by saturation at ~ 22 T (H_c) with a saturation moment of ~ 6.5 μ_B/f.u (not shown here), which reflects the full moment of localised Eu 4*f* electrons. The in-plane resistivity (ρ_{xx}) and interlayer resistivity (ρ_{zz}) exhibit clear anomalies at the magnetic phase transition of Eu sublattice (Fig. 2). In particular, ρ_{zz} exhibits a large jump at H_f, followed by giant Shubnikov–de Haas (SdH) oscillations that reach $\Delta\rho_{zz}/\rho_{zz}$ ~ 50% in the spin-flop antiferromagnetic (AFM) phase (Fig. 2A). This high ρ_{zz} state is terminated at H_c, above which the ρ_{zz} value is substantially reduced. Interestingly, the magnitude of the SdH oscillations in ρ_{xx} and ρ_{yx} (Hall resistivity) is also enhanced in the spin-flop AFM phase (Fig. 2B and 2C), which evolves to plateau-like structures in the ρ_{yx} profile as indicated horizontal thick arrows in Fig. 2C. This signifies the first observation of the multilayer quantum Hall effect of quasi 2D Dirac fermions in a bulk magnet [6].

In spite of the strong coupling between the magnetism and transport properties, the carrier mobility is estimated to be as high as μ ~ 14,000 cm^2/Vs at 2 K. This indicates that the interlayer conduction is suppressed by the staggered Eu moments along the *c* axis, whereas the ferromagnetic order within the plane may promote the in-plane transport. Thus, the crystal structure of $EuMnBi_2$ can be regarded as a natural spin-valve structure embedded in a multilayer Dirac fermion system. Our discovery would open the door for engineering the Dirac fermion transport in magnetic materials suitable for novel spintronic devices with an extremely high speed.

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A New Numerical Method for Finite-Temperature Calculations of Strongly Correlated Electrons Systems

T. Misawa

In strongly correlated electrons systems, many exotic phenomena such as high-T_c superconductivities have been found. To clarify how the strongly electronic correlations induce such exotic phenomena, highly-accurate numerical methods for the low-energy effective models of strongly correlated electron systems such as Hubbard model play essential role. For the ground-state calculations (zero-temperature calculations), powerful numerical algorithms such as density matrix renormalization group method or tensor network algorithms already exist and they have been applied to broad range of the strongly correlated electrons systems. However, for the finite-temperature calculations, the efficient numerical method is absent and development of highly-accurate finite-temperature calculations remains a challenging problem.

In the textbook implementation of the finite-temperature calculation, it is necessary to take ensemble average over the excited states and it is practically formidable to carry out. Contrary to the standard implementation, recent development of the statistical physics shows that the calculation within small number of pure states instead of the full ensemble average is sufficient for accurate estimate of finite-temperature properties. Such pure states are called thermal pure quantum (TPQ) states and they are easily generated by performing the imaginary-time evolution of the wave function.

Based on the principle of the TPQ, we develop a new method to perform the calculations for the larger system

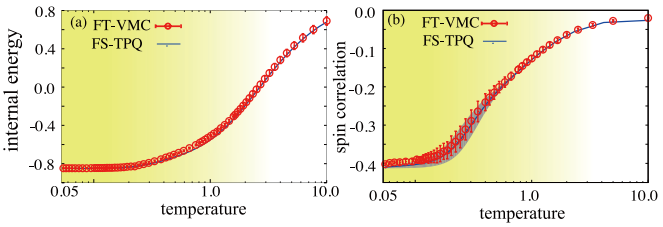

Fig. 1. (a) Temperature dependence of internal energy per site calculated from FT-VMC for 4×4 half-filled Hubbard model with U/t=4. The FT-VMC result is shown by red circles in comparison with essentially exact results obtained by full-space TPQ (FS-TPQ) method shown by blue curve. (b) Temperature dependence of nearest neighbor spin correlations calculated by FT-VMC (red circle) and FS-TPQ (blue curve) method. The shadow region in (a) and (b) represent the error bars in FS-TPQ method.

size where the exact imaginary-time evolution is impossible. A key fact is that accurate imaginary-time evolution of the wave functions is possible by using the stochastic reconfiguration method, which is used as the optimization method in the variational Monte Carlo (VMC) method. Thus, we call this numerical method finite-temperature VMC (FT-VMC) method. By comparing the exact results, as shown in Fig. 1, we have shown that temperature dependence of the physical properties such as internal energy and spin correlations is well reproduced by using the FT-VMC method. Moreover, we have shown that our method can be applicable to larger system size where the exact imaginary-time evolution is impossible. Our method opens a new way for the accurate calculations of the strongly correlated electron systems.

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Capturing Transiently Charged States at the C60/TiO2(110) Interface by Time-Resolved Soft X-ray Photoelectron Spectroscopy

K. Ozawa, S. Yamamoto, and I. Matsuda

One of key technologies for realizing sustainable society is an efficient conversion of the sunlight into chemical and electrical energies. Titanium dioxide (TiO_2) exhibits a high photocatalytic activity for water splitting to produce a zero-emission fuel. TiO_2 is also used as a transparent electrode in photovoltaic cells [2]. One of the extensively studied TiO_2-based photovoltaic cells is a dye-sensitized organic cell, in which visible-light sensitive dye molecules or polymers are loaded onto the TiO_2 electrodes. The TiO_2 electrode collects photoexcited electrons from the light absorbing layer to facilitate electron-hole separation. In such a photovoltaic cell, a charge transfer across the interface is an important elemental step to define the performance of the cell. A molecule of C_{60} is an important component of dye-sensitized photovoltaic cells, where the C_{60} layer is used as an electron acceptor and as an electron transport layer. C_{60} also serves to enhance photocatalytic activity of TiO_2 by promoting the separation of the photoexcited electron-hole pairs. In the present study, we apply time-resolved soft X-ray photoelectron spectroscopy (TRPES) to the C_{60}/TiO_2 (110) heterojunction in order to elucidate how the excited carriers behave at the junction. An experiment of TRPES utilizing the pump-probe method has been proven to be a powerful tool to simultaneously determine the electronic structure and the dynamics of the photoexcited carriers at semiconductor surfaces.

The TRPES measurements were carried out at SPring-8 BL07LSU [1]. For the pump light, a second harmonic of an amplified Ti:sapphire laser pulse was used. The pulse duration and a repetition rate were 35 fs and 1 kHz, respectively. The photon energy was set at 3.06 eV, which exceeds both the band gap of rutile TiO_2 (3.0 eV) and the energy difference between the highest occupied molecular orbital (HOMO) level and the lowest unoccupied molecular orbital (LUMO) level of C_{60} (2.3 eV). For the probe light, synchrotron radiation (SR) lights with the energies of 253 eV and 600 eV were used to measure valence-band spectra and Ti 2p and C 1s core-level spectra, respectively. The SR lights were provided by a single bunch and a 11/29-filling bunch train of an H-mode operation. SR pulses from the single bunches were used for the pump/probe measurements. A width of the pulse was 50 ps and a time interval between the pulses was 4.79μs.

We examined the effect of UV laser irradiation on the electronic structure of the C_{60}/TiO_2(110) heterojunction[2]. An upper panel in Fig. 1 shows a Ti $2p_{3/2}$ spectrum measured without UV irradiation. A background subtracted peak is reproduced by a single Voigt function with a peak maximum at 458.2 eV. A Ti $2p_{3/2}$ spectrum in the lower panel is acquired at 1ns after laser pulse irradiation. The peak is also fitted by a Voigt function with a peak maximum at 458.3 eV. Regarding the C 1s core-level peak of C_{60}, a laser induced shift is 0.25 eV towards the higher binding energy (BE) side. The C 1s peak in the dark condition (without laser irradiation) is located at 284.4 eV. A small structure at 286.1 eV is due to C–O. The peak moves to 284.65 eV at 1 ns after irradiation. The BE shifts of both Ti $2p_{3/2}$ and C 1s peaks are transient because the peaks go back to the original positions

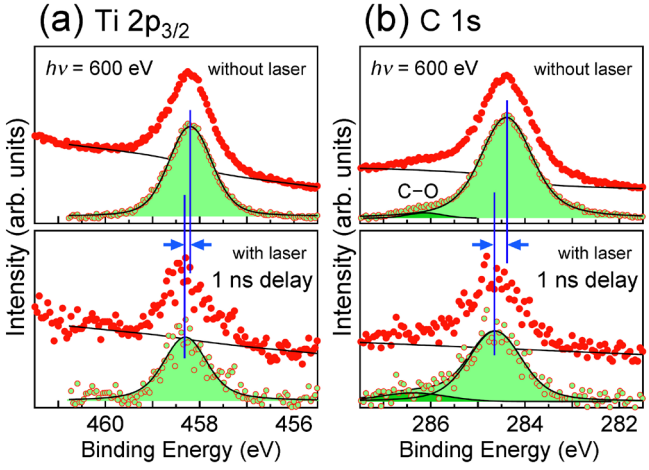

Fig. 1. (a) Ti $2p_{3/2}$ and (b) C 1s core-level spectra for C_{60}/TiO_2(110) with the C_{60} thickness of 0.57 nm. Spectra in the upper panels were acquired without the pump laser, whereas those in the lower panels were measured at 1 ns after irradiation of the laser pulse. The photon energy of the pump laser was 3.06 eV, and a power density was 40μJ/cm2/pulse. The photon energy of the probe SR light was 600 eV, and the emitted photoelectrons were collected with repetition rates of 208 kHz for the upper spectra and 1 kHz for the lower spectra. In each panel, a raw spectrum and a background-subtracted spectrum are drawn by dots. Background curves, shown by solid lines, were a combination of a Shirley-type curve and a linear line. Solid lines with shaded areas are the result of least-square fitting using Voigt functions.

by the time the next probe pulse arrives after 4.79 μs. The energy shift does not due to the surface photovoltage (SPV) effect since direction of the energy shift is opposite to the expectation. Moreover, the power density of the irradiated pump laser in the present study was 40μJ/cm2/pulse, which was insufficient to induce the SPV effect on the TiO_2(110) surface [1].

Figure 1 clearly demonstrates that deposited C_{60} on TiO_2(110) must be responsible for the UV-induced shift of the Ti $2p_{3/2}$ core level in the weak excitation condition. Aside from the TiO_2 substrate, the C_{60} overlayer also absorbs the 3.06-eV pump laser. In the present excitation condition, the HOMO → LUMO+1 and HOMO-1 → LUMO transitions are possible so that the valence electrons should promote to the LUMO and LUMO+1 levels, and the holes are left in the HOMO and HOMO-1 levels. Since both the LUMO and LUMO+1 states energetically overlap to the conduction band of TiO_2, a resonant transfer of the excited electrons is possible from C_{60} to TiO_2. Such an interface charge transfer competes with the electron-hole recombination process. It is speculated that a large fraction of the photoexcited electrons in the C_{60} layer is possible to be transferred to TiO_2. The transferred electrons, then, undergo deexcitation to the bottom of the conduction band of TiO_2. As a result, C_{60} is cationized after laser irradiation. The C 1s peak shift towards the higher BE side must, therefore, be caused by this charging effect. Regarding the TiO_2 side of the heterojunction, additional electrons are injected from the C_{60} layer so that the carrier density is increased at the TiO_2 surface. The BE shift of the Ti $2p_{3/2}$ peak should, therefore, reflect the enlarged magnitude of downward band bending.

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Progress of Facilities

Supercomputer Center

The Supercomputer Center (SCC) is a part of the Materials Design and Characterization Laboratory (MDCL) of ISSP. Its mission is to serve the whole community of computational condensed-matter physics of Japan providing it with high performance computing environment. In particular, the SCC selectively promotes and supports large-scale computations. For this purpose, the SCC invites proposals for supercomputer-aided research projects and hosts the Steering Committee, as mentioned below, that evaluates the proposals.

The ISSP supercomputer system consists of two subsystems: System B, which is intended for more nodes with relatively loose connections. In July, 2015, the SCC replaced the two supercomputer subsystems (SGI Altix ICE 8400EX and NEC SX-9) to one new system (System B, SGI ICE XA/UV hybrid system). The system B consists of 1584 CPU nodes, 288 ACC nodes, and 19 FAT nodes. The CPU node has 2CPUs (Intel Xeon). The ACC node has 2CPUs (Intel Xeon) and 2GPUs (NVIDIA Tesla K40). The FAT node has 4CPUs (Intel Xeon) and large memory (1TB). The system B have totally 2.6 PFlops theoretical peak performance.

System C - FUJITSU PRIMEHPC FX10 was installed in April, 2013. It is highly compatible with K computer, the largest supercomputer in Japan. System C consists of 384 nodes, and each node has 1 SPARC64TM IXfx CPU (16 cores) and 32 GB of memory. The system C have totally 90.8 TFlops.

The hardware administration is not the only function of the SCC. The ISSP started hosting Computational Materials Science Initiative (CMSI), a new activity of promoting materials science study with next-generation parallel supercomputing. This activity is financially supported by the MEXT HPCI strategic program, and in CMSI, a number of major Japanese research institutes in various branches of materials science are involved. The SCC supports the activities of CMSI as its major mission.

All staff members of university faculties or public research institutes in Japan are invited to propose research projects (called User Program). The proposals are evaluated by the Steering Committee of SCC. Pre-reviewing is done by the Supercomputer Project Advisory Committee. In school year 2015 totally 239 projects were approved. The total points applied and approved are listed on Table. 1 below.

The research projects are roughly classified into the following three (the number of projects approved):

First-Principles Calculation of Materials Properties (123)
Strongly Correlated Quantum Systems (31)
Cooperative Phenomena in Complex, Macroscopic Systems (85)

All the three involve both methodology of computation and its applications. The results of the projects are reported in 'Activity Report 2015' of the SCC. Every year 3-4 projects are selected for “invited papers” and published at the beginning of the Activity Report. In the Activity Report 2015, the following three invited papers are included:

"Correlation Effects in Topological Insulators", Norio KAWAKAMI
"Capacitance of Nanosized Capacitors Investigated Using the Orbital-Separation Approach–Dead Layer Effect and Negative Capacitance", Shusuke KASAMATSU, Satoshi WATANABE, Seungwu HAN, and Cheol Seong HWANG
"Multiscale Simulation Performed on ISSP Super Computer: Analysis of Entangled Polymer Melt Flow”, Takahiro MURASHIMA

Class	Max Points		Application	Number of Projects	Total Points			
					Applied		Approved	
	System B	System C			System B	System C	System B	System C
A	100	100	any time	13	1.3k	1.3k	1.3k	1.3k
B	1k	500	twice a year	57	43.8k	8.6k	26.0k	7.8k
C	10k	2.5k	twice a year	162	1394.8k	181.3k	475.0k	147.8k
D	10k	2.5k	any time	2	18.0k	4.0k	14.0k	2.5k
E	30k	2.5k	twice a year	5	150.0k	7.5k	79.0k	6.2k
S			twice a year	0	0	0	0	0
CMSI				33	125.0k	139.0k	125.0k	139.0k
Total				272	1732.9k	341.7k	720.3k	304.6k

Table 1. Research projects approved in 2015
The maximum points allotted to the project of each class are the sum of the points for the two systems; Computation of one node for 24 hours corresponds to one points for the CPU nodes of System B and System C. The FAT and ACC nodes require two points for a 1-node 24-hours use.

Neutron Science Laboratory

The Neutron Science Laboratory (NSL) has been playing a central role in neutron scattering activities in Japan since 1961 by performing its own research programs as well as providing a strong General User Program for the university-owned various neutron scattering spectrometers installed at the JRR-3 (20MW) operated by Japan Atomic Energy Agency (JAEA) in Tokai. In 2003, the Neutron Scattering Laboratory was reorganized as the Neutron Science Laboratory to further promote the neutron science with use of the instruments in JRR-3. Under the General User Program supported by NSL, 14 university-group-owned spectrometers in the JRR-3 reactor are available for a wide scope of researches on material science, and proposals close to 300 are submitted each year, and the number of visiting users under this program reaches over 6000 person-day/year. In 2009, NSL and Neutron Science Laboratory (KENS), High Energy Accelerator Research Organization (KEK) built a chopper spectrometer, High Resolution Chopper Spectrometer, HRC, at the beam line BL12 of MLF/J-PARC (Materials and Life Science Experimental Facility, J-PARC). HRC covers a wide energy and Q-range ($10\mu eV < \hbar\omega < 2eV$ and $0.02Å^{-1} < Q < 50Å^{-1}$), and therefore becomes complementary to the existing inelastic spectrometers at JRR-3. HRC started to accept general users through the J-PARC proposal system in FY2011.

Triple axis spectrometers, HRC, and a high resolution powder diffractometer are utilized for a conventional solid state physics and a variety of research fields on hard-condensed matter, while in the field of soft-condensed matter science, researches are mostly carried out by using the small angle neutron scattering (SANS-U) and/or neutron spin echo (iNSE) instruments. The upgraded time-of-flight (TOF) inelastic scattering spectrometer, AGNES, is also available through the ISSP-NSL user program.

Scientific outputs from HRC in FY2015 covers wide range in magnetism and strongly correlated electrons. One of the highlights is the identification of magnetic model in multiferroic $NdFe_3(BO_3)_4$. Combination of position sensitive detectors in wide scattering angle and the rotation of sample goniometer in HRC enables the effective measurement of neutron structure factor $S(\mathbf{q}, \hbar\omega)$ as shown in Fig. 1. The well-defined excitations in high-energy resolution are observed. The characteristic features including anti-crossing of modes and anisotropy gap are consistently explained by spin-wave calculation on the basis of coupled Fe-Nd subsystems. Detailed analysis on the spectra revealed that the multiferroic structures in the compound is determined by the local anisotropy of Nd ion.

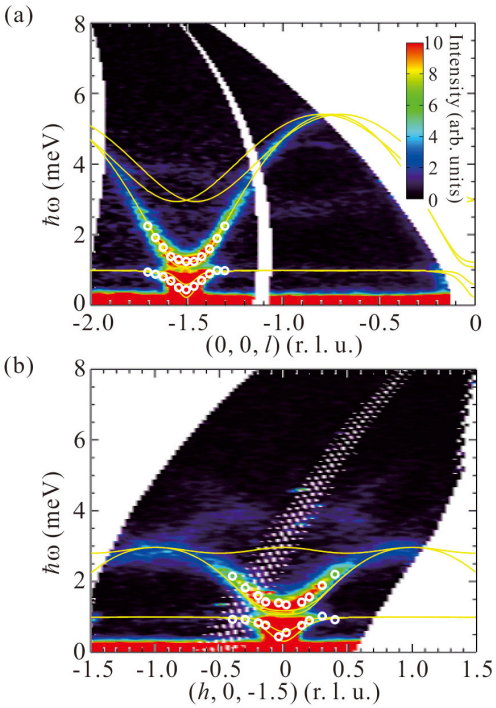


Fig. 1. Neutron structure factor of $NdFe_3(BO_3)_4$ sliced by the plane of $\hbar\omega$ - c^* in panel (a) and that of $\hbar\omega$ - a^* in panel (b). For more details, see Research Highlights of Masuda group at page 20.

Technical progress of HRC spectrometer was the development of the magnetic field environment. We examined a performance test of a superconducting magnet on the HRC goniometer. The magnetic field of 10 T was achieved with normal operation of the related components in the straying field. The magnitude of the field is the highest record in J-PARC/MLF at present. By using radial collimator for the reduction of background scattering from Aluminum supporting ring in the magnet, high-quality data was collected.

The NSL also operates the U.S.-Japan Cooperative Program on neutron scattering, providing further research opportunities to material scientists who utilize the neutron scattering technique for their research interests. In 2010, relocation of the U.S.-Japan triple-axis spectrometer, CTAX, was completed, and it is now open to users.
http://neutrons.ornl.gov/instruments/HFIR/CG4C/

The activity report on Neutron Scattering Research in JFY2012-2014 is given in NSL-ISSP Activity Report vol. 20 (2015).

International MegaGauss Science Laboratory

The objective of this laboratory (Fig. 1) is to study the physical properties of solid-state materials (such as semiconductors, magnetic materials, metals, insulators, superconducting materials) under ultra-high magnetic field conditions. Such a high magnetic field is also used for controlling the new material phase and functions. Our pulse magnets, at moment, can generate up to 87 Tesla (T) by non-destructive manner, and from 100 T up to 760 T (the world strongest as an in-door record) by destructive methods. The laboratory is opened for scientists both from Japan and from overseas,

Fig. 1. Building view of the International MegaGauss Science Laboratory (C-building) at ISSP.

Fig. 2. The building for the flywheel generator (left hand side) and a long pulse magnet station (right hand side). The flywheel giant DC generator is 350 ton in weight and 5 m high (bottom). The generator, capable of a 51 MW output power with the energy storage 210 MJ, is planned to energize the long pulse magnet generating 100 T without destruction.

especially from Asian countries, and many fruitful results are expected to come out not only from collaborative research but also from our in-house activities. One of our ultimate goals is to provide the scientific users as our joint research with magnets capable of a 100 T, milli-second long pulses in a non-destructive mode, and to offer versatile physical precision measurements. The available measuring techniques now involve magneto-optical measurements, cyclotron resonance, spin resonance, magnetization, and transport measurements. Recently, specific heat and calorimetric measurements are also possible to carry out with sufficiently high accuracy.

Our standard non-destructive-type pulse magnets are energized by single capacitor bank and can generate fields up to 75 T for ordinary use. Their simple sinusoidal waveforms are advantageous for precise and reliable measurements of various physical properties. Several on-demand magnets having irregular shapes and sizes are developed for some particular experiments. We open six magnet cells for parallel experiments and accept more than 50 research projects per year in 2013.

A 210 MJ flywheel generator (Fig. 2), which is the world largest DC power supply (recorded in the Guinness Book of World Records) has been installed in the DC flywheel generator station at our laboratory, and used as an energy source of long pulse magnets. The magnet technologies are intensively devoted to the quasi-steady long pulse magnet (an order of 1-10 sec) energized by the giant DC power supply. The latest long-pulse magnet can generate fields up to 36 T with its pulse half-period of 1 sec.

Our interests cover the study on quantum phase transitions (QPTs) induced by high magnetic fields. Field-induced QPTs have been explored in various materials such as quantum spin systems, strongly correlated electron

	Alias	Type	B_{max}	Pulse width Bore	Power source	Applications	Others
Building C Room 101-113	Electro- Magnetic Flux Compression	destructive	730 T	μs 10 mm	5 MJ, 40kV	Magneto-Optical Magnetization	5 K – Room temperature
	Horizontal Single-Turn Coil	destructive	300 T 200 T	μs 5 mm 10 mm	0.2 MJ, 50 kV	Magneto-Optical measurements Magnetization	5 K – 400 K
	Vertical Single-Turn Coil	destructive	300 T 200 T	μs 5 mm 10 mm	0.2 MJ, 40 kV	Magneto-Optical Magnetization	2 K – Room temperature
Building C Room 114-120	Mid-Pulse Magnet	Non-destructive	60 T 70 T	40 ms 18 mm 40 ms 10 mm	0.9 MJ, 10 kV	Magneto-Optical measurements Magnetization Magneto-Transport Hall resistance Polarization Magneto-Striction Magneto-Imaging Torque Magneto- Calorimetry Heat Capacity	Independent Experiment in 5 site Lowest temperature 0.1 K
Building C Room 121	PPMS	Steady State	14 T			Resistance Heat Capacity	Down to 0.3 K
	MPMS	Steady State	7 T			Magnetization	
Building K	Short-Pulse magnet	Non-destructive	87 T (2-stage pulse) 85 T	5 ms 10 mm 5 ms 18 mm	0.5 MJ, 20 kV	Magnetization Magneto-Transport	2K – Room temperature
	Long-Pulse magnet	Non-destructive	36 T	1 s 30 mm	210 MJ, 2.7 kV	Resistance Magneto-Calorimetry	2K – Room temperature

Table 1. Available Pulse Magnets, Specifications

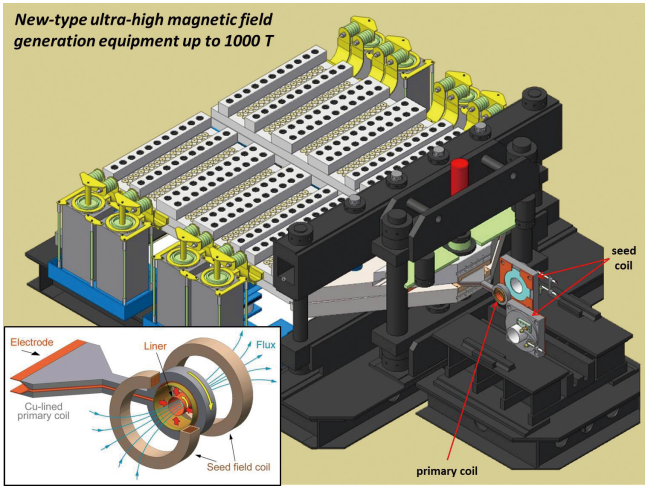


Fig. 3. (Build. C) The building for the electro-magnetic flux compression, generating over 700 T. 1000 T project started since 2010, and finally condenser banks of 9 MJ (5 MJ + 2 MJ +2 MJ) as a main system with the 2 MJ sub bank system for the seed field have been installed, and completed in the year of 2014.

systems and other magnetic materials. Direct thermodynamic evidences of QPTs are obtained through magnetization and recently developed caloric measurements. For some QPTs, changes in symmetry at the transitions are sensitively resolved through measurements of electric polarization or optical imaging using a polarizing microscope. High resolution of electrical measurements realized the observation of quantum oscillations in high quality crystals through measurements of electrical resistivity, contactless impedance, and torque magnetometry.

Magnetic fields higher than 100 T can only be obtained with destructing a magnet coil, where ultra-high magnetic fields are obtained in a microsecond time scale. Our destructive techniques have undergone intensive developments. The project, financed by the ministry of education, culture, sports, science and technology, is now in progress, and goal is to generate 1000 T by the electromagnetic flux compression (EMFC) system (Fig. 3). The system which is unique to ISSP in the world scale is comprised of a power source of 5 MJ main condenser bank and 2 MJ condenser bank and has been accomplished its installation. Two magnet stations are constructed and both are energized from each power source. Both systems are fed with a 2 MJ condenser bank used for a seed-field coil, of which magnetic flux is to be compressed.

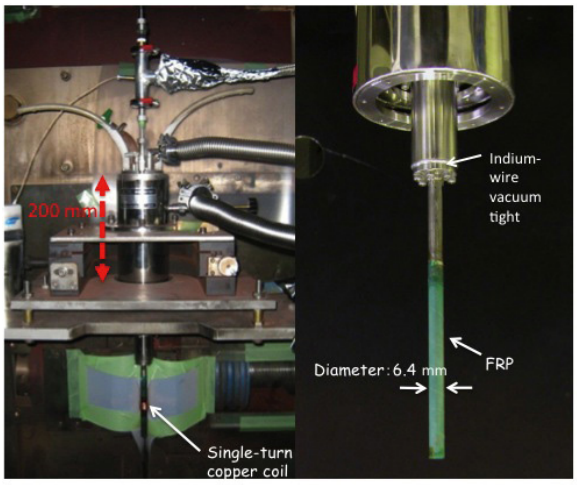


Fig. 4. A photo of the V-type single-turn coil equipped with 40 kV, (A:100+B:100=200 kJ) fast operating pulse power system. Measurements are carried out from room temperature down to 2 K by a specially designed cryostat.

As an easy access to the megagauss science and technology, we have the single-turn coil (STC) system capable of generating the fields of up to 300 T by a fast-capacitor of 200 kJ. We have two STC systems, one is a horizontal type (H-type) and the other is a vertical type (V-type, Fig. 4). Various kinds of laser spectroscopy experiments such as the cyclotron resonance and the Faraday rotation using the H-type STC are available. On the other hand, for very low-temperature experiments, a combination of the V-type STC with a liquid helium bath cryostat is very useful and the magnetization measurements at temperature as low as 2 K can be performed up to 120 T with high precision.

Center of Computational Materials Science

With the advancement of hardware and software technologies, large-scale numerical calculations have been making important contributions to materials science and will have even greater impact on the field in the near future. Center of Computational Materials Science (CCMS) is a specialized research center for promoting computer-aided materials science with massively parallel computers, such as K-computer. The center has also been functioning as the headquarters of Computational Materials Science Initiative (CMSI), which is an inter-institutional organization for computational science of a broad range of disciplines, including molecular science, quantum chemistry, biological materials, and solid state physics. ISSP made contracts with 9 universities and 2 national institutes for supporting the activities of CMSI in which nearly 100 research groups are involved. SY2015 was the final year of SPIRE, the MEXT project that had been the main financial source of CMSI, and CCMS has inherited some of the activities of CMSI. Apart from the SPIRE, CCMS is handling various projects: Project 7 and 5 of MEXT FLAGSHIP2020 Project (so-called "post-K computer project"), Element Strategy Initiative, Professional Development Consortium for Computational Materials Scientists (PCoMS). Through these activities, CCMS has become the center of the community of computational condensed matter physics, in which researchers from different backgrounds work together on grand challenge problems and develop computational infrastructures (new algorithms, coding styles, standard software packages, etc).

The branch office of CCMS in the RIKEN AICS building on the Port Island Kobe was closed on March 2016, after completing its mission of supporting CMSI researchers

Fig. 1. Members of Kobe branch office on the day of its closing

getting together at the K-computer site to exchange ideas of computational science, fine-tune various applications software for the K-computer, and develop better contact with staff members of RIKEN.

The following is the selected list of meetings organized by CCMS in SY2015:

- 05/11-13 The 3rd OpenMX/QMAS Workshop 2015, Hands-on workshop on electronic structure methods“
- 05/14 10sor network workshop -- Field 2 x 5 joint workshop on new algorithms for quantum manybody problems --
- 05/25 “CMSI Hands-On: FMO Tutorial”
- 06/01-06/19 New Perspectives in Spintronic and Mesoscopic Physics ＜ NPSMP2015 ＞
- 06/12 “CMSI Hands-On: ERmod Tutorial”
- 07/30 “CMSI Hands-On: Rokko Tutorial”
- 08/10-8/12 CMSI camp for application development“TOKKUN!6”
- 9/02 “Symposium on Collaboration between major experimental facilities and supercomputers”
- 9/07 “CMSI Hands-On: Version control system tutorial”
- 9/08-10 The 12th CMSI Camp for Programming Skill Developments
- 11/09-11/11 The18th Asian Workshop on First-Principles Electronic Structure Calculations
- 12/07-12/08 The 6th CMSI Simposium
- 12/09 Post-K Simposium
- 01/21 The 12th CMSI Workshop for Industry-Academia Collaboration “The programming environment MateriApps LIVE!”
- 03/05 The 4th TUT-CMSI Symposium for visualization of computational materials science
- 03/08 Workshop on topological materials

Laser and Synchrotron Research Center (LASOR Center)

Laser and Synchrotron Research (LASOR) Center started from October, 2012. LASOR Center aims to promote material sciences using advanced photon technologies at ISSP by combining the “Synchrotron Radiation Laboratory” and “Advanced Spectroscopy Group”. These two groups have long histories since 1980’s and have kept strong leaderships in each photon science fields for a long time in the world. In the past several decades, the synchrotron-based and laser-based photon sciences have made remarkable progresses independently. However, recent progresses

Fig. 1. Open ceremony of LASOR center on October 2012.

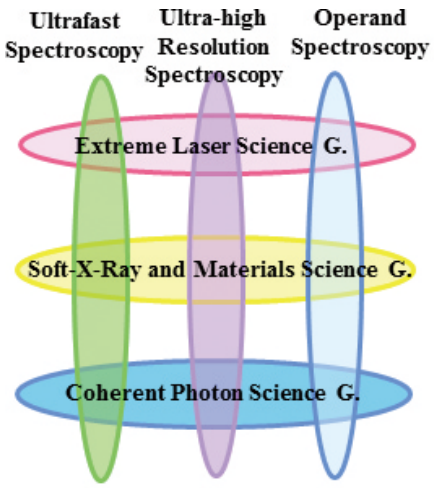


Fig. 2. Developments of advanced spectroscopy at LASOR center by three groups

in both fields make it feasible to merge the synchrotron-based and laser based technologies to develop a new direction of photon and materials sciences. In the LASOR Center, extreme laser technologies such as ultrashort-pulse generation, ultraprecise control of optical pulses in the frequency domain, and high power laser sources for the generation of coherent VUV and SX light are intensively under development. The cutting edge soft X-ray beamline is also developed at the synchrotron facility SPring-8.

LASOR center aims three major spectroscopic methods [ultrafast, ultra-high resolution, and operand spectroscopy] by three groups [extreme laser science group, soft-X-ray spectroscopy and materials science group, and coherent photon science group], as illustrated in Fig. 2. Under this framework, various advanced spectroscopy, such as ultra-high resolution photoemission, time-resolved, spin-resolved spectroscopy, diffraction, light scattering, imaging, microscopy and fluorescence spectroscopy are in progress by employing new coherent light sources based on laser and synchrotron technologies that cover a wide spectral range from X-ray to terahertz. In LASOR Center, a variety of materials sciences for semiconductors, strongly-correlated materials, molecular materials, surface and interfaces, and bio-materials are studied using advanced light sources and advanced spectroscopy. Another important aim of LASOR Center is the synergy of photon and materials sciences.

Most of the research activities on the extreme laser

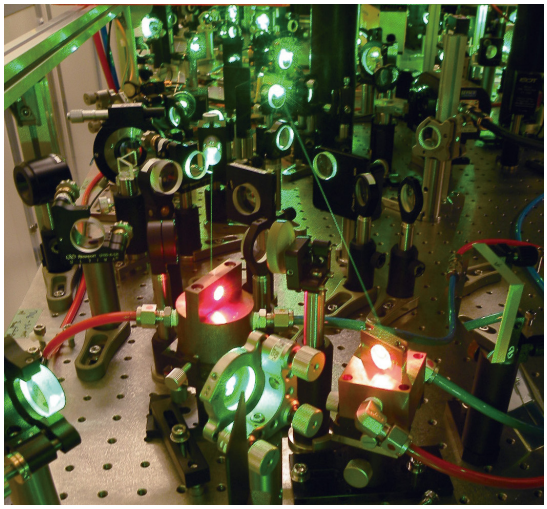


Fig. 3. Close look of a high-peak-power ultrashort-pulse laser

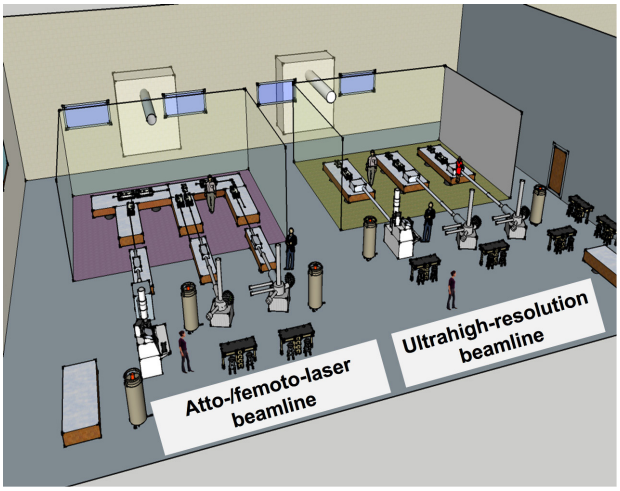


Fig. 4. Newly designed building E was constructed for new extreme VUV- and SX-lasers and new spectroscopy.

Fig. 6. 10-MHz high harmonic generation in an enhancement cavity.

development and their applications to materials science are performed in the ISSP buildings D and E at Kashiwa Campus where large clean rooms and the vibration-isolated floor are installed. On the other hand, the experiments utilizing the advanced synchrotron source are performed at a beamline BL07LSU in SPring-8 (Hyogo).

• Extreme Laser Science Group

The advancement of ultrashort-pulse laser technologies in the past decade has transformed the laser development at ISSP into three major directions, (i) towards ultrashort in the time domain, (ii) ultra high resolution in the spectral domain, and (iii) the extension of the spectral range, with extreme controllability of the laser sources. For ultrafast spectroscopy, we have developed carrier-envelope phase stable intense infrared light source that can produce sub-two cycle optical pulses for high harmonic and attosecond pulse generation. So far we observed coherent soft-X-ray radiation extending to a photon energy of ~330 eV. The simulation predicts the soft-X-ray field consists of single isolated attosecond pulses. For ultra-high resolution spectroscopy, fiber-laser-based light sources are intensively developed for producing EUV pulses for high resolution and time-resolved photoemission spectroscopy as well as extending the frequency comb to ultraviolet or infrared for various applications. The spectral range of intense optical pulses are being extended from visible to IR, MIR and THz ranges. Various types of high-repetition-rate ultrastable light sources are developed for laser-based ultrahigh resolution photoemission spectroscopy, high-average-power EUV generation in an enhancement cavity, and frequency comb spectroscopy for atomic physics, astronomical application, and frequency standards.

• Soft-X-ray and Materials Science Group

Recently, VUV and SX lasers have progressed very rapidly. They become very powerful for the materials science using the cutting-edge VUV and SX spectroscopy. Especially, angle resolved photoemission spectroscopy (ARPES) is very powerful to know the solid state properties. Laser has excellent properties, such as coherence, monochromaticity, polarization, ultra-short pulse, high intensity, and so on. By using monochromatic laser light, the resolution of ARPES becomes about 70-μeV. The materials science with sub-meV resolution-ARPES is improved drastically by using high resolution laser. For examples, superconducting gap anisotropy of the superconductors and Fermiology of the strongly correlated materials are studied very well. On the other hand, using pulsed laser light, the time-resolved photoemission in fs region becomes powerful to know the relaxation process of photo-excited states of the materials. Furthermore, by using CW laser with circular polarization in VUV region, the photoelectron microscopy (PEEM) is developed. The spatial resolution of nm resolution is very powerful for the study of nanomagnetic materials.

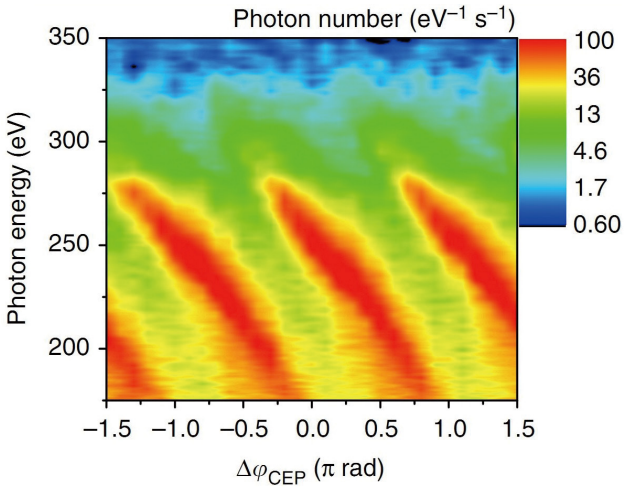


Fig. 5. Phase-dependence of high harmonic spectra in soft X rays.

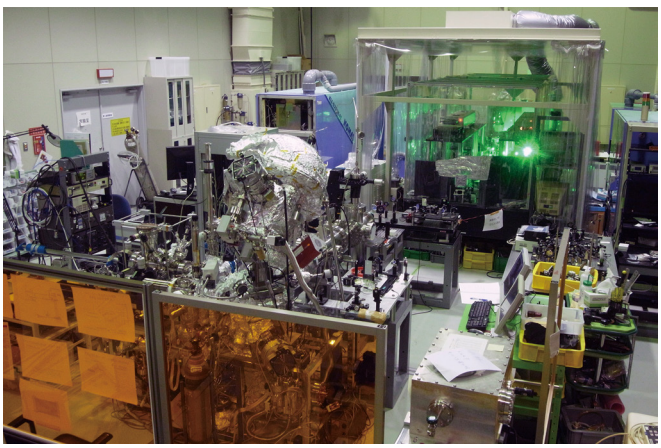


Fig. 7. Pump-probed photoemission system using 60-eV laser

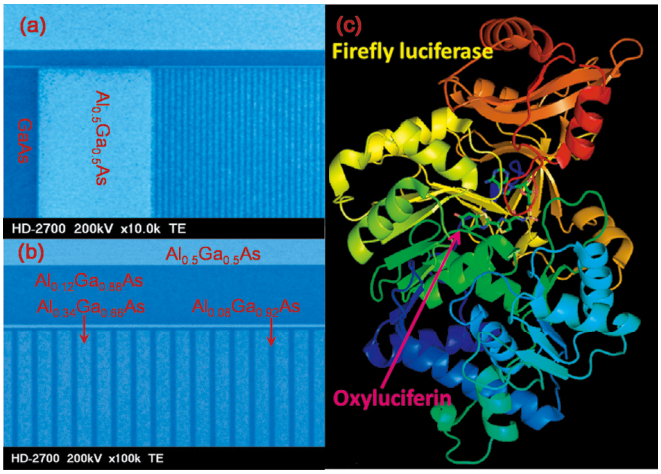


Fig. 8. Photonics devices under study: (left panel) semiconductor quantum wires and (right panel) firefly-bioluminescence system consisting of light emitter (oxyluciferin) and enzyme (luciferase)

• Coherent Photon Science Group

The coherent-photon science group has main interests in exploring a variety of coherent phenomena and non-equilibrium properties of excited states in condensed matters, in collaborations with research groups in charge of photoemission, operand-spectroscopy and extreme laser science. This group covers a wide range of materials, from semiconductors, ferromagnets, complexes and superconductors to biomaterials. Various ultrafast optics technologies such as femtosecond luminescence and pump-and-probe transmission/reflection spectroscopy are applied to studies on wavepacket dynamics, photo-induced phase transitions and carrier dynamics. Coherent control and observation of spin dynamics in magnetic materials and metamaterial structures by using high power terahertz radiation source is extensively studied. Advanced photonics devices are intensively studied, such as quantum nano-structure lasers with novel low-dimensional gain physics, low-power light-standard LEDs, very efficient multi-junction tandem solar cells for satellite use, and wonderful bio-/chemi-luminescent systems for wide bio-technology applications.

Synchrotron Radiation Laboratory

The Synchrotron Radiation Laboratory (SRL) was established in 1975 as a research division dedicated to solid state physics using synchrotron radiation (SR). Currently, SRL is composed of two research sites, the Harima branch and the E-building of the Institute for Solid State Physics.

• Brilliant soft X-ray beamline at Harima branch

In 2006, the SRL staffs have joined the Materials Research Division of the Synchrotron Radiation Research Organization (SRRO) of the University of Tokyo and they have played an essential role in constructing a new high brilliant soft X-ray beamline, BL07LSU, in SPring-8. The light source is the polarization-controlled 25-m long soft X-ray undulator with electromagnetic phase shifters that allow fast switching of the circularly (left, right) and linearly (vertical, horizontal) polarized photons.

The monochromator is equipped with a varied line-spacing plain grating, which covers the photon energy range from 250 eV to 2 keV. At the downstream of the beamline, a lot of experimental stations have been developed for frontier spectroscopy researches: five endstations, i.e. time-resolved soft X-ray spectroscopy (TR-SX) equipped with a two-dimensional angle-resolved time-of-flight (ARTOF) analyzer (Fig. 1), three-dimensional (3D) nano-ESCA station equipped with the Scienta R-3000 analyzer (Fig. 2), high resolution soft X-ray emission spectroscopy (XES) stations (Fig. 3) are regularly maintained by the SRL staffs and open for public use, and at free-port station many novel spectroscopic tools have been developed and installed such as soft X-ray resonant magneto-optical Kerr effect (MOKE) (Fig.4) and soft X-ray diffraction (Fig. 5), ambient pressure photo-emission, two dimensional photoelectron diffraction and so on. The beamline construction was completed in 2009 and SRL established the Harima branch laboratory in SPring-8. At SPring-8 BL07LSU, each end-station has achieved high performance: the TR-SX station have established the laser-pump and SR-probe

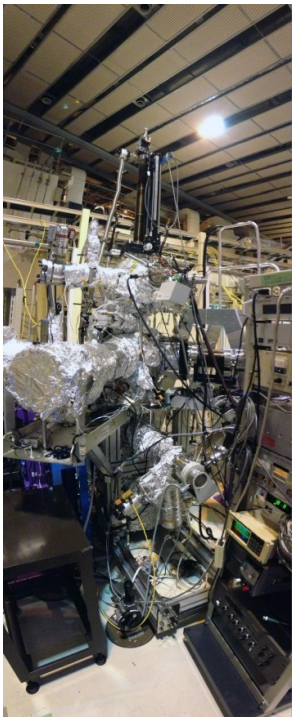


Fig. 1. TR-SX station

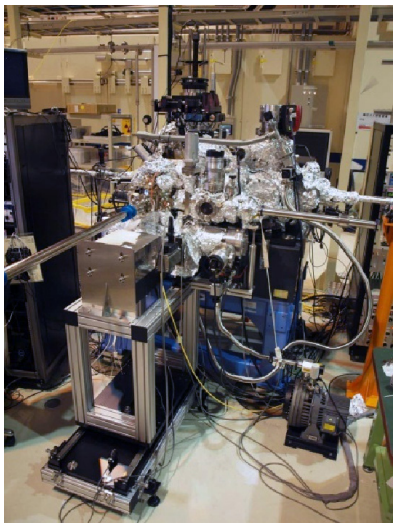


Fig. 2. 3D-nano ESCA station

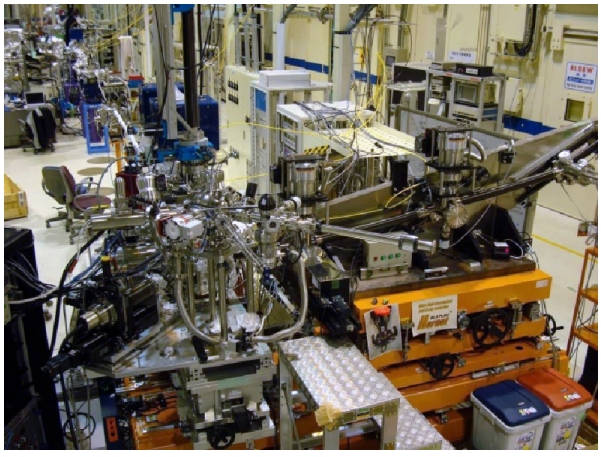


Fig. 3. Soft X-ray emission station

Fig. 4. Soft X-ray MOKE station

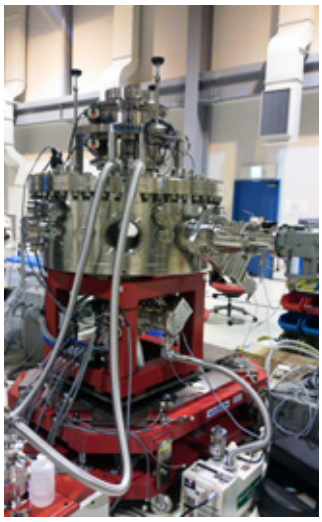


Fig. 5. Soft X-ray diffraction station

method with the time-resolution of 50 ps which corresponds to the SR pulse-width; the 3D nano-ESCA station reaches the spatial resolution of 70 nm; the XES station provides spectra with the energy resolution around 70 meV at 400 eV and will enable real ambient pressure experiments in the near future. Soft X-ray resonant MOKE station has been developed to make novel magneto-optical experiment using fast-switching of the polarization-controlled 25-m long soft X-ray undulator. The soft X-ray diffraction station has been fully constructed and the time-resolved measurement is available by using lasers at the TR-SX station. Each end-station has now been opened fully to outside users. In 2015, 176 researchers made their experiments during the SPring-8 operation time of 4805 hours.

• High-resolution Laser SARPES at E-building

Spin- and angle-resolved photoelectron spectroscopy (SARPES) is a powerful technique to investigate the spin-dependent electronic states in solids. In FY 2014, Laser and Synchrotron Research Center (LASOR) SRL constructed a new SARPES apparatus (Fig. 6), which was designed to provide high-energy and -angular resolutions and high efficiency of spin detection using a laser light instead of the synchrotron radiation in Institute for Solid State Physics. The achieved energy resolution of 1.7 meV in SARPES spectra is the highest in the world at present. From FY 2015, the new SARPES system has been opened to outside users.

The Laser-SARPES system consists of an analysis chamber, a carousel chamber connected to a load-lock chamber, and a molecular beam epitaxy chamber, which are kept ultra-high vacuum (UHV) environment and are connected each other via UHV gate valves. The electrons are excited with 6.994-eV photons, yielded by 6th harmonic of a Nd:YVO_4 quasi-continuous wave laser with repetition rate of 120 MHz. The hemispherical electron analyzer is a custom-made ScientaOmicron DA30-L, modified for installing the spin detectors. The spectrometer is equipped with two high-efficient spin detectors associating very low energy electron diffraction are orthogonally placed each other, which allows us to analyze the three-dimensional spin polarization of electrons. At the exit of the hemispherical analyzer, a multi-channel plate and a CCD camera are also installed, which enables us to perform simultaneously the angle-resolved photoelectron spectroscopy with two-dimensional (energy-momentum) detection. So far, spin-dependent band structures of more than 10 materials have been studied by 4 outside groups.

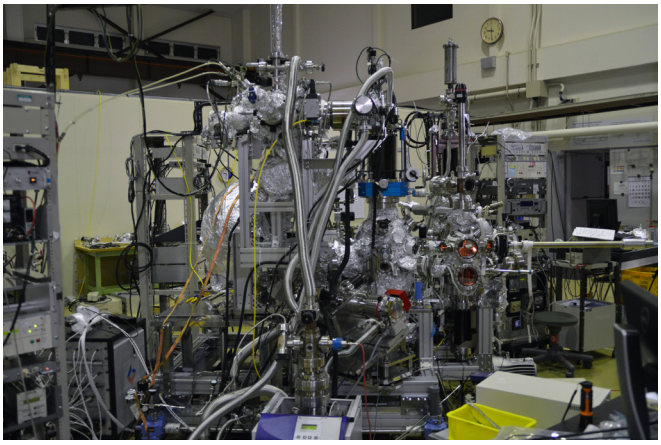


Fig. 6. Laser-SARPES system at E-building

Conferences and Workshops

International Conferences and Workshops

New Perspectives in Spintronic and Mesoscopic Physics (NPSMP2015)

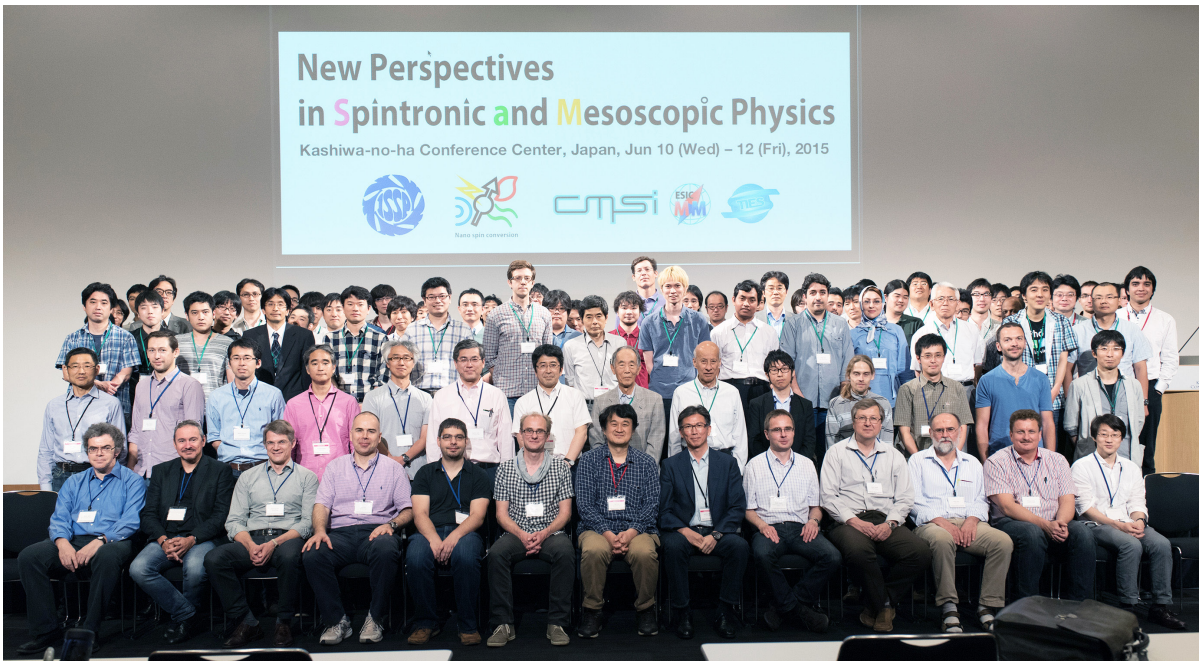
June 1 - 19, 2015
T. Kato and Y. Otani

Since 2006, the ISSP has organized an annual series of three-week workshops, with the only exception in 2011 due to the aftermath of the Tohoku earthquake. The last two in the series are "Emergent Quantum Phases in Condensed Matter – from topological to first-principles approaches" (EQPCM2013) and "New Horizon of Strongly Correlated Physics" (NHSCP2014). In 2015, the ISSP organized the ninth workshop, "New Perspectives in Spintronic and Mesoscopic Physics" (NPSMP2015), held for three weeks starting from the beginning of June.

The targets of this workshop are two important and related research areas, mesoscopic physics and spintronic physics. Recent theoretical and experimental development deepens physics of mesoscopic systems, strengthening relationship to other research areas such as nonequilibrium statistical mechanics, quantum information, many-body quantum theory, fundamental theory of quantum mechanics, and so on. On the other hand, the spintronic physics covers spin-related phenomena such as spin-dependent transport, spin injection, spin dynamics and so on. Although activity in spintronic physics is originally oriented to application, it includes important fundamental topics related to mesoscopic physics such as control and measurement of spin diffusion and spin current, physics of the Berry phase, and phenomena originated from spin-orbit interaction. The purpose of this workshop is to share recent developments in these two research fields, to discuss important future issues, and to stimulate participants' motivation toward breakthrough in the interdisciplinary research area between spintronic and mesoscopic physics. The program and presentation materials are available on the web at the URL http://www.issp.u-tokyo.ac.jp/public/npsmp2015/index.html.

Following the tradition of the series, the workshop contained the intensive three-day symposium during Jun. 10–12, and 34 oral and 53 poster presentations (the largest number so far) were made there. The remaining part was arranged into a more relaxing style providing a long discussion time, and 14 one-hour oral presentations and 15 half-a-hour oral presentations were made. This style of workshop attracted many people; the cumulative number of participants during the three weeks summed up to 649, and 320 of them attended the symposium part.

The NPSMP2015 workshop was organized by the ISSP and the Grant-in-Aid for Scientific Research on Innovative Areas "Nano Spin Conversion Science". It was also supported by Computational Materials Science Initiative (CMSI), Elements Strategy Initiative Center for Magnetic Materials (ESICMM), and Tokodai Institute for Element Strategy (TIES). The workshop organizers were Takeo Kato (Chair, ISSP), Yoshichika Otani (Chair, ISSP), Sadamichi Maekawa (ASRC, Japan Atomic Energy Agency), Gerrit E. W. Bauer (IMR, Tohoku University), Shingo Katsumoto (ISSP), Yasuhiro Tokura (University of Tsukuba), Mikio Eto (Keio University), Gen Tatara (CEMS RIKEN), and Kensuke Kobayashi (Osaka University).

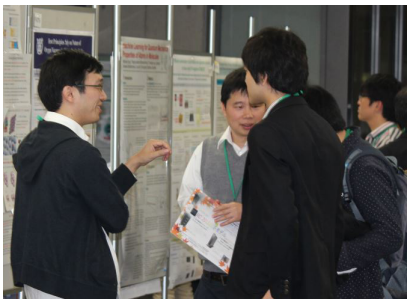


The 18th Asian Workshop on First-Principles Electronic Structure Calculations

November 9 - 11, 2015
T. Ozaki, H. Akai, Y. Tatada, and O. Sugino

First-principles electronic structure calculations have been playing an invaluable role in characterizing and understanding properties of materials and even in designing novel materials having better performance and/or exotic physical properties. The Asian workshop is an annual series starting in 1998 to provide a forum for discussing all the important issues in computational condensed matter physics and materials science. The principal purpose of the workshop is to offer an opportunity for exchanging ideas and enjoying in-depth discussion both in the methodology in computational physics and chemistry and its application to a wide variety of materials having not only fundamental significance and but also industrial importance. In this time five plenary speakers in European countries and United States of America were invited, and 18 speakers were invited from Asian countries. The discussion was focused on methodological development in first-principles methods, applications of DFT to electric devices, molecular and spin dynamics, materials informatics, and topological insulators. Prof. Hutter of Zurich University reported efficient implementations of many-body perturbation theories such as MP2 and RPA, and showed that it is now possible to accurately perform molecular dynamics simulations even for bulk systems consisting of several hundred atoms based on such many-body perturbation theories. The direction may lead to a wide variety of applications of MP2 and RPA to hydrogen bonded systems and molecular crystals in near future. Prof. Oganov of Skolkovo Institute of Science and Technology presented evolutional algorithms to investigate unknown crystal structures and its impressive applications to high pressure phases including the H_2S superconductor. Though it was considered even up to recent years that searching new crystal structures is fundamentally difficult, the series of studies that his group did clearly demonstrates that prediction of crystal structures is now feasible by combining DFT calculations and the evolutional algorithms. The prediction of crystal structures is a fundamental technology in materials informatics that many computational materials scientists have been recently involved, and thereby his talk was a good occasion for researchers in Asian area to know the impressive progress. Prof. Weng of Chinese Academy of Sciences discussed materials exploration for topological insulators based on first-principles calculations in a very concise and informative style, which is one of emerging fields. It was quite impressive to hear that a lot of novel materials proposed by his group have been already confirmed by experiments, which also demonstrates a recent progress of first-principles calculations. We also had a poster session on the second day where there were more than a hundred presentations on methodological developments and applications. The accumulated number of participants is counted 409, suggesting the workshop was successful. It was announced by the international committee members that the next workshop in 2016 will be held in Hsinchu in Taiwan.

This workshop was financially supported by Institute for Solid State Physics (ISSP), the University of Tokyo, Computational Materials Science Initiative, The Asia Pacific Center for Theoretical Physics (APCTP), Elements Strategy Initiative for Structural Materials, National Institute for Materials Science, SGI Japan, Ltd., Real Computing Inc., and X-Ability Co., Ltd. The management of the workshop was performed by the research stuffs and secretaries of the related laboratories and CMSI.



International Workshop: Topological Phenomena in Novel Quantum Matter: Laboratory Realization of Relativistic Fermions and Spin Liquids

February 29 - March 4, 2016
C. Broholm, M. Oshikawa, and A. Rosch

Topology is a field of mathematics which classifies properties of mathematical structures which are robust under deformations. This field has recently emerged as a powerful paradigm to discover, classify, and investigate quantum properties of materials. The international workshop exploring the forefront of this exciting field was held at and sponsored by Max-Planck Institute for Physics of Complex Systems in Dresden, Germany, co-sponsored by TOPONET program of ISSP and by the profile area "Quantum Matter and Materials" of the University of Cologne.

The workshop, which was attended by 90 participants, has focused on two classes of such topological quantum materials. First, in Dirac matter topological properties are often intrinsically linked to the relativistic Dirac equation. Second in spin systems geometry and spin-orbit coupling can suppress magnetic ordering and give rise to novel topological spin liquid states. The workshop brought together experimental and theoretical physicists working in the two fields. It gave an overview on the tremendous scientific development especially in the last few years in the two fields.

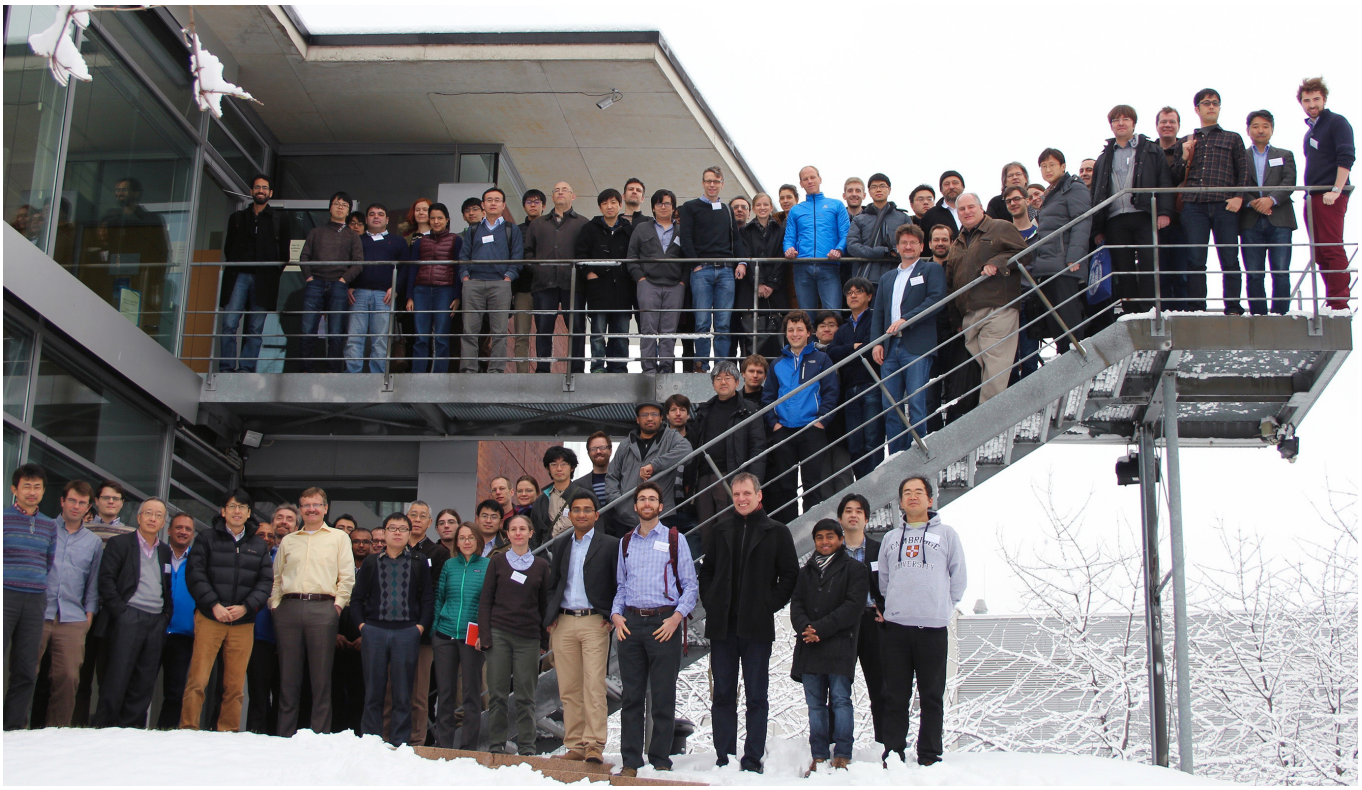
The experimental and theoretical investigation of new topological quantum materials, such as topological insulators, topological superconductors, and magnetic materials with strong spin-orbit interactions and frustration, was central to many key contributions to the workshop. The classification of interacting topological states and routes towards their realization were also a major theme. Applications of concepts from solid state physics to quantum optics experiments were also discussed.

The latest development on magnetic skyrmion materials including their controlled creation and destruction by electric fields, the quest for experimental signature of Majorana fermions in spin liquids, the observation of the topologically quantized electromagnetic response of topological insulators, magnetic quantum oscillations without Fermi surfaces, and anomalous magnetotransport were presented in inspiring talks.

Overall, the workshop was characterized by lively and intensive discussions until late in the night. In particular the poster sessions offered a wealth of fresh experimental results and theoretical insights and highlighted the passion of young scientists for the field. A brainstorming session on the most important future research directions in topological quantum matter showed that this field is still at its infancy. Interacting topological states, experiments probing projective symmetries, strange metals and the experimental realization of emergent gauge fields were only some of the research areas where the participants expect major advances in the near future.







ISSP Series Workshop on Synergetic Science for Functional Material Systems: (2) Soft Dynamics

April 2 - 3, 2015

O. Yamamuro, H. Mori, J. Yoshinobu, F. Komori, M. Shibayama, T. Suemoto, H. Akiyama, O. Sugino, H. Noguchi, Y. Harada, I. Matsuda, and M. Lippmaa

This workshop is the second one among the series workshops on synergetic science for functional material systems, which were proposed and organized by the 12 members of ISSP working group for a future plan on a new research group of interdisciplinary area. The workshop was not on usual soft matter science, but focusing on the dynamics and related functionality characteristic of the soft materials listed below. We organized presentations including 18 invited talks and 26 contributed posters.

The topics of this workshop were (1) non-equilibrium dynamics and autonomic motor systems which are recently remarked in statistical physics, (2) dynamics of proteins and DNA which has been a central research subject in biophysics, (3) dynamics on surfaces and interfaces, (4) functional solids and polymers, and (5) dynamics of liquids, mesophases and membranes. These spread across a wide research area.

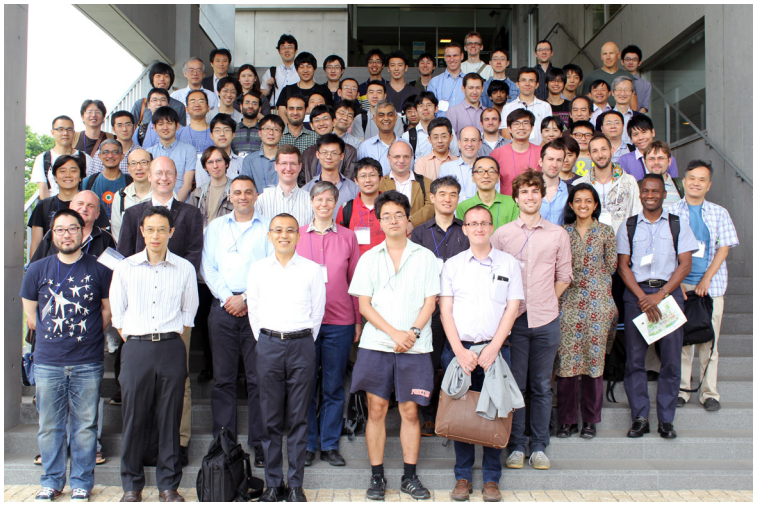
We had 80 and 74 attendances for the first and second days, respectively, including many young researchers and people from other universities and institutes. There was very active and fruitful discussion even though the subjects of the workshop are not common in ISSP. This may show a high demand for a new research area in ISSP.

International Workshop on Condensed Matter Physics & AdS/CFT

May 25 - 29, 2015

R. Meyer (Kavli IPMU), S.Nakamura, H. Ooguri, M. Oshikawa, M. Yamazaki, and H. Zhang

In 1997, a new duality between quantum field theories and gravity called the "gauge/string duality" (AdS/CFT correspondence) originated from string theory. Recently, this duality is also applied to strongly correlated states of condensed matter such as the electronic states in high-Tc superconductors. This subject attracts the interest of string theorists, condensed matter physicists and the gravitational community. The goal of this joint workshop with Kavli IPMU was to bring together key members from these three communities to foster exchange in this direction and ignite further collaboration.



The program of the workshop consisted of 20 hour-long talks by internationally recognized experts, who gave excellent overviews over their respective topics and at the same time presented cutting-edge research. In total 122 participants (80 from Japan) attended the workshop. 33 researchers from Japan and abroad used the opportunity to present their work in the gong show and poster presentation. The workshop focused on three topics: (1) AdS/CFT, non-Fermi liquid phenomenology and high temperature superconductivity, (2) non-equilibrium physics and AdS/CFT, and (3) topological states of matter and entanglement entropy.

This workshop, supported by Kavli IPMU, ISSP, and EU HoloGrav network, was unique in bringing together condensed matter physicists and string theorists nearly in a half-half ratio, which made it very successful.

New Perspectives in Spintronic and Mesoscopic Physics (NPSMP2015)

June 10 - 12, 2015

T. Kato and Y. Otani

This ISSP workshop was held as the symposium part of the international workshop of the same title. See the section of "International Conferences and Workshops".

ISSP Workshop: Basic Science for Supporting Materials Developments

June 10, 2015

M. Takigawa, H. Mori, O. Sugino, Y. Harada, and F. Komori

For society, industry, and economy of Japan, it is essential to develop useful and superior materials. Therefore, it is wished that the results of basic scientific research are effectively utilized for industrial applications for society and economy. In the problems that industry really faces, there are a lot of the research subjects that are essential for the development of the basic science. The workshop was held from viewpoints how the basic science contributes to the solution to industrial problems, and how the material scientists examine the scientific significance in them. Nine lectures on these subjects were delivered in the workshop, and there was fruitful discussion among 98 participants. The workshop provided an opportunity to remind a sentence in the prospectus of Institute for Solid State Physics; a general and systematic study of solid state physics raises the research standard of our country and contributes to development of the industrial engineering. It is not easy to find a conclusive answer to the question how to promote the basic science to support materials developments under the present severe financial and economic conditions. Importance of the continuous examinations and discussion on this subject is recognized again from the wide viewpoints such as this workshop was realized.

ISSP Series Workshop on Synergetic Science for Functional Material Systems: (3) Reaction and Transport

June 24 - 26, 2015

J. Yoshinobu, H. Mori, F. Komori, M. Shibayama, T. Suemoto, O. Yamamuro, H. Akiyama, O. Sugino, H. Noguchi, Y. Harada, I. Matsuda, and M. Lippmaa

This workshop focusing on “Reaction and Transport” in inhomogeneous systems is the third one among the series workshops on synergetic science for functional material systems, which were proposed and organized by the 12 members of ISSP working group for a future plan on a new research group of interdisciplinary area. In this workshop, we organized presentations including 29 invited talks and 40 contributed posters.

The topics of this workshop consists of (1) reaction and transport phenomena at surface and interface, such as catalysis, photocatalysis, thin film growth etc. (2) charge dynamics in bulk and at interface (3) transport of atoms and ions such as hydrogen and proton in various materials and electrochemistry, and (4) reaction and transport in the systems from single molecule to more complex bio-molecules.

We had 76, 85 and 50 attendances for the first, second and third days, respectively, including young researchers and students from other universities and institutes. At the last session on 26 June, the present activities and the future plan of ISSP for functional materials were presented, and we discussed on this issue and exchanged opinions between the organizers and participants very actively.

ISSP Workshop on Glass Transition and Related Science

July 30 - August 1, 2015

O. Yamamuro, T. Odagaki, H. Tanaka, K. Miyazaki, K. Fukao, R. Nozaki, Y. Saruyama, and N. Yamamuro

This is the largest domestic workshop on the glass transition which has been held every 2 – 4 years since 2002. The glass transition is a mysterious phenomenon that a liquid is solidified without any structural change and its mechanism has not been clarified yet. In the physical properties of glasses, there are also many unsolved problems (e.g., boson peaks) originating from its non-periodic and disordered structure. Other than the works on the glass itself, there are many interesting phenomena related to the glass transition such as spin glass transition, jamming transition of granular materials, dynamical transition in proteins, etc. It is meaningful to assemble both experimental and theoretical researchers of the areas mentioned above to exchange current information and make discussion for future researches. We organized 32 oral and 41 poster presentations.

The topics of this workshop were (1) structures and entropy of glasses, (2) theories and computer simulations on glasses and supercooled liquids, (3) glass transitions in polymer systems, (4) polyamorphism and liquid-liquid transitions, (5) dielectric spectroscopy for glasses and liquids, (6) glass transition and shear thickening, (7) glass transition and jamming transition, (8) glass transition and phase transition in solid state physics, and (9) glassy dynamics of soft matters and biological systems.

We had 95, 95 and 73 attendances for the first, second and third days, respectively, including many young researchers and people from outside of ISSP. There was very active and fruitful discussion throughout the workshop.

Frontier of Physics on the Spin Systems

November 16 - 18, 2015

M. Oshikawa, N. Kawashima, K. Kindo, M. Takigawa, H. Tsunetsugu, M. Tokunaga, S. Nakatsuji, Z. Hiro, H. Kawamura, H. Tanaka, H. Nojiri, M. Hagiwara, H. Kaneyasu, and T. Sakai

The physics of spin systems has been investigated very extensively. Even in the 21st century many new phenomena have been experimentally discovered, as well as many new theoretical concepts, in this field. At the present workshop we focused on the following new phenomena; the quantum spin liquid, the quantum spin ice, the Bose-Einstein condensation of magnons, the spin nematic phase, the chiral order, the Skirmion, the Z_2 vortex, etc. More than 100 people attended the workshop and very fruitful discussions were performed there. Particularly, young scientists' presentations and comments were encouraged. One of important purposes is to encourage communications between the experimentalists and the theoreticians, as well as between the expertized and young scientists. We hope that the discussion at this workshop would lead to creations of some new concepts, trends, or breakthroughs in this field in the near future.

New Aspects of Excitonic Phases in Low-Dimensional Electronic Systems

November 26 - 28, 2015
T. Mizokawa, H. Fukuyama, H. Takagi, Y. Ohta, H. Sawa, Y. Uwatoko, H. Okamura, H. Yaguchi, and M. Tokunaga

Some semimetals or small-gap semiconductors may exhibit a phase transition to excitonic insulator that is characterized by condensation of electron-hole pairs and can be described in BCS or BEC manners. Although the excitonic phase was theoretically predicted almost half a century ago, solid experimental evidence of the excitonic phase was not established until recently due to limitation of candidate materials. Very recently, possibility of excitonic phases has been examined in new excitonic insulator candidates such as $TiSe_2$, Ta_2NiSe_5, and graphite. In addition, the concept of the excitonic phase would be extended to describe charge fluctuations in various strongly correlated materials including cuprates, Fe pnictide/chalcogenide, organic conductors, and heavy Fermion systems. In order to discuss the new aspects of the excitonic phase and its future prospects, the present workshop was held at ISSP from November 26 to 28, 2015. In addition to the exciting results on the new excitonic insulator candidates, fundamental relationship between the excitonic phase and the spin/charge/orbital fluctuations in various strongly correlated systems has been reported and discussed by the speakers and the audiences during the workshop.

Research Frontier of Quantum Matter

December 8 - 9, 2015
T. Arima, K. Ishida, N. Nagaosa, K. Miyake, M. Oshikawa, S. Nakatsuji, and Z. Hiroi

In the past decade, large-scale research facilities have become increasingly important for the Institute's mission, and the three centers have been built: the LASOR laboratory houses unique laser and spectroscopy facilities, the IMGSL provides magnetic fields of record strength, and a supercomputer center (SCC-ISSP) operated by the MDCL provides computational resources. Each of these facilities provides a platform for in-house research and also serves a sizable outside user community. In the next step, the ISSP expects an organizational reform of small science groups so as to stimulate interdisciplinary cooperation within ISSP. To accelerate this, the ISSP has a strategic plan that generates two new cross-divisional research groups; "quantum materials" and "functional materials" groups. The former will focus on topological quantum phases in correlated-electron materials, while the latter aims to conduct fundamental research on materials with significant functional properties in areas of immediate societal needs.

This ISSP workshop was planned to give a chance to discuss on the direction and future prospect of the quantum materials group both from inside and outside of the ISSP. Four review and fourteen presentations were given both from theory and experimental sides. 79 (25 from inside) and 86 (38) people attended the workshop in the first and second days, respectively. In addition, lively discussion was carried out among participants from various communities and from different points of view, which made the workshop very successful.

Meeting of Quantum Turbulence and Classical Turbulence

January 5 - 7, 2016

M. Tsubota, T. Gotoh, K. A. Takeuchi, Y. Tsuji, Y. Fukumoto, H. Yano, and M. Yamashita

Quantum turbulence (QT) has been studied in the field of low temperature physics. Quantum turbulence refers to turbulence appearing in quantum condensed systems like superfluid helium and atomic Bose-Einstein condensates etc., typically consisting of quantized vortices and giving a prototype of turbulence. On the other hand, classical turbulence (CT) has a long research history, studied in the field of fluid mechanics. However, there has been little scientific communication between the scientists of quantum turbulence and those of classical turbulence. This workshop organized for the first time the scientific collaboration between two different communities. There were 135 cumulative participants over three days, attending 28 oral and 7 poster presentations and lively discussions. Starting with review talks in both fields, the novel original works were reported. In the afternoon of the last day, a free discussion session "What can QT learn from CT and what can CT learn from QT?" was held. Very active discussions were performed about the basic themes such as definition of turbulence.

ISSP Workshop: Status of SPring-8 BL07LSU -Integration of X-Ray Spectroscopy and Diffraction

March 1, 2016

H. Wadati, S. Shin, F. Komori, I. Matsuda, and Y. Harada

Synchrotron radiation laboratory has a Harima branch to maintain and develop a high-brilliance soft X-ray beamline BL07LSU at SPring-8. There we are performing time-resolved, spatial-resolved and energy-resolved soft X-ray spectroscopy to study electronic states and their dynamics of new materials. In this workshop, recent research activities at our beamline were reported and we discussed our new experimental techniques which integrate x-ray spectroscopy and diffraction. The speakers talked about their recent results from each end station (time-resolved spectroscopy, 3D nano-ESCA, emission spectroscopy, and so on). There were two invited talks; one is about synthesizing novel superconductors and the advantage of using synchrotron x-rays for finding new materials, and the other is about coherent x-ray scattering using synchrotron x-rays and x-ray free electron lasers. There were a lot of discussions for each talk, and we successfully

started to obtain a clear vision about our future experimental techniques combining x-ray spectroscopy and diffraction. We also encouraged the young generation in this research field by awarding the best poster prize to one graduate student.

ISSP Workshop: π-Electron and Hydrogen Coupled Functional Properties in Molecular Materials

March 29, 2016
H. Mori and M. Yamashita

This workshop was intended to deepen the understanding and to make discussions on "π-electron-hydrogen coupled functional properties in molecular materials". Recently, "π-electronic properties" and "hydrogen-related properties" have been coupled towards novel "π-electron and hydrogen coupled functional properties" by the development of the coupled system, a series of catechol-fused tetrathiafulvalene (TTF), in ISSP. In collaboration of chemists and physicists, several coupled functional properties have been unveiled: "the metallic state of purely organic single-unit crystal of κ-H_3(Cat-EDT-ST)$_2$", "the quantum spin liquid state of κ-H_3(Cat-EDT-TTF)$_2$", and "electronic switching induced by deuterium and charge transfer of κ-D_3(Cat-EDT-TTF)$_2$ and κ-D_3(Cat-EDT-ST)$_2$". However, the mechanism of the novel "hydrogen-π-electron coupled functional properties" is still non-trivial and the future prospects are open question.

The workshop consisted of two parts, experiment and theory sessions. The 10 experts and a graduate student gave 30 min talks. The first talk was given by Dr. A. Ueda (ISSP) on the development π-electron-hydrogen coupled organic conductors based upon Cat-TTFs. This talk was followed by Dr. T. Isono (NIMS) on the quantum spin liquid state observed by torque and magnetic susceptibility measurements of the π-electron-hydrogen coupled organic magnet. In the afternoon session, Prof. T. Itoh (Tokyo Science University) gave a talk on the quantum spin liquid and charge-ordered states of Cat-TTF system observed by ^{13}C-NMR and ^{1}H-NMR. Continuously, the quantum paraelectric state by dielectric measurement and thermochromism by optical measurement of κ-H_3(Cat-EDT-TTF)$_2$ was given a talk by Dr. K. Hashimoto (IMR, Tohoku Univ.). Dr. S. Yamashita (Osaka Univ.) gave a talk on the ground states for the gapless quantum spin liquid state of κ-H_3(Cat-EDT-TTF)$_2$ and non-magnetic state of κ-D_3(Cat-EDT-TTF)$_2$ by heat capacity measurements. The peculiar anisotropic thermal conductivity of κ-H_3(Cat-EDT-TTF)$_2$ was given by Dr. M. Shimozawa (ISSP). Then, Prof. H. Okamoto introduced the responses by Tera-hertz electric field for molecular conductors.

In the last session, the theoretical aspects of "π-electron-hydrogen coupled functional properties" were introduced and discussed. Dr. A. Naka (Tohoku Univ.) gave a talk on charge excitation and optical spectra of π-electron-hydrogen coupled model. Then, Mr. R. Yamamoto (Yokohama city Univ.) introduced the theoretical study of large H/D isotope effect by multi-component DFT method. This talk was followed by Dr. T. Tsumuraya (NIMS) on the first-principal calculation of κ-H_3/D_3(Cat-EDT-TTF)$_2$. Finally, Dr. H. Watanabe (Riken) gave a talk on covering weak to strong π-electron-hydrogen coupling region with Variational Monte Carlo (VMC) method.

Although this workshop was organized in the end of academic year, 32 participants joined and made active discussion on the current topics and future issues to be address for shedding light on the novel "π-electron-hydrogen coupled functional properties" in the course of workshop. The program is available on the web at the URL: http://hmori.issp.u-tokyo.ac.jp/pdf/program_201603_ISSPWS.pdf

Subjects of Joint Research

平成 27 年度　共同利用課題一覧（前期）/ Joint Research List (2015 First Term)

嘱託研究員 / Commission Researcher

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：森　初果							
1	プロトンと電子が相関する分子性導体の量子化学計算	立川　仁典	横浜市立大学	大学院生命ナノシステム科学研究科	Quantum chemical calculation of proton-electron correlated molecular conductors	Masanori Tachikawa	Yokohama City University
2	常圧で金属状態を示す純有機単一成分導体の開発	御崎　洋二	愛媛大学	大学院理工学研究科	Development of purely organic single-component molecular metals under ambient pressure	Youji Misaki	Ehime University
3	純有機単一成分超伝導体の開発	白旗　崇	愛媛大学	大学院理工学研究科	Development of purely organic single-component molecular superconductors	Kenta Kimura	Ehime University
4	機能性生体系物質の開発	東　雅代	名古屋工業大学	しくみ領域	Development of functional biomaterials	Masayo Azuma	Nagoya Institute of Technology
担当所員：中辻　知							
5	X 線回析実験による非クラマース状態における幾何学的フラストレーションの研究	澤　博	名古屋大学	大学院工学研究科	X-ray diffraction study of geometrical frustration study of non-Kramers state	Hiroshi Sawa	Nagoya University
6	価数異常に伴う量子臨界スケーリングの研究	三宅　和正	豊田理化学研究所		Theoretical study on quantum critical scaling associated with valence instability	Kazumasa Miyake	Toyota Physical and Chemical Research Institute
7	フラストレート磁性体における量子物性の探究	木村　健太	大阪大学	大学院基礎工学研究科	The search for quantum state in frustrated magnets	Kenta Kimura	Osaka University
8	極低温磁化装置の開発と磁気測定	柄木　良友	琉球大学	教育学部	Development of low temperature magnetic measurements	Yoshitomo Karaki	University of the Ryukyus
9	価数揺動重い電子系イッテルビウム化合物における量子臨界現象の解明	久我　健太郎	大阪大学	大学院理学研究科	Investigation of quantum critical phenomena in valence fluctuating and heavy fermion Yb-based compound	Kentarou Kuga	Osaka University

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：大谷　義近							
10	2 次元原子層を利用したスピン流回路の創製	新見　康洋	大阪大学	大学院理学研究科	Creation of spin current circuits using two-dimensional atomic layers	Yasuhiro Niimi	Osaka University
担当所員：吉信　淳							
11	合金表面における二酸化炭素の水素化に関する研究	森川　良忠	大阪大学	大学院工学研究科	Study on catalytic hydrogenation of CO_2 on alloy surfaces	Yoshitada Morikawa	Osaka University
12	金属表面に吸着した生体関連分子の高分解能電子エネルギー損失分光による研究	米田　忠弘	東北大学	多元物質科学研究所	A HREELS study of biomolecules on metal surfaces	Tadahiro Komeda	Tohoku University
13	酸化物半導体光触媒における水分子の吸着と反応の研究	松本　吉泰	京都大学	大学院理学研究科	Study of water adsorption and splitting reaction on oxide semiconductor catalysts	Yoshiyasu Matsumoto	Kyoto University
14	エピタキシャルグラフェンの化学修飾と表面分光による評価	Md. Zakir Hossain	群馬大学	大学院理工学府	Chemical modification of epitaxial graphene and its spectroscopic characterization	Md. Zakir Hossain	Gunma University
担当所員：上床　美也							
15	有機伝導体の圧力効果	村田　惠三	大阪経済法科大学	21 世紀社会総合研究センター	Effect of pressure on the organic conductor	Keizo　Murata	Osaka University of Economics and Law
16	多重極限関連圧力装置の調整	高橋　博樹	日本大学	文理学部	Adjustment of cubic anvil apparatus	Hiroki Takahashi	Nihon University
17	希土類化合物の単結晶試料評価とその圧力効果	藤原　哲也	山口大学	大学院理工学研究科	Effect of pressure on the Ce compounds	Tetsuya Fujiwara	Yamaguchi University
18	希土類 122 化合物における圧力効果	繁岡　透	山口大学	大学院理工学研究科	Pressure effect of rare earth 122 compounds	Toru Shigeoka	Yamaguchi University
19	磁性体の圧力効果	巨海　玄道	久留米工業大学		Effect of pressure on the magnetic materials	Gendo Oomi	Kurume Institute of Technology
20	圧力下 NMR 測定法に関する開発	藤原　直樹	京都大学	大学院人間・環境学研究科	Development of NMR measurement method under high pressure	Naoki Fujiwara	Kyoto University
21	低温用マルチアンビル装置の開発	辺土　正人	琉球大学	理学部	Development of multi-anvil apparatus for low temperature	Masato Hedo	University of the Ryukyus
22	中性子回析に用いる圧力装置の開発	片野　進	埼玉大学	大学院理工学研究科	Developments of high pressure cell for neutron diffraction	Susumu Katano	Saitama University
23	擬一次元有機物質の圧力下物性研究	糸井　充穂	日本大学	医学部	Study on pressure induced superconductivity of quasi organic conductor	Miho Itoi	Nihon University

No.	課題名	氏名	所属		Title	Name	Organization
24	高圧下の比熱測定装置の開発	梅原　出	横浜国立大学	工学部	Development of apparatus for specific heat measurements under high pressure	Izuru Umehara	Yokohama National University
25	磁化測定装置の開発	名嘉　節	物質・材料研究機構		Development of the magnetometer	Takashi Naka	NIMS
26	AgPdCu 合金圧力セルを用いた磁場中比熱測定	河江　達也	九州大学	大学院工学府	Development of pressure cell for specific heat measurements under magnetic field	Tastuya Kawae	Kyushu University
27	3d 遷移金属化合物の圧力下における磁気特性	鹿又　武	東北学院大学	工学総合研究所	Investigation of magnetic properties for 3d transition intermetallic compounds under pressure	Takeshi Kanomata	Tohoku Gakuin University
28	希釈冷凍機温度で使用可能な 10GPa 級超高圧発生装置の開発	松林　和幸	電気通信大学	大学院情報理工学研究科	Development of 10 Gpa class high pressure apparatus for low temperature	Kazuyuki Matsubayashi	The University of Electro-Communications
担当所員：野口　博司							
29	高並列汎用量子格子模型ソルバー・パッケージの整備・公開	山地　洋平	東京大学	大学院工学系研究科	Development of open source program package of massively parallel solver for quantum lattice models	Youhei Yamaji	The University of Tokyo
30	〃	三澤　貴宏	東京大学	大学院工学系研究科	〃	Takahiro Msawa	The University of Tokyo
担当所員：柴山　充弘							
31	小型集束型小角散乱装置の高性能化及びそれによる応用研究	古坂　道弘	北海道大学	大学院工学研究院	Development of a compact focusing small-angle neutron scattering instrument and application research using the instrument	Michihiro Furusaka	Hokkaido University
32	中性子散乱装置の共同利用・開発による強相関電子系物質の構造物性の研究	岩佐　和晃	東北大学	大学院理学研究科	Structural studies of strongly correlated electron systems by usage of neutron scattering and instrumental developments	Kazuaki Iwasa	Tohoku University
33	湾曲大型２次元中性子検出器と低温振動写真撮影装置の開発	木村　宏之	東北大学	多元物質科学研究所	Development of Large-area curved two dimensional neutron detector and Low temperature oscillating photographic device	Hiroyuki Kimura	Tohoku University
34	中性子散乱装置のアップグレードと共同利用研究の推進	藤田　全基	東北大学	金属材料研究所	Upgrading of the neutron scattering device and promotion of the research and public use	Masaki Fujita	Tohoku University
35	中性子散乱装置のアップグレード後の研究計画の実施と共同利用の推進	田畑　吉計	京都大学	大学院工学研究科	Progress of the joint research by using the neutron scattering instruments	Yoshikazu Tabata	Kyoto University
36	中性子散乱装置のアップグレード後の研究計画の実施と共同利用の推進	松村　武	広島大学	大学院先端物質科学研究科	Promotion of joint research after the upgrade of neutron scattering instruments	Takeshi Matsumura	Hiroshima University
37	J-PARC/MLF と JRR-3 共存時代に向けた３軸型中性子散乱装置の高度化	松浦　直人	総合科学研究機構		Upgrade of 3-axis neutron spectrometer for the oncoming coexistence of J-PARC/MLF and JRR-3	Masato Matsuura	CROSS
38	中性子分光器を用いた強相関電子系物質の微視的研究	桑原　慶太郎	茨城大学	大学院理工学研究科	Neutron scattering study of strongly correlated electron systems by using neutron spectrometers	Keitaro Kuwahara	Ibaraki University

No.	課題名	氏名	所属		Title	Name	Organization
39	高度化した３軸分光器を用いた共同利用の推進と物質科学研究の実施	横山　淳	茨城大学	理学部	Executing user program and study of material science with the advanced triple-axis spectrometers	Makoto Yokoyama	Ibaraki University
40	膜貫通ペプチドのフリップフロップ誘起能の評価	中野　実	富山大学	大学院医学薬学研究部	Induction of phospholipid flip-flop by transmembrane peptides	Minoru Nakano	University of Toyama
41	C1-3　ULS 極小角散乱装置 IRT	杉山　正明	京都大学	原子炉実験所	Development of micro-focusing small-angle neutron scattering spectrometer	Masaaki Sugiyama	Kyoto University
42	集光テスト用小型 SANS の開発及び冷中性子反射率計 / 干渉計のアップグレード	日野　正裕	京都大学	原子炉実験所	Development of compact focusing SANS instrument and improvement of cold neutron reflectometer and interferometer	Masahiro Hino	Kyoto University
43	集光テスト用小型 SANS の開発及び冷中性子反射率計・干渉計のアップグレード	北口　雅暁	名古屋大学	現象解析研究センター	Development of compact SANS and improvement of cold neutron reflectometer and interferometer	Masaaki Kitaguchi	Nagoya University
44	流動場でのソフトマターの構造変化に関する研究	高橋　良彰	九州大学	先導物質化学研究所	Studies on structural change of soft matter under flow field	Yoshiaki Takahashi	Kyushu University
45	三軸分光器を用いた極端条件下における物質科学研究の実施	阿曽　尚文	琉球大学	理学部	Material science studies under extreme conditions by using triple-axis spectrometers	Naofumi Aso	University of the Ryukyus
46	非干渉性中間散乱関数測定による非イオン界面活性剤ベシクルにおける腹面内拡散	川端　庸平	首都大学東京	大学院理工学研究科	Incoherent intermediate correlation function of lateral and rotational diffusion in a nonionic vesicle	Youhei Kawabata	Tokyo Metropolitan University
47	中性子散乱研究計画の実施と共同利用の推進	伊藤　晋一	高エネルギー加速器研究機構	物質構造科学研究所	Propelling the inter university research cooperation	Shinichi Itoh	KEK
48	冷中性子干渉イメージング装置開発研究	大竹　淑恵	理化学研究所	光量子工学研究領域	Research and development of interferometric imaging instruments for cold neutron	Yoshie Otake	RIKEN
49	三軸分光器の高度化およびそれを用いたスピンダイナミクス研究	佐藤　卓	東北大学	多元物質科学研究所	Improvement of triple-axis spectrometer and its application to the spin dynamics research	Taku Sato	Tohoku University
50	高度化した三軸分光器を用いた強相関電子系物質の研究	南部　雄亮	東北大学	多元物質科学研究所	Study of strongly correlated electron systems using advanced triple-axis spectrometers	Yusuke Nambu	Tohoku University
51	中性子散乱実験を用いたイオン液体系高分子溶液・ゲルの構造研究	藤井　健太	山口大学	大学院理工学研究科	Structural study of ionic liquid-based polymer system by SANS	Kenta Fujii	Yamaguchi University
52	ダイヤモンド型量子スピン鎖 $K_3Cu_3AlO_2(SO_4)_4$ のパルス強磁場中超強磁場磁化測定	満田　節生	東京理科大学	理学部	Magnetization study on S=1/2 diamond chain system $K_3Cu_3AlO_2(SO_4)_4$ in pulsed ultra-high magnetic fields	Setsuo Mitsuda	Tokyo University of Science
担当所員：金道　浩一							
53	強磁場量子ビーム科学のためのパルスマグネットの開発	鳴海　康雄	東北大学	金属材料研究所	Developments of pulse magnets for synchrotron and neutron experiments in pulsed high magnetic fields	Yasuo Narumi	Tohoku University

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：辛　埴							
54	高温超伝導体の高分解能光電子分光	藤森　淳	東京大学	大学院理学系研究科	Ultra-high resolution photoemission spectroscopy on high Tc superconductor	Atsushi Fujimori	The University of Tokyo
55	60-eV レーザーを用いた時間分解光電子分光の開発	石坂　香子	東京大学	大学院工学系研究科	The development of time-resolved photoemission using 60eV laser	Kyoko Ishizaka	The University of Tokyo
56	鉄系超伝導体のレーザー光電子分光	下志万　貴博	東京大学	大学院工学系研究科	Laser-ARPES on Fe superconductor	Takahiro Shimojima	The University of Tokyo
57	Bi 系超伝導体の角度分解光電子分光	竹内　恒博	豊田工業大学		Angle-resolved photoemission study on high Tc cuprate	Tsunehiro Takeuchi	Toyota Technological Institute
58	高分解能光電子分光による強相関物質の研究	横谷　尚睦	岡山大学	大学院自然科学研究科	Ultra-high resolution study on strongly correlated materials	Takayoshi Yokoya	Okayama University
59	酸化バナジウムの高分解能光電子分光	江口　律子	岡山大学	大学院自然科学研究科	Photoemission study on vanadium oxides	Ritsuko Eguchi	Okayama University
60	有機化合物の光電子分光	金井　要	東京理科大学	理工学部	Photoemission study on organic compounds	Kaname Kanai	Tokyo University of Science
61	重い電子系ウラン化合物の高分解能光電子分光	藤森　伸一	日本原子力研究開発機構	量子ビーム応用研究センター	Ultra high resolution photoemission study on heavy fermion uranium compounds	Shinichi Fujimori	JAEA
62	レーザー光電子分光による酸化物薄膜の研究	津田　俊輔	物質・材料研究機構		Laser-photoemission study on oxide films	Shunsuke Tsuda	NIMS
63	4f 電子系物質の高分解能光電子分光	松波　雅治	自然科学研究機構	分子科学研究所	Photoemission study on 4f materials	Masaharu Matsunami	National Institutes of Natural Sciences
64	超高空間分解能光電子顕微鏡による磁区構造観察	中川　剛志	九州大学	大学院総合理工学府	Observation of magnetic domain structures by ultra-high resolution photoemission electron microscopy	Takeshi Nakagawa	Kyushu University
65	Mn 化合物の時間分解光電子分光	大川　万里生	東京理科大学	理学部	Time resolved photoemission on Mn compounds	Mario Okawa	Tokyo University of Science
66	収差補正型光電子顕微鏡の建設と利用研究	小嗣　真人	東京理科大学	基礎工学部	Construction and utilization research of aberration correction photoelectron emission microscopy	Masato Kotsugi	Tokyo University of Science
67	時間分解・マイクロビームラインの開発と研究	室　隆桂之	高輝度光科学研究センター		Development of micr- and time-resolved beamline	Takayuki Muro	JASRI
68	光電子分光法を用いた各種分子性結晶の電子状態の研究及び装置の低温化	木須　孝幸	大阪大学	大学院基礎工学研究科	Research on electron state of molecular crystals using photoemission spectroscopy	Takayuki Kisu	Osaka University
69	時間分解光電子分光を用いた VO_2 の研究と装置の高度化	吉田　力矢	北海道大学	電子科学研究所	Time-resolved photoemission study of VO_2 and upgrade of experimental apparatus	Rikiya Yoshida	Hokkaido University

No.	課題名	氏名	所属		Title	Name	Organization
70	トポロジカル絶縁体の電子状態の解明	木村　昭夫	広島大学	大学院理学研究科	Electronic-structure study of topological insulators	Akio Kimura	Hiroshima University
担当所員：松田　巌							
71	高輝度放射光軟Ｘ線を用いた時間分解光電子分光による表面ダイナミクス研究	近藤　寛	慶應義塾大学	理工学部	Study of surface dynamics by time-resolved photoemission spectroscopy with high-brilliant soft x-ray synchrotron radiation	Hiroshi Kondoh	Keio Universitt
72	軟Ｘ線アンジュレータビームラインの分光光学系の開発研究	雨宮　健太	高エネルギー加速器研究機構	物質構造科学研究所	Research and development of soft X-ray undulator beamline	Kenta Amemiya	KEK
73	光電子スピン検出器の開発・研究	奥田　太一	広島大学	放射光科学研究センター	Research and development of a new photoelectron spin detector	Taichi Okuda	Hiroshima University
74	光電子顕微鏡による磁性ナノ構造物質の磁化過程	木下　豊彦	高輝度光科学研究センター		Magnetization in process of magnetic nano structure by PEEM	Toyohiko Kinoshita	JASRI
75	高輝度軟Ｘ線を利用した強相関物質の電子状態研究	組頭　広志	高エネルギー加速器研究機構	物質構造科学研究所	Study of electronic states in strongly correlated materials with high brilliant soft-Xray.	Hiroshi Kumigashira	KEK
76	時間分解光電子分光法による光触媒材料のキャリアダイナミクス研究	小澤　健一	東京工業大学	大学院理工学研究科	Study of carrier dynamics in photocatalysis materials by time-resolved photoemission spectroscopy	Kenichi Ozawa	Tokyo Institute of Technology
77	軟Ｘ線時間分解分光実験による磁性研究	木村　昭夫	広島大学	大学院理学研究科	Study of magnetic properties by time-resolved soft X-ray spectroscopy	Akio Kimura	Hiroshima University
78	高輝度軟Ｘ線を利用する光電子顕微鏡装置の設計・開発	坂本　一之	千葉大学	大学院融合科学研究科	Research and designing of a PEEM spectrometer for high brilliance soft X ray.	Kazuyuki Sakamoto	Chiba University
79	二次元表示型スピン分解光電子エネルギー分析器の開発	大門　寛	奈良先端科学技術大学院大学	物質創成科学研究科	Development of 2D display type spin resolved photoelectron energy analyzer.	Hiroshi Daimon	Nara Institute of Science and Technology
80	時間分解光電子回析実験の要素技術開発	林　好一	東北大学	金属材料研究所	Technical development of time-resolved photoelectron diffraction experiment	Koichi Hayashi	Tohoku University
81	分子吸着系における時間分解光電子分光の研究	間瀬　一彦	高エネルギー加速器研究機構	物質構造科学研究所	Study of time-resolved photoemission spectroscopy for molecular adsorption system	Kazuhiko Mase	KEK
82	共鳴磁気光学カー効果の散乱理論研究	田口　宗孝	奈良先端科学技術大学院大学	物質創成科学研究科	Study of scattering theory for the resonant magneto-optical Kerr effect	Munetaka Taguchi	Nara Institute of Science and Technology
担当所員：原田　慈久							
83	軟Ｘ線吸収／発光分光法によるリチウムイオン電池電極材料の電子物性研究	細野　英司	産業技術総合研究所	エネルギー技術研究部門	Study on the electronic property of electrode materials for Li-ion batteries by soft X-ray absorption/emission spectroscopy	Eiji Hosono	AIST
84	軟Ｘ線吸収／発光分光法によるリチウムイオン電池電極材料の電子物性研究	朝倉　大輔	産業技術総合研究所	エネルギー技術研究部門	Study on the electronic property of electrode materials for Li-ion batteries by soft X-ray absorption/emission spectroscopy	Daisuke Asakura	AIST

No.	課題名	氏名	所属		Title	Name	Organization
85	超高分解能軟Ｘ線発光分光による水素吸蔵合金中の水素の波動関数の局在性に関する研究	関場　大一郎	筑波大学	数理物質系	Study on the localization of wave functions of hydrogen atom in hydrogen storage alloys using ultrahigh resolution soft X-ray emission spectroscopy	Daiichiro Sekiba	University of Tsukuba
86	時間分解光電子分光による重い電子系の研究	関山　明	大阪大学	大学院基礎工学研究科	Study on heavy fermion materials by time-resolved photoemissio	Akira Sekiyama	Osaka University
87	高分解能光電子分光による酸化バナジウムの研究	藤原　秀紀	大阪大学	大学院基礎工学研究科	Study on vanadium oxides by high resolution photoemission	Hidenori Fujiwara	Osaka University
88	軟Ｘ線発光・共鳴非弾性散乱分光の磁気円・線二色性測定システムの構築	菅　滋正	大阪大学	産業科学研究所	Construction of a noble system for circular and linear dichroism in soft X-ray emission and RIXS spectroscopy	Suga Shigemasa	Osaka University
89	極小角Ｘ線散乱と軟Ｘ線吸収・発光分光によるソフトマテリアルの物性研究	雨宮　慶幸	東京大学	大学院新領域創成科学研究科	Study on the physical properties of soft materials by a combination of ultra-small-angle X-ray scattering and soft X-ray absorption/emission spectroscopy	Yoshiyuki Amemiya	The University of Tokyo
90	二次元原子薄膜トランジスタの電子状態のナノ分析（Ｉ）	吹留　博一	東北大学	電気通信研究所	Nanoscale analysis of electronic states of graphene device	Hirokazu Fukidome	Tohoku University
91	省エネ・創エネ・蓄電デバイスのオペランド分光	尾嶋　正治	東京大学	放射光連携研究機構	Operando nano-spectroscopy for energy efficient, power generation and energy storage devices	Masaharu Oshima	The University of Tokyo
担当所員：和達　大樹							
92	共鳴硬・軟Ｘ線散乱による構造物性と磁性研究	村上　洋一	高エネルギー加速器研究機構	物質構造科学研究所	Studying structures and magnetism of materials by resonant hard and soft x-ray scattering	Youichi Murakami	KEK
93	三次元 nanoESCA による実デバイスのオペランド電子状態解析	永村　直佳	物質・材料研究機構		Operando analysis of the electronic structure of actual devices by 3DnanoESCA	Naoka Nagamura	NIMS
94	共鳴軟Ｘ線散乱を用いた外場下での電子秩序状態の解明	山崎　裕一	東京大学	大学院工学系研究科	Observation of electric ordered state under external field by resonant soft x-ray scattering	Yuichi Yamasaki	The University of Tokyo

一般研究員 / General Researcher

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：榊原　俊郎							
1	強相関電子系準結晶の極低温物性の研究	出口　和彦	名古屋大学	大学院理学研究科	Low temperature study of strongly correlated electron quasicrystal	Kazuhiko Deguchi	Nagoya University
2	〃	松川　周矢	名古屋大学	大学院理学研究科	〃	Shuya Matsukawa	Nagoya University
3	強相関電子系化合物の秩序相に対する結晶対称性および軌道縮退の効果	横山　淳	茨城大学	理学部	Effects of crystal symmetry and orbital degeneracy in ordered states of strongly correlated electron systems	Makoto Yokoyama	Ibaraki University

No.	課題名	氏名	所属		Title	Name	Organization
4	〃	大高　凌	茨城大学	理学部	〃	Ryo Otaka	Ibaraki University
5	超伝導対称性決定のための実験的、理論的研究	町田　一成	岡山大学	大学院自然科学研究科	Theoretical and experimental studies on determination of pairing symmetry in superconductors	Kazunari Machida	Osaka University
6	量子スピンアイス系 $Yb_2Ti_2O_7$ の特異な磁気相転移	安井　幸夫	明治大学	理工学部	Anomalous magnetic transition of quantum spin Ice system $Yb_2Ti_2O_7$	Yukio Yasui	Meiji University
7	CuO_2 リボン鎖系 $(Rb_{1-x}Cs_x)_2Cu_2Mo_3O_{12}$ の磁気的挙動	安井　幸夫	明治大学	理工学部	Magnetic behavior of CuO_2 ribbon chain system $(Rb_{1-x}Cs_x)_2Cu_2Mo_3O_{12}$	Yukio Yasui	Meiji University
8	単結晶 $YbNi_2Si_2$ の極低温磁化比熱測定	松本　裕司	名古屋工業大学	大学院工学研究科	Magnetization and specific heat measurements for single crystal $YbNi_2Si_2$ at low temperature	Yuji Matsumoto	Nagoya Institute of Technology
9	六方晶 $Tm_2Pt_6Ga_{15}$ 及び $Er_2Pt_6Ga_{15}$ の極低温磁化及び比熱測定	大原　繁男	名古屋工業大学	大学院工学研究科	Magnetization and specific heat measurements for hexagonal $Er_2Pt_6Ga_{15}$ and $Tm_2Pt_6Ga_{15}$ at low temperature	Shigeo Ohara	Nagoya Institute of Technology
10	〃	松本　裕司	名古屋工業大学	大学院工学研究科	〃	Yuji Matsumoto	Nagoya Institute of Technology
11	〃	植田　拓也	名古屋工業大学	大学院工学研究科	〃	Takuya Ueda	Nagoya Institute of Technology
12	極低温磁化測定から検証する $Tb_{2-x}Ti_2+xO_7$ の長距離秩序の起源	高津　浩	首都大学東京	大学院理工学研究科	Investigation of the long-range order of $Tb_{2-x}Ti_2+xO_7$ by means of magnetization measurements	Hiroshi Takatsu	Tokyo Metropolitan University
13	異方的超伝導ギャップを有する $Y_5Tr_6Sn_{18}$(Tr; 遷移金属) の超伝導ギャップ構造の研究	加瀬　直樹	新潟大学	大学院自然科学研究科	Superconducting gap symmetry of anisotropic superconductor $Y_5Tr_6Sn_{18}$ (Tr; transition metal)	Kase Naoki	Niigata University
14	〃	照井　祐輔	新潟大学	工学部	〃	Yuusuke Terui	Niigata University
15	極低温磁化測定による $SmTr_2Zn_{20}$ (Tr = Rh, Ir) の磁場誘起相転移の検証	加瀬　直樹	新潟大学	大学院自然科学研究科	Study of field-induced order of $SmTr_2Zn_{20}$ (Tr = Rh, Ir) by low-temperature magnetization measurements	Naoki Kase	Niigata University
16	〃	棚橋　正貴	新潟大学	工学部	〃	Masataka Tanahashi	Niigata University
17	ルテニウム酸化物超伝導体 Sr_2RuO_4 の一軸性圧力下における比熱測定	矢口　宏	東京理科大学	理工学部	Specific-heat measurements of the ruthenate superconductor Sr_2RuO_4 under uniaxial pressure	Hiroshi Yaguchi	Tokyo University of Science
18	〃	山崎　照夫	東京理科大学	理工学部	〃	Teruo Yamazaki	Tokyo University of Science
19	高圧合成法による新規パイロクロア型遷移金属化合物の探索	有馬　孝尚	東京大学	大学院新領域創成科学研究科	Exploration of new transition metal compounds of pyrochlore structure by means of high-pressure syntheses	Takahisa Arima	The University of Tokyo
20	〃	鷲見　浩樹	東京大学	大学院新領域創成科学研究科	〃	Hiroki Sumi	The University of Tokyo

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21	フェルダジルラジカルを用いた新規電荷移動錯体の低温磁気測定	山口　博則	大阪府立大学	大学院理学系研究科	Low temperature magnetic properties of verdazyl-based charge-transfer complexes	Hironori Yamaguchi	Osaka Prefecture University
22	〃	佐々木　裕太	大阪府立大学	理学部	〃	Yuta Sasaki	Osaka Prefecture University
23	〃	岡田　将孝	大阪府立大学	理学部	〃	Masataka Okada	Osaka Prefecture University
24	強相関伝導系のパルス磁場中の超音波測定	吉澤　正人	岩手大学	大学院工学研究科	Ultrasonic measurements of strongly correlated electron systems in pulsed magnetic field	Masahito Yoshizawa	Iwate University
25	〃	納口　昇也	岩手大学	大学院工学研究科	〃	Syoya Noguchi	Iwate University
26	高圧合成法による新規パイロクロア型遷移金属化合物の探索	徳永　祐介	東京大学	大学院新領域創成科学研究科	Exploration of new transition metal compounds of pyrochlore structure by means of high-pressure syntheses	Yusuke Tokunaga	The University of Tokyo
担当所員：瀧川　仁							
27	有機一次元三角格子モット絶縁体における磁場誘起相転移の探索	清水　康弘	名古屋大学	大学院理学研究科	Magnetic field induced transition in an organic Mott insulator with one-dimensional triangular lattice	Yasuhiro Shimizu	Nagoya University
28	〃	小野　聡大	名古屋大学	理学部	〃	Akihiro Ono	Nagoya University
担当所員：中辻　知							
29	Ce および Yb 化合物における磁場中ミリケルビン領域での物性測定	海老原　孝雄	静岡大学	大学院理学研究科	Low temperature physical properties at magnetic fields in Yb and Ce compounds	Takao Ebihara	Shizuoka University
担当所員：リップマー　ミック							
30	太陽電池用シリコン還元プロセスにおけるフラックス効果の評価	伊高　健治	弘前大学	北日本新エネルギー研究所	Analysis of the flux-effect under the direct reduction process for solar grade silicon	Itaka Kenji	Hirosaki University
31	新規ウルツァイト型四面体強誘電体材料の創成	安井　伸太郎	東京工業大学	応用セラミックス研究所	The creation of novel wurtzite-type tetrahedral ferroelectric materials	Shintaro Yasui	Tokyo Institute of Technology
32	遷移金属酸化物界面ヘテロ界面金属層の起源の解明	李　美希	奈良先端科学技術大学院大学	物質創成科学研究科	Origin of metallic conductivity at transition metal oxides interface	Mihee Lee	Nara Institute of Science and Technology
担当所員：吉信　淳							
33	水の光分解触媒物質 $BiVO_4$ 及び $La_5Ti_2CuS_5O_7$ の構造と物性の研究	山田　太郎	東京大学	大学院工学系研究科	Studies on the structure and physical properties of $BiVO_4$ and $La_5Ti_2CuS_5O_7$ - photoactive materials for water splitting catalysis	Taro Yamada	The University of Tokyo

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34	Si(001) 表面上の準安定物理吸着過程の透過 FTIR 測定	大野　真也	横浜国立大学	大学院工学研究院	FTIR measurements of metastable physisorption processes on Si(001)	Shinya Ohno	Yokohama National University
35	〃	清水　正太郎	横浜国立大学	理工学部	〃	Shotaro Shimizu	Yokohama National University
36	STM による Ag(110) 上の二次元 TiO_2 ナノシートの構造解析	枝元　一之	立教大学	理学部	STM study of the structure of two-dimensional TiO_2 nanosheets formed on Ag(110)	Kazuyuki Edamoto	Rikkyo University
37	パラジウム表面における水添触媒反応機構の解明	福谷　克之	東京大学	生産技術研究所	Elucidation of the mechanism of hydrogenation reaction on Pd surfaces	Katsuyuki Fukutani	The University of Tokyo
38	〃	ビルデ　マーカス	東京大学	生産技術研究所	〃	Markus Wilde	The University of Tokyo
39	〃	小倉　正平	東京大学	生産技術研究所	〃	Shohei Ogura	The University of Tokyo
40	〃	大野　哲	東京大学	生産技術研究所	〃	Satoshi Ohno	The University of Tokyo
41	水素終端 Si(110)-(1 × 1) 表面の初期酸化過程の研究	須藤　彰三	東北大学	大学院理学系研究科	Initial oxidation process of hydrogen-terminated Si(110)-(1 × 1) surfaces	Shozo Suto	Tohoku University
42	〃	川本　絵里奈	東北大学	大学院理学系研究科	〃	Erina Kawamoto	Tohoku University
担当所員：勝本　信吾							
43	量子ホール効果測定のための高移動度半導体試料作成	福田　昭	兵庫医科大学		Development of the high mobility semiconductor sample for the measurements in the quantum Hall regime	Akira Fukuda	Hyogo College of Medicine
44	〃	寺澤　大樹	兵庫医科大学		〃	Daiju Terasawa	Hyogo College of Medicine
担当所員：小森　文夫							
45	再放出低速陽電子による TiO_2(110) 表面および表面近傍の欠陥密度の研究	松本　益明	東京学芸大学	教育学部	Study of the surface and subsurface defect densities on TiO_2(110) by re-emitted slow positrons	Masuaki Matsumoto	Tokyo Gakugei University
46	金属／半導体表面上ナノ構造の形成とナノ構造を持つ表面における光学応答の時間分解測定	河村　紀一	日本放送協会	放送技術研究所	Time resolved spectroscopy of optical responses from nano-structures on metal / semiconductor surfaces	Norikazu Kawamura	Nippon Hoso Kyokai
47	Ag 超薄膜 /Si(111) 基板界面への水素吸蔵	中辻　寛	東京工業大学	大学院総合理工学研究科	Hydrogen absorption at the interface of Ag thin film and Si(111) substrate	Kan Nakatsuji	Tokyo Institute of Technology
48	陽電子消滅法によるボロン正二十面体クラスター固体の金属結合–共有結合転換研究	金沢　育三	東京学芸大学	教育学部	Metallic-covalent bonding conversion research in boron icosahedral cluster solids using positron annihilation	Ikuzo Kanazawa	Tokyo Gakugei University

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49	〃	今井　恵利華	東京学芸大学	大学院教育学研究科	〃	Imai Erika	Tokyo Gakugei University
50	Al-Pd-Mn 準結晶と Al-Pd-Mn-Si 近似結晶における空孔濃度の系統的な研究	金沢　育三	東京学芸大学	教育学部	Positron-annihilation studies of Al-Pd-Mn quasicrystal and Al-Pd-Mn-Si approximant crystals	Ikuzo　Kanazawa	Tokyo Gakugei University
51	〃	佐々木　友彰	東京学芸大学	大学院教育学研究科	〃	Tomoaki Sasaki	Tokyo Gakugei University
52	Si(111)-7 × 7 表面における Fe クラスターの形成と磁性に関する研究	楊　昊宇	奈良先端科学技術大学院大学	物質創成科学研究科	A Study on the formation of iron clusters and magnetism on Si(111)-7 × 7 surfaces	Yang Haoyu	Nara Institute of Science and Technology
担当所員：長谷川　幸雄							
53	二ホウ化物薄膜上エピタキシャルシリセン及びゲルマニウム層の低温走査トンネル顕微鏡観察	高村　由起子	北陸先端科学技術大学院大学	大学院マテリアルサイエンス研究科	Low temp. STM investigation of epitaxial silicene and germanium on diboride	Yukiko Takamura	Japan Advanced Institute of Science and Technology
54	〃	アントワーヌ　フロランス	北陸先端科学技術大学院大学	大学院マテリアルサイエンス研究科	〃	Antoine Fleurence	Japan Advanced Institute of Science and Technology
55	〃	フローリアン　ジャンベール	北陸先端科学技術大学院大学	大学院マテリアルサイエンス研究科	〃	Florian Gimbert	Japan Advanced Institute of Science and Technology
56	〃	トバイアス　ギル	北陸先端科学技術大学院大学	大学院マテリアルサイエンス研究科	〃	Tobias Gill	Japan Advanced Institute of Science and Technology
57	重い電子系超伝導の実空間観察のための超低温・強磁場の小型 STM の開発	河江　達也	九州大学	大学院工学研究院	Development of a miniature STM for low-temperature and high-eld measurements of heavy fermion superconductors	Tastuya Kawae	Kyushu University
58	〃	イスラム　モハメド　サイフル	九州大学	大学院工学府	〃	Md. Saiful Islam	Kyushu University
59	〃	高田　弘樹	九州大学	大学院工学府	〃	Hiroki Takata	Kyushu University
担当所員：山下　穣							
60	超流動 He-3,A1 相中のスピン流れと電場の交差相関の探索	山口　明	兵庫県立大学	大学院物質理学研究科	Study of cross-correlation between spin flow and electric field in superfluid He-3 A1	Akira Yamaguchi	The University of Hyogo
61	〃	白濱　圭也	慶應義塾大学	理工学部	〃	Keiya Shirahama	keio Universitt
62	〃	村川　智	慶應義塾大学	理工学部	〃	Satoshi Murakawa	keio Universitt
63	〃	互井　通裕	慶應義塾大学	理工学部	〃	Michihiro Tagai	keio Universitt

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担当所員：上床　美也							
64	価数揺動 Yb 系準結晶における高圧下物性研究	出口　和彦	名古屋大学	大学院理学研究科	High-pressure study on mixed-valence Yb-quasicrystal	Kazuhiko Deguchi	Nagoya University
65	〃	松川　周矢	名古屋大学	大学院理学研究科	〃	Shuya Matsukawa	Nagoya University
66	価数揺動物質の圧力下電子状態研究	井村　敬一郎	名古屋大学	大学院理学研究科	Study of electronical states in valence-uctuation materials under high-pressure	Keiichiro Imura	Nagoya University
67	〃	河出　直哉	名古屋大学	大学院理学研究科	〃	Naoya Kawade	Nagoya University
68	クラスタ化合物 $V_4S_9Br_4$ の圧力下電気抵抗測定	和氣　剛	京都大学	大学院工学研究科	Resistivity measurement on a cluster compound $V_4S_9Br_4$ under high pressure	Takeshi Waki	Kyoto University
69	結晶構造に反転対称性のない $EuTGe_3$(T: 遷移金属）の高圧下物性研究	本多　史憲	東北大学	金属材料研究所	Effect of pressure on the physical properties of $EuTGe_3$ (T: transition metal) without inversion symmetry in the crystal structure	Fuminori Honda	Tohoku University
70	〃	大貫　惇睦	琉球大学	理学部	〃	Yoshichika Onuki	University of the Ryukyus
71	Co 基ホイスラー合金における圧力誘起マルテンサイト変態に関する研究	重田　出	鹿児島大学	大学院理工学研究科	Study on pressure-induced martensitic phase transformation in Co-based Heusler alloys	Shigeta Iduru	Kagoshima University
72	〃	藤本　祐太郎	鹿児島大学	大学院理工学研究科	〃	Yutaro Fujimoto	Kagoshima University
73	有機分子性導体の高圧物性の研究	鳥塚　潔	法政大学	理工学部	Studies on high pressure properties of organic molecular conductors	Kiyoshi Torizuka	Hosei University
74	価数秩序相を持つ Eu 化合物の圧力下電気抵抗測定	光田　暁弘	九州大学	大学院理学研究院	Measurement of electrical resistivity under high pressure of Eu-based compound with valence ordering phase	Akihiro Mitsuda	Kyushu University
75	〃	甲木　義人	九州大学	大学院理学府	〃	Yoshito Katsuki	Kyushu University
76	$BaTi_2(Sb_{1-x}Bi_x)_2O$ における超伝導転移温度の圧力依存性	山本　隆文	京都大学	大学院工学研究科	Pressure dependence of superconducting temperature of $BaTi_2(Sb_{1-x}Bi_x)_2O$	Takafumi Yamamoto	Kyoto University
77	〃	小林　洋治	京都大学	大学院工学研究科	〃	Yoji Kobayashi	Kyoto University
78	〃	竹入　史隆	京都大学	大学院工学研究科	〃	Takeiri Fumitaka	Kyoto University
79	〃	村上　泰斗	京都大学	大学院工学研究科	〃	Taito Murakami	Kyoto University

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80	高圧下における Yb_4As_3 の電荷秩序−無秩序転移	中村　修	岡山理科大学	学外連携推進室	Charge order-disorder transition in Yb_4As_3 under high pressure	Osamu Nakamura	Okayama University of Science
81	新規三元化合物 $EuCuP_2$ の輸送特性	繁岡　透	山口大学	大学院理工学研究科	Transport property of the novel ternary compound $EuCuP_2$	Toru Shigeoka	Yamaguchi University
82	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
83	Ce-Zn-Ge 三元系新規化合物の合成および単結晶育成 (2)	繁岡　透	山口大学	大学院理工学研究科	Synthesis and single crystal growth of Ce-Zn-Ge novel ternary intermetallics II	Toru Shigeoka	Yamaguchi University
84	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
85	$YbMn_2Ge_2$ の高圧力下磁化測定 (2)	繁岡　透	山口大学	大学院理工学研究科	Magnetization measurements under high pressures in $YbMn_2Ge_2$ II	Toru Shigeoka	Yamaguchi University
86	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
87	重い電子系物質 $Yb_2Pt_6Al_{15}$ の高圧下電気抵抗	松本　裕司	名古屋工業大学	大学院工学研究科	Electrical resistivity measurements under high pressure for heavy fermion $Yb_2Pt_6Al_{15}$	Yuji Matsumoto	Nagoya Institute of Technology
88	〃	植田　拓也	名古屋工業大学	大学院工学研究科	〃	Takuya Ueda	Nagoya Institute of Technology
89	充填スクッテルダイト $EuFe_4As_{12}$ の圧力下電気抵抗	川村　幸裕	室蘭工業大学	大学院工学研究科	Electrical resistivity study of filled skutterudite $EuFe_4As_{12}$ under pressure	Yukihiro Kawamura	Muroran Institute of Technology
90	$YbCo_2Zn_{20}$ の Co 元素位置の置換効果	阿曽　尚文	琉球大学	理学部	Substitution effect at Co element in $YbCo_2Zn_{20}$	Naofumi Aso	University of the Ryukyus
91	〃	比嘉　泰之	琉球大学	大学院理工学研究科	〃	Yasuyuki higa	University of the Ryukyus
92	$YbCo_2Zn_{20}$ の Zn 元素位置の置換効果	阿曽　尚文	琉球大学	理学部	Substitution effect at Zn element in $YbCo_2Zn_{20}$	Naofumi Aso	University of the Ryukyus
93	〃	高村　治希	琉球大学	理学部	〃	Haruki Takamura	University of the Ryukyus
94	ホイスラー型強磁性形状記憶合金の格子定数の圧力依存性	安達　義也	山形大学	大学院理工学研究科	Pressure dependence of the lattice constants for the Heusler type ferromagnetic shape memory alloys	Yoshiya Adachi	Yamagata University
95	希土類化合物 $R_2T_3Ge_5$ (R: 希土類元素) の高圧下物性	中島　美帆	信州大学	理学部	Physical Properties of Rare Earth Coumpound $R_2T_3Ge_5$ (R: Rare Earth metal) under High Pressure	Miho Nakashima	Shinshu University
96	〃	竹原　大翔	信州大学	理学部	〃	Hiroto Takehara	Shinshu University

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97	新規磁性超伝導体の探索	武田　直也	新潟大学	工学部	Exploration of new magnetic superconductor	Naoya Takeda	Niigata University
98	〃	古田　沙紀子	新潟大学	大学院自然科学研究科	〃	Sakiko Koda	Niigata University
99	回転希釈冷凍機を用いた量子液体・固体研究	白濱　圭也	慶應義塾大学	理工学部	Study of quantum fluids and solids using rotating dilution refrigerator	Keiya Shirahama	keio Universitt
100	〃	高橋　大輔	足利工業大学	共通課程	〃	Daisuke Takahashi	Ashikaga Institute of Technology
101	〃	村川　智	慶應義塾大学	理工学部	〃	Satoshi Murakawa	keio Universitt
102	〃	立木　智也	慶應義塾大学	大学院理工学研究科	〃	Tomoya Tsuiki	keio Universitt
103	導電性ラングミュア・ブロジェット膜の高圧下の電気的性質に関する研究	三浦　康弘	桐蔭横浜大学	大学院工学研究科	Studies on electrical properties of conductive langmuir-blodgett films under high pressure	Yasuhiro Miura	Toin University of Yokohama
104	ペロブスカイト酸化物 $PbVO_3$ の高圧下電気輸送特性の測定	岡　研吾	中央大学	理工学部	Investigation of the electronic transport of perovskite $PbVO_3$ under high-pressure	Kengo Oka	Chuo University
105	重い電子系物質における ^3He 温度領域での磁化測定	河江　達也	九州大学	大学院工学研究院	Magnetization measurements in ^3He temperature region for heavy fermion systems	Tastuya Kawae	Kyushu University
106	擬三元系 $(Ho,R)Rh_2Si_2$ 単結晶の磁気特性	繁岡　透	山口大学	大学院理工学研究科	Magnetic characteristics of pseudoternary system $(Ho,Gd)Rh_2Si_2$ single crystal	Toru Shigeoka	Yamaguchi University
107	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
108	多形化合物 RIr_2Si_2(R= 希土類）の磁気転移　4	繁岡　透	山口大学	大学院理工学研究科	Magnetic transition of polymorphic compound RIr_2Si_2 (R=rera earth) 4	Toru Shigeoka	Yamaguchi University
109	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
110	梯子型鉄系化合物の圧力効果	大串　研也	東北大学	大学院理学研究科	High-pressure effect on Fe-based ladder compounds	Kenya Ohgushi	Tohoku University
111	価数揺動物質の高圧力中輸送特性の研究	仲間　隆男	琉球大学	理学部	Trasport properties of valence fluctuating compounds under pressure	Takao Nakama	University of the Ryukyus
112	〃	赤嶺　拡	琉球大学	大学院理工学研究科	〃	Hiromu Akamine	University of the Ryukyus
113	遷移金属化合物の高圧力下の輸送特性	仲間　隆男	琉球大学	理学部	Pressure effect on transport properties of transition metal compounds	Takao Nakama	University of the Ryukyus

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114	〃	照屋　淳志	琉球大学	大学院理工学研究科	〃	Atsusi Teruya	University of the Ryukyus
115	〃	屋良　朝之	琉球大学	理学部	〃	Tomoyuki Yara	University of the Ryukyus
116	層状希土類化合物の単結晶育成と圧力下輸送特性	中野　智仁	新潟大学	大学院自然科学研究科	Single-crystal growth of layerd the rare-earth compound and its transport properties under pressure	Tomohito Nakano	Niigata University
117	〃	高橋　英亮	新潟大学	工学部	〃	Eisuke Takahashi	Niigata University
118	希土類化合物における量子臨界現象の探索とその圧力効果	中野　智仁	新潟大学	大学院自然科学研究科	Investigation of quantum critical phenomena in rare earth compounds and its pressure effect	Nakano Tomohito	Niigata University
119	〃	上杉　和哉	新潟大学	工学部	〃	Kazuya Uesugi	Niigata University
120	TmB_4 の磁気準周期秩序相における圧力効果	伊賀　文俊	茨城大学	理学部	Pressure effect on the magnetic quasi-period ordered phase in TmB_4	Fumitoshi Iga	Ibaraki University
121	〃	道村　真司	埼玉大学	研究機構科学分析支援センター	〃	Shinji Michimura	Saitama University
122	超流動ヘリウム３ー A 相での半整数量子渦の検出	石川　修六	大阪市立大学	大学院理学研究科	Investigation of the half quantized vortices in superfluid ^{3}He-A phase	Osamu Ishikawa	Osaka City University
123	空間反転対称性を欠いた系 $CeNiC_2$ の圧力下での磁気秩序と超伝導	片野　進	埼玉大学	大学院理工学研究科	Magnetic ordering and superconductivity of the non-centrosymmetric system $CeNiC_2$ under high pressure	Susumu Katano	Saitama University
124	多重極限下のゼーベック係数測定システムの開発	辺土　正人	琉球大学	理学部	Development of new Seebeck coefficient measurement system under multiple extreme conditions	Masato Hedo	University of the Ryukyus
125	〃	友利　圭佑	琉球大学	大学院理工学研究科	〃	Tomori Keisuke	University of the Ryukyus
126	空間反転対称性のない遷移金属間化合物とその関連物質の高圧下輸送特性	辺土　正人	琉球大学	理学部	Transport properties of non-centrosymmetric transition metals compounds under high pressure	Masato Hedo	University of the Ryukyus
127	〃	垣花　将司	琉球大学	大学院理工学研究科	〃	Masashi Kakihana	University of the Ryukyus
128	鉄系超伝導体 FeSe の純良単結晶における圧力誘起相転移の研究	芝内　孝禎	東京大学	大学院新領域創成科学研究科	Studies on the pressure-induced phase transition in clean single crystals of iron-based superconductor FeSe	Takasada Shibauchi	The University of Tokyo
129	〃	水上　雄太	東京大学	大学院新領域創成科学研究科	〃	Yuta Mizukami	The University of Tokyo
130	〃	松浦　康平	東京大学	工学部	〃	Kouhei Matsuura	The University of Tokyo

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131	Cr 系遍歴磁性体の圧力効果	三井　好古	鹿児島大学	大学院理工学研究科	Pressure effect on the Cr-based itinerant magnetic materials	Yoshifuru Mitsui	Kagoshima University
132	〃	吉永　総志	鹿児島大学	理学部	〃	Soushi Yoshinaga	Kagoshima University
133	低次元銅酸化物超伝導体の圧力効果	久田　旭彦	徳島大学	大学院ソシオ・アーツ・アンド・サイエンス研究部	Pressure effect on low-dimensional cuprate superconductor	Hisada Akihiko	The University of Tokushima
134	〃	藤原　直樹	京都大学	大学院人間・環境学研究科	〃	Naoki Fujiwara	Kyoto University
135	希土類炭化物の高圧下抵抗率の研究	山浦　淳一	東京工業大学	元素戦略研究センター	Study of high-pressure resistivity on rare earth carbide	Junichi Yamaura	Tokyo Institute of Technology
136	〃	小林　賢介	高エネルギー加速器研究機構	物質構造科学研究所	〃	Kensuke Kobayashi	KEK
137	有機伝導体に適した高圧実験の測定法の開発	村田　惠三	大阪市立大学	大学院理学研究科	Development of high pressure experimental method applicable to organic conductors	Keizo　Murata	Osaka City University
138	ホイスラー化合物強磁性体 $Fe_2Mn_{1-x}V_xSi$ の高圧化電気抵抗率測定	伊藤　昌和	鹿児島大学	大学院理工学研究科	Electrical resistivity of Heusler compound $Fe_2Mn_{1-x}V_xSi$ under pressure	Masakazu Ito	Kagoshima University
139	〃	桑原　脩人	鹿児島大学	大学院理工学研究科	〃	Syuto Kuwahara	Kagoshima University
140	カゴ状化合物 CeT_9X_4(T: 遷移金属 ,X:Ge,Si) の圧力下電気抵抗測定	広瀬　雄介	新潟大学	理学部	Electrical resistivity measurement of cage structure compounds CeT_9X_4 (T:Transition Metal, X:Si,Ge) under high pressure	Yusuke　Hirose	Niigata University
141	〃	佐藤　翔子	新潟大学	大学院自然科学研究科	〃	Shoko Satoh	Niigata University
142	圧力下磁場中点接合分光実験の試み	本山　岳	島根大学	大学院総合理工学研究科	Development of a new method of point-contact-spectroscopy under pressure	Gaku Motoyama	Shimane University
143	〃	小川　翔平	島根大学	大学院総合理工学研究科	〃	Shohei Ogawa	Shimane University
144	UT_2X_2 (T: 遷移金属 , X: Si, Ge) の反強磁性の圧力効果	青木　大	東北大学	金属材料研究所	Effect of pressure on the antiferromagnetism of UT_2Si_2 (T: transition metal, X: Si, Ge)	Dai Aoki	Tohoku University
145	〃	本多　史憲	東北大学	金属材料研究所	〃	Fuminori Honda	Tohoku University
146	〃	志村　康成	東北大学	大学院工学研究科	〃	Yasunari Shimura	Tohoku University
147	固体ヘリウムの超流動に見られる様な「新規超流動現象の基礎研究」	久保田　実	日本橋学館大学	リベラルアーツ学部	Fundamental study of new types of superfluidity, as seen in solid ^4He	Minoru Kubota	Nihonbashi　Gakkan University

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148	Mg_2Si 熱電半導体の高圧下ホール効果測定	財部　健一	岡山理科大学	理学部	High-pressure Hall effect measurement in Mg_2Si thermoelectric semiconductor	Kenichi Takarabe	Okayama University of Science
149	〃	安井　望	岡山理科大学	大学院理学研究科	〃	Nozomu Yasui	Okayama University of Science
150	三角格子磁性体 $NaM(Acac)_3benzen(M=Fe,Ni,Co,Mn)$ の低温磁性	柄木　良友	琉球大学	教育学部	Low temperature magnetizm of triangular lattice antiferromagnet $NaM(acac)_3benzen$	Yoshitomo Karaki	University of the Ryukyus
151	$YbCo_2Zn_{20}$ の Co 元素の置換効果	小林　理気	琉球大学	琉球大学理学部	Substitution effect at Co element in $YbCo_2Zn_{20}$	Riki Kobayashi	University of the Ryukyus
担当所員：川島　直輝							
152	テンソルネットワーク変分法の並列化	原田　健自	京都大学	大学院情報学研究科	Parallelization of a tensor network variational method	Kenji Harada	Kyoto University
担当所員：廣井　善二							
153	Fe 系 MAX 相化合物の高圧合成	和氣　剛	京都大学	大学院工学研究科	High pressure synthesis of iron based MAX phase compounds	Takeshi Waki	Kyoto University
154	遍歴電子磁性体の圧力効果	岡本　佳比古	名古屋大学	大学院工学研究科	High pressure effect on itinerant electron magnets	Yoshihiko Okamoto	Nagoya University
155	新規超伝導体 $BaTi_2(Sb_{1-x}Bi_x)_2O$ における圧力誘起構造相転移	陰山　洋	京都大学	大学院工学研究科	Pressure indured structural transition in $BaTi_2(Sb_{1-x}Bi_x)_2O$	Hiroshi Kageyama	Kyoto University
156	〃	山本　隆文	京都大学	大学院工学研究科	〃	Takafumi Yamamoto	Kyoto University
157	〃	セドリック タッセル	京都大学	白眉センター	〃	Cedric Tassel	Kyoto University
158	超高圧プレスを用いた新規プロトニクス酸化物のソフト化学的合成法の検討	山口　周	東京大学	大学院工学系研究科	Oxide-Protonics materials synthesis by combined use of soft chemical method and high pressure	Shu Yamaguchi	The University of Tokyo
159	〃	三好　正悟	東京大学	大学院工学系研究科	〃	Shogo Miyoshi	The University of Tokyo
160	〃	田中　和彦	東京大学	大学院工学系研究科	〃	Kazuhiko Tanaka	The University of Tokyo
161	〃	本多　慶一郎	東京大学	工学部	〃	Keiichiro Honda	The University of Tokyo
162	溶融亜鉛メッキ合金相の応力誘起変態	山口　周	東京大学	大学院工学系研究科	Stress-induced phase transformation of Fe-Zn alloy formed in hot-dip process	Shu Yamaguchi	The University of Tokyo

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163	〃	三好　正悟	東京大学	大学院工学系研究科	〃	Shogo Miyoshi	The University of Tokyo
164	〃	田中　和彦	東京大学	大学院工学系研究科	〃	Kazuhiko Tanaka	The University of Tokyo
165	窒素を含む芳香族化合物の高圧下における安定性と重合反応	篠崎　彩子	東京大学	大学院理学系研究科	Influence of nitrogen on the stability of aromatic compounds under high pressure condition.	Ayako Shiozaki	The University of Tokyo
166	Fe-$MgSiO_3$-H_2 系の高温高圧下におけるふるまいの解明	飯塚　理子	愛媛大学	地球深部ダイナミクス研究センター	Behavior of Fe-$MgSiO_3$-H_2 system under high pressure and temperature condition	Riko Iizuka	Ehime University
167	アルカリ土類金属元素を含む充填スクッテルダイト超伝導体の高圧合成	関根　ちひろ	室蘭工業大学	大学院工学研究科	High-pressure synthesis of alkaline earth metal based filled-skutterudite superconductors	Chihiro Sekine	Muroran Institute of Technology
168	〃	三影　勇人	室蘭工業大学	大学院工学研究科	〃	Hayato Mikage	Muroran Institute of Technology
169	下部マントルの高温高圧条件におけるマントル鉱物と窒素との反応性の探索	鍵　裕之	東京大学	大学院理学系研究科	Reactivity of nitrogen with minerals at lower-mantle conditions	Hiroyuki Kagi	The University of Tokyo
170	〃	篠崎　彩子	東京大学	大学院理学系研究科	〃	Ayako Shiozaki	The University of Tokyo
171	〃	久保　俊智	東京大学	大学院理学系研究科	〃	Kubo Toshinori	The University of Tokyo
172	高圧下におけるアミノ酸のラセミ化ならびにペプチド化の観察	鍵　裕之	東京大学	大学院理学系研究科	Racemization and peptide formation of amino acids under high pressure	Hiroyuki Kagi	The University of Tokyo
173	〃	藤本　千賀子	東京大学	大学院理学系研究科	〃	Chikako Fujimoto	The University of Tokyo
174	新規な窒化炭素の高圧高温合成	財部　健一	岡山理科大学	理学部	Synthesis of new carbon nitride at high pressure and high temperature	Kenichi Takarabe	Okayama University of Science
175	〃	安井　望	岡山理科大学	大学院理学研究科	〃	Nozomu Yasui	Okayama University of Science
176	3d 遷移金属多窒化物の高圧合成とラマン散乱測定	丹羽　健	名古屋大学	大学院工学研究科	High pressure synthesis of 3d transition metal pernitride and Raman scattering measurements	Ken Niwa	Nagoya University
177	〃	寺部　俊紀	名古屋大学	大学院工学研究科	〃	Toshiki Terabe	Nagoya University
178	遷移金属二硫化物の高圧合成	丹羽　健	名古屋大学	大学院工学研究科	High pressure synthesis of transition metal disulfide	Ken Niwa	Nagoya University
179	〃	秋田　貴弘	名古屋大学	大学院工学研究科	〃	Takahiro Akita	Nagoya University

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180	新規サイト秩序型ペロブスカイト複酸化物の高圧高温合成	志村　元	名古屋大学	大学院工学研究科	High pressure synthesis of novel site ordered perovskites	Gen Shimura	Nagoya University
181	Al 陰イオンを含むメタロイド合金の超高圧合成	白子　雄一	名古屋大学	大学院工学研究科	High-pressure synthesis of metaloid alloy with Al anion	Yuichi Shirako	Nagoya University
182	〃	齋藤　雄太	名古屋大学	大学院工学研究科	〃	Yuta Saito	Nagoya University
183	希ガス化合物の高圧合成とラマン散乱測定による評価	長谷川　正	名古屋大学	大学院工学研究科	High pressure synthesis of noble gas compounds and characterization by Raman scattering measurements	Masashi Hasegawa	Nagoya University
184	〃	松崎　郁弥	名古屋大学	大学院工学研究科	〃	Fumiya Matsuzaki	Nagoya University
185	格子内に空隙を持つ遷移金属酸化物およびフッ化物の高圧合成	長谷川　正	名古屋大学	大学院工学研究科	High pressure synthesis of novel open structured transition metal oxides and fluorides	Masashi Hasegawa	Nagoya University
186	〃	廣瀬　瑛一	名古屋大学	大学院工学研究科	〃	Eiichi Hirose	Nagoya University
187	超高圧高温処理による水の光分解触媒物質の高品位化の研究	山田　太郎	東京大学	大学院工学系研究科	Improvement of photocatalytic materials for water splitting by means of ultrahigh-pressure and high-temperature treatment	Taro Yamada	The University of Tokyo
188	超高圧高温処理による水の光分解触媒物質の高品位化の研究	守屋　映祐	東京大学	大学院工学系研究科	Improvement of photocatalytic materials for water splitting by means of ultrahigh-pressure and high-temperature treatment	Yosuke Moriya	The University of Tokyo
189	〃	後藤　陽介	東京大学	大学院工学系研究科	〃	Yosuke Goto	The University of Tokyo
担当所員：益田　隆嗣							
190	非磁性不純物による三角スピンチューブのスピンダイナミクスの変化	真中　浩貴	鹿児島大学	大学院理工学研究科	Non-magnetic impurity effect on spin dynamics of triangular spin tubes	Hirotaka Manaka	Kagoshima University
191	高エネルギー X 線ラウエ法によるヘリカル磁性合金 (Gd-Y,Gd-La, Tb-Y, Dy-Y) の単結晶試料評価	山崎　照夫	東京理科大学	理工学部	Evaluation of the single crystals of the helical magnetic alloys (Gd-Y,Gd-La, Tb-Y, Dy-Y) by high-energy X-ray Laue method	Teruo Yamazaki	Tokyo University of Science
192	〃	栗原　舞	東京理科大学	大学院理工学研究科	〃	Mai Kurihara	Tokyo University of Science
193	スピネル型バナジウム酸化物における磁気励起の観測	阿部　伸行	東京大学	大学院新領域創成科学研究科	Measurement of magnetic excitation in spinel type vanadate	Nobuyuki Abe	The University of Tokyo
194	〃	松浦　慧介	東京大学	大学院新領域創成科学研究科	〃	Keisuke Matsuura	The University of Tokyo

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担当所員：吉澤　英樹							
195	ルテニウム酸化物における不均一磁性と遍歴 4d 電子の相関	横山　淳	茨城大学	理学部	Interplay between heterogeneous magnetism and itinerant 4d electrons in ruthenium oxides	Makoto Yokoyama	Ibaraki University
196	〃	大高　凌	茨城大学	理学部	〃	Ryo Otaka	Ibaraki University
197	希土類合金 $Gd_{1-x}La_x$ の比熱測定	矢口　宏	東京理科大学	理工学部	Specific heat measurements for the rare-earth magnetic alloy $Gd_{1-x}La_x$.	Hiroshi Yaguchi	Tokyo University of Science
198	〃	山崎　照夫	東京理科大学	理工学部	〃	Teruo Yamazaki	Tokyo University of Science
199	〃	栗原　舞	東京理科大学	大学院理工学研究科	〃	Mai Kurihara	Tokyo University of Science
200	鉄系超伝導体 $FeTe_{1-x}S_x$ の純良単結晶における Te 雰囲気中アニール効果	山崎　照夫	東京理科大学	理工学部	Effect of Te-annealing in the Fe-based superconducter $FeTe_{1-x}S_x$	Teruo Yamazaki	Tokyo University of Science
201	〃	久保田　聡	東京理科大学	大学院理工学研究科	〃	Satoshi Kubota	Tokyo University of Science
担当所員：柴山　充弘							
202	単一鎖長ポリオキシエチレン–ポリオキシプロピレン系非イオン性界面活性剤のレオロジーに関する研究	吉村　倫一	奈良女子大学	研究院自然科学系	Study on rheology of homogeneous polyoxyethylene-polyoxypropylene-type nonionic surfactants without molecular weight distribution	Tomokazu Yoshimura	Nara Women’s University
203	〃	矢田　詩歩	奈良女子大学	大学院人間文化研究科	〃	Shiho Yada	Nara Women’s University
担当所員：金道　浩一							
204	重い電子系化合物が示す非従来型超伝導と磁性の相関	横山　淳	茨城大学	理学部	Interplay between unconventional superconductivity and magnetism in heavy-fermion compounds	Makoto Yokoyama	Ibaraki University
205	〃	益子　寛明	茨城大学	理学部	〃	Hiroaki Mashiko	Ibaraki University
206	単結晶 $La_{1-x}Sr_xCoO_3$ と $LaCo_{1-x}Rh_xO_3$ の強磁場誘起スピン転移	佐藤　桂輔	茨城工業高等専門学校		Field induced spin-state transition in $La_{1-x}Sr_xCoO_3$ and $LaCo_{1-x}Rh_xO_3$	Keisuke Sato	Ibaraki University
207	希土類金属間化合物の強磁場物性研究	海老原　孝雄	静岡大学	大学院理学研究科	Physical properties in rare earth intermetallic compounds at high magnetic fields	Takao Ebihara	Shizuoka University
208	幾何学的フラストレート磁性体の強磁場磁化測定	菊池　彦光	福井大学	大学院工学研究科	Magnetization studies of the frustrated magnets	Hikomitsu Kikuchi	University of Fukui

No.	課題名	氏名	所属		Title	Name	Organization
209	〃	国枝　賢治	福井大学	大学院工学研究科	〃	Kenji Kunieda	University of Fukui
210	チタン三角クラスターにおけるフラストレーションと強磁場物性	浅野　貴行	福井大学	大学院工学研究科	Frustration and magnetic properties under high-magnetic fields in titanium triangular clusters	Takayuki Asano	University of Fukui
211	〃	一二三　優汰	福井大学	工学部	〃	Yuta Hifumi	University of Fukui
212	三角格子またはカゴメ格子をもつ遷移金属フッ化物単結晶の磁性	植田　浩明	京都大学	大学院理学研究科	magnetism of single crystals of transition metal fluorides with triangular lattice or kagome lattice	Hiroaki Ueda	Kyoto University
213	〃	後藤　真人	京都大学	大学院理学研究科	〃	Masato Goto	Kyoto University
214	〃	篠原　翔	京都大学	理学部	〃	Sho Shinohara	Kyoto University
215	$SrCo_2P_2$ の周辺物質を中心とした層状遍歴電子磁性体の強磁場磁化過程	道岡　千城	京都大学	大学院理学研究科	High field magnetization of $SrCo_2P_2$, its family compounds and other layered itinerant electron magnets	Chishiro Michioka	Kyoto University
216	〃	今井　正樹	京都大学	大学院理学研究科	〃	Masaki Imai	Kyoto University
217	〃	原口　祐哉	京都大学	大学院理学研究科	〃	Yuya Haraguchi	Kyoto University
218	〃	勝間　勇人	京都大学	理学部	〃	Hayato Katsuma	Kyoto University
219	デラフォサイト型フラストレート磁性体の強磁場磁化	佐藤　博彦	中央大学	理工学部	High-field magnetization of delafossite-type frustrated magnets	Hirohiko Sato	Chuo University
220	〃	池戸　優太	中央大学	大学院理工学研究科	〃	Yuta Ikedo	Chuo University
221	10 MJ コンデンサーバンク用大型ワイドボアパルスマグネットの開発	萩原　政幸	大阪大学	大学院理学研究科	Development of a large wide-bore pulse magnet for a 10 MJ capacitor bank	Masayuki Hagiwara	Osaka University
222	〃	谷口　一也	大阪大学	大学院理学研究科	〃	Kazuya Taniguchi	Osaka University
223	〃	佐藤　和樹	大阪大学	理学部	〃	Kazuki Sato	Osaka University
224	近藤半導体 (Yb, R)B_{12} (R=Zr, Sc, Y) の 80T 級磁場下での強磁場物性	伊賀　文俊	茨城大学	理学部	High field physical property of Kondo insulator (Yb, R)B_{12} (R=Zr, Sc, Y) up to 80T class by using the pulse magnet	Fumitoshi Iga	Ibaraki University
225	〃	和田　徹	茨城大学	大学院理工学研究科	〃	Toru Wada	Ibaraki University

No.	課題名	氏名	所属		Title	Name	Organization
226	高圧合成希土類 12 ホウ化物及び valence skipping 超伝導参照物質 (Ca,Sr)FeO_3 の磁化特性と比熱	伊賀　文俊	茨城大学	理学部	Magnetic and thermal properties of rare earth dodeca-borides produced by high pressure synthesis and valence-skipping superconductor reference (Ca,Sr)FeO_3	Fumitoshi Iga	Ibaraki University
227	〃	川和　英司	茨城大学	大学院理工学研究科	〃	Eiji Kawawa	Ibaraki University
228	金属ナノ結晶の磁化特性	稲田　貢	関西大学	システム理工学部	Magnetic properties of metal nanocrystals	Mitsuru Inada	Kansai University
229	高ドープ Bi-2212 のパルス強磁場下輸送特性	渡辺　孝夫	弘前大学	大学院理工学研究科	Transport properties in heavily overdoped Bi-2212 under high pulsed magnetic fields	Takao Watanabe	Hirosaki University
230	〃	臼井　友洋	弘前大学	大学院理工学研究科	〃	Tomohiro Usui	Hirosaki University
231	〃	寺本　祐基	弘前大学	大学院理工学研究科	〃	Yuki Teramoto	Hirosaki University
232	有機／無機スピン源を有する新規量子スピン系の強磁場磁化と磁場中比熱	小野　俊雄	大阪府立大学	大学院理学系研究科	High field magnetization and the heat capacity on the new quantum spin systems with organic/inorganic spin sources	Toshio Ono	Osaka Prefecture University
233	〃	井川　直哉	大阪府立大学	大学院理学系研究科	〃	Naoya Ikawa	Osaka Prefecture University
234	〃	笠谷　和宏	大阪府立大学	大学院理学系研究科	〃	Kazuhiro Kasatani	Osaka Prefecture University
235	〃	遠藤　耀司	大阪府立大学	大学院理学系研究科	〃	Youji Endo	Osaka Prefecture University
236	$Ni_{2-x}MnGa$ の強磁場下における磁歪測定	伊藤　昌和	鹿児島大学	大学院理工学研究科	Magnetic strain of Heusler compounds $Ni_{2-x}MnGa$ in high magnetic field	Masakazu Ito	Kagoshima University
237	〃	桑原　脩人	鹿児島大学	大学院理工学研究科	〃	Syuto Kuwahara	Kagoshima University
担当所員：松田　康弘							
238	近藤半導体 $(Yb,R)B_{12}$ および価数揺動物質 $(Y,Tm)B_6$ のワンターンコイル 120T パルス磁場下での強磁場磁化過程	伊賀　文俊	茨城大学	理学部	High field magnetization of Kondo insulator $(Yb,R)B_{12}$ and valence fluctuation material $(Y,Tm)B_6$ by using one-turn coil in a 120 T pulse magnet	Fumitoshi Iga	Ibaraki University
239	〃	小山内　湧人	茨城大学	大学院理工学研究科	〃	Yuto Osanai	Ibaraki University
240	酸素−窒素混合固体における磁場誘起相転移	小林　達生	岡山大学	大学院自然科学研究科	Field-induced phase transition in O_2-N_2 mixed solid	Tatsuo Kobayashi	Okayama University
241	メタホウ酸銅における強磁場下の非相反方向二色性	有馬　孝尚	東京大学	大学院新領域創成科学研究科	Nonreciprocal directional dichroism in magnetic ferroelectrics in a high magnetic field	Arima Takahisa	The University of Tokyo

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242	〃	阿部　伸行	東京大学	大学院新領域創成科学研究科	〃	Nobuyuki Abe	The University of Tokyo
243	〃	豊田　新悟	東京大学	大学院新領域創成科学研究科	〃	Shingo Toyoda	The University of Tokyo
244	〃	根津　正謙	東京大学	大学院新領域創成科学研究科	〃	Netsu Naoaki	The University of Tokyo
担当所員：徳永　将史							
245	強磁場による強相関電子系準結晶の研究	出口　和彦	名古屋大学	大学院理学研究科	Low temperature study of strongly correlated electron quasicrystal	Kazuhiko Deguchi	Nagoya University
246	〃	松川　周矢	名古屋大学	大学院理学研究科	〃	shuya matsukawa	Nagoya University
247	ブリージングパイロクロア格子反強磁性体の強磁場磁化過程	岡本　佳比古	名古屋大学	大学院工学研究科	High field magnetization measurements of Breathing pyrochlore lattice antiferromagnets	Yoshihiko Okamoto	Nagoya University
248	遍歴電子強磁性と局在磁気モーメントが共存する系の磁化過程	太田　寛人	東京農工大学	大学院工学府	Magnetic behavior of systems with itinerant ferromagnetism and localized magnetic moments	Hiroto Ohta	Tokyo University of Agriculture and Technology
249	〃	鈴木　敦	東京農工大学	工学部	〃	Atsushi Suzuki	Tokyo University of Agriculture and Technology
250	フラストレーションを有する磁性体の強磁場磁化過程	香取　浩子	東京農工大学	大学院工学研究院	High-field magnetization of frustrated magnets	Hiroko Katori	Tokyo University of Agriculture and Technology
251	〃	磯崎　勝哉	東京農工大学	工学部	〃	Isozaki Katsuya	Tokyo University of Agriculture and Technology
252	非破壊パルスマグネットを用いた磁場誘起密度波多重相におけるグラファイトの輸送測定	矢口　宏	東京理科大学	理工学部	Transport measurements of graphite in the magnetic-field induced multiple density-wave phase using a non-destructive pulsed magnet	Hiroshi Yaguchi	Tokyo University of Science
253	$U(Rh_{1-x}Co_x)Ge$ の強磁場下におけるメタ磁性に関する研究	本多　史憲	東北大学	金属材料研究所	Study of metamagnetism on $U(Rh_{1-x}Co_x)Ge$ under high magnetic field	Fuminori Honda	Tohoku University
254	〃	青木　大	東北大学	金属材料研究所	〃	Dai Aoki	Tohoku University
255	〃	志村　康成	東北大学	大学院工学研究科	〃	Yasunari Shimura	Tohoku University
256	超強磁場を利用した CoCr 基合金におけるリエントラント挙動を示すマルテンサイト変態の観察および起源解明	キョ　キョウ	東北大学	大学院工学研究科	Observation and clarification of the origin of re-entrant martensitic transformation using strong magnetic field in CoCr based alloys	Xiao XU	Tohoku University
257	一次元反強磁性体 $BaCo_2Si_2O_7$ の強磁場磁化過程	赤木　暢	大阪大学	大学院理学研究科	High magnetic field magnetization process of 1D antiferromagnet $BaCo_2Si_2O_7$	Mitsuru Akaki	Osaka University

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258	単体元素半導体 Te の強磁場中の磁気抵抗測定	小林　夏野	岡山大学	理学部	Magnetoresistance in pulsed magnetic field on semiconducting tellurium	Kaya Kobayashi	Okayama University
259	$Pr_{1-x}Sr_x(Mn_{1-y}Fe_y)O_3$ の反強磁性と熱電特性に関する研究	中津川　博	横浜国立大学	大学院工学研究院	Antiferromagnetism and thermoelectric properties in $Pr_{1-x}Sr_x(Mn_{1-y}Fe_y)O_3$	Hiroshi Nakatsugawa	Yokohama National University
260	新規カイラル量子磁性体の強磁場磁化測定	木村　健太	大阪大学	大学院基礎工学研究科	High-field magnetization measurements of a new chiral quantum magnet	Kenta Kimura	Osaka University
担当所員：嶽山　正二郎							
261	カゴメ–ハニカム–三角複合格子を持つフラストレート磁性体の磁気光学特性	佐藤　博彦	中央大学	理工学部	Magneto-optical properties of the frustrated magnets containing a kagome-honeycomb-triangular composite lattice	Hirohiko Sato	Chuo University
262	〃	大塚　大祐	中央大学	大学院理工学研究科	〃	Daisuke Otsuka	Chuo University
263	マルチフェロイック三角格子反強磁性体 $AgFeO_2$ の強磁場磁気光学特性	佐藤　博彦	中央大学	理工学部	Magneto-optical properties of multiferroic triangular-lattice antiferromagnet $AgFeO_2$ under high magnetic fields	Hirohiko Sato	Chuo University
264	〃	池戸　優太	中央大学	大学院理工学研究科	〃	Yuta Ikedo	Chuo University
担当所員：秋山　英文							
265	微小共振器構造を組み合わせた窒素デルタドープ GaAs からの発光特性評価	矢口　裕之	埼玉大学	大学院理工学研究科	Characterization of luminescence properties of nitrogen delta-doped GaAs with a micro-cavity structure	Hiroyuki Yaguchi	Saitama University
266	〃	高宮　健吾	埼玉大学	総合技術支援センター	〃	Kengo Takamiya	Saitama University
267	〃	須藤　真樹	埼玉大学	大学院理工学研究科	〃	Masaki Sutou	Saitama University
担当所員：辛　埴							
268	トポロジカル絶縁体 / 磁性絶縁超薄膜体のヘテロ接合の界面原子構造解析	平原　徹	東京工業大学	大学院理工学研究科	Interface structure analysis of a topological/magnetic insulator thin film heterostructure	Toru Hirahara	Tokyo Institute of Technology
269	極低温超高分解能レーザー光電子分光装置による超伝導ギャップ測定	鈴木　博人	東京大学	大学院理学系研究科	Superconducting gap measurement by low-temperature high-resolution laser angle-resolved pho-toemision spectroscopy	Hakuto Suzuki	The University of Tokyo
270	〃	堀尾　眞史	東京大学	大学院理学系研究科	〃	Masafumi Horio	The University of Tokyo
271	鉄系超伝導体の時間分解角度分解光電子分光	下志万　貴博	東京大学	工学部	Time-resolved and angle-resolved photoemission study on the iron-based superconeductors	Takahiro Shimojima	The University of Tokyo

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272	〃	中村　飛鳥	東京大学	大学院工学系研究科	〃	Asuka Nakamura	The University of Tokyo
273	角度分解光電子分光による鉄系超伝導体における擬ギャップの研究	園部　竜也	東京大学	大学院工学系研究科	APRES Study on Pseudogap in Iron-Pnictides	Tatsuya Sonobe	The University of Tokyo
274	強いスピン相互作用を有するビスマス化合物における超伝導状態の直接観測	坂野　昌人	東京大学	大学院工学系研究科	Direct observation of superconducting state in bismuth compound with strong spin-orbit coupling	Masato Sakano	The University of Tokyo
275	時間分解光電子分光による新規半導体の励起状態の観測	石坂　香子	東京大学	大学院工学系研究科	Excited state of semiconductors investigated by time-resolved photoemission spectroscopy	Kyoko Ishizaka	The University of Tokyo
276	〃	鈴木　裕也	東京大学	大学院工学系研究科	〃	Yuya Suzuki	The University of Tokyo
277	トポロジカル絶縁体表面ディラック電子のスピン依存緩和ダイナミクス	木村　昭夫	広島大学	大学院理学研究科	Spin-dependent nonequilibrium dynamics of surface Dirac Fermions in topological insulators	Akio Kimura	The University of Tokyo
278	強磁性トポロジカル絶縁体の非平衡ダイナミクス	朱　思源	広島大学	大学院理学研究科	Nonequilibrium dynamics in ferromagnetic topological insulators	Zhu Siyuan	The University of Tokyo
279	空間反転対称性の破れた物質におけるスピン分極の観測	石坂　香子	東京大学	大学院工学系研究科	Observation of spin polarization in inversion-symmetry broken materials	Kyoko Ishizaka	The University of Tokyo
担当所員：末元　徹							
280	テラヘルツ分光装置を用いた酸化物磁性材料の研究	大越　慎一	東京大学	大学院理学系研究科	Study of magnetic oxide using terahertz spectroscopy	Shinichi Ohkoshi	The University of Tokyo
281	〃	生井　飛鳥	東京大学	大学院理学系研究科	〃	Namai Asuka	The University of Tokyo
282	〃	吉清　まりえ	東京大学	大学院理学系研究科	〃	Marie Yoshikiy	The University of Tokyo
283	電波天文観測用超伝導素子のテラヘルツ分光計測	山本　智	東京大学	大学院理学系研究科	THz spectroscopy of a superconducting detector for radio-astronomical observations	Satoshi Yamamoto	The University of Tokyo
284	〃	浅原　彰文	東京大学	大学院理学系研究科	〃	Akifumi Asahara	The University of Tokyo
285	〃	西村　優里	東京大学	大学院理学系研究科	〃	Yuri Nishimura	The University of Tokyo

物質合成・評価設備 P クラス / Materials Synthesis and Characterization P Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	遷移金属酸窒化物、酸水素化物における構造物性研究	山浦　淳一	東京工業大学	元素戦略研究センター	Study of structural physics on transition metal oxynitrides and oxyhydrides	Junichi Yamaura	Tokyo Institute of Technology
2	〃	真木　祥千子	東京工業大学	元素戦略研究センター	〃	Sachiko Maki	Tokyo institute of technology
3	電子が複合自由度を持つ遷移金属系物質の純良単結晶育成と物性評価	片山　尚幸	名古屋大学	大学院工学研究科	Growth of single crystals of transition metal compounds with charge, orbital and spin degrees of freedom	Naoyuki Katayama	Nagoya University
4	〃	菅原　健人	名古屋大学	大学院工学研究科	〃	Kento Sugawara	Nagoya University

物質合成・評価設備 G クラス / Materials Synthesis and Characterization G Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	超臨界水を利用したドライ画像フィルムの分解と銀化合物のリサイクル	大友　順一郎	東京大学	大学院新領域創成科学研究科	Decomposing dry imaging film and recycling silver compounds using supercritical water	Junichiro Otomo	The University of Tokyo
2	〃	升川　駿	東京大学	工学部	〃	Masukawa Shun	The University of Tokyo
3	固体酸・塩基触媒を利用した高温高圧水を反応場とした多段階有機合成反応	大友　順一郎	東京大学	大学院新領域創成科学研究科	multi-step organic synthesis in sub- and supercritical water using solid acid/base catalysts	Junichiro Otomo	The University of Tokyo
4	〃	中井　佑輔	東京大学	大学院新領域創成科学研究科	〃	yusuke nakai	The University of Tokyo
5	高温高圧水中における固体酸・塩基触媒反応の速度論的解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Kinetic analysis of solid acid and base catalyzed reactions in sub- and supercritical water	Junichiro Otomo	The University of Tokyo
6	〃	秋月　信	東京大学	大学院新領域創成科学研究科	〃	Makoto Akizuki	The University of Tokyo
7	中温作動燃料電池における電極及び電解質の材料設計	大友　順一郎	東京大学	大学院新領域創成科学研究科	Material design of electrode and electrolyte for intermediate temperature	Junichiro Otomo	The University of Tokyo
8	〃	小城　元	東京大学	大学院新領域創成科学研究科	〃	Kojo Gen	The University of Tokyo
9	固体酸化物形燃料電池の電極 / 電解質界面におけるカチオン拡散現象評価	大友　順一郎	東京大学	大学院新領域創成科学研究科	Evaluation of cation diffusion in the electrode/electrolyte interface of solid oxide fuel cell	Junichiro Otomo	The University of Tokyo
10	〃	橋北　直人	東京大学	大学院新領域創成科学研究科	〃	Naoto Hashikita	The University of Tokyo

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11	プロトン電導性電解質を用いた再生型燃料電池における電極反応評価	大友　順一郎	東京大学	大学院新領域創成科学研究科	Investigation of electrode reaction in reversivle fuel cells with proton conducting electrolyte	Junichiro Otomo	The University of Tokyo
12	〃	松岡　修平	東京大学	工学部	〃	Mastuoka Shuhei	The University of Tokyo
13	新規エネルギー貯蔵システムの触媒開発と表面反応解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Study on catalyst synthesis and surface reaction analysis for novel energy storage systems	Junichiro Otomo	The University of Tokyo
14	〃	高坂　文彦	東京大学	大学院新領域創成科学研究科	〃	Fumihiko Kosaka	The University of Tokyo
15	ペロブスカイト型酸化物を用いたケミカルルーピングシステムの開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Preparation of perovskite oxides as supports for MeO (Me: Cu, Ni) oxygen carrier materials for chemical looping systems	Junichiro Otomo	The University of Tokyo
16	〃	オーチェン ジェームズ オーチェン	東京大学	大学院新領域創成科学研究科	〃	Ochieng James Ochieng	The University of Tokyo
17	メソポーラスマテリアル・グラフェンオキサイドに担持した金属触媒のキャラクタリゼーション	佐々木　岳彦	東京大学	大学院新領域創成科学研究科	Characterization for metal catalysts supported on mesoporous materials and graphene oxides	Takehiko Sasaki	The University of Tokyo
18	高圧合成法による新規 5d 遷移金属化合物の探索	有馬　孝尚	東京大学	大学院新領域創成科学研究科	Exploration of new 5d transition metal compounds by means of high-pressure synthesis	Takahisa Arima	The University of Tokyo
19	〃	阿部　伸行	東京大学	大学院新領域創成科学研究科	〃	Nobuyuki Abe	The University of Tokyo
20	〃	豊田　新悟	東京大学	大学院新領域創成科学研究科	〃	Shingo Toyoda	The University of Tokyo
21	〃	根津　正謙	東京大学	大学院新領域創成科学研究科	〃	Netsu Naoaki	The University of Tokyo
22	〃	鷲見　浩樹	東京大学	大学院新領域創成科学研究科	〃	Hiroki Sumi	The University of Tokyo
23	超臨界水熱合成による酸化物コンポジットナノ粒子の合成手法の開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Development of synthesis methodology for oxide composite nanoparticles under supercritical hydrothermal synthesis	Junichiro Otomo	The University of Tokyo
24	〃	横　哲	東京大学	大学院新領域創成科学研究科	〃	Akira Yoko	The University of Tokyo
25	高温高圧水を利用した微粒子の in situ 有機修飾技術の開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	The development of in situ organic modification technology of particles in high temperature and pressure water	Junichiro Otomo	The University of Tokyo
26	〃	岳　磊	東京大学	大学院新領域創成科学研究科	〃	Lei Yue	The University of Tokyo
27	超臨界水熱合成によるコアシェル型微粒子の合成手法の開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	The preparation of core-shell particles under supercritical hydrothermal synthesis	Junichiro Otomo	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
28	〃	李　夢婷	東京大学	大学院新領域創成科学研究科	〃	Li Mengting	The University of Tokyo
29	複合酸化物ナノ粒子の超臨界水熱合成手法の検討	大友　順一郎	東京大学	大学院新領域創成科学研究科	Study of compound oxide nano-particles using supercritical hydrothermal synthesis	Junichiro Otomo	The University of Tokyo
30	〃	加藤　進介	東京大学	大学院新領域創成科学研究科	〃	Shinsuke Kato	The University of Tokyo
31	触媒反応の insitu ラマン散乱測定	佐々木　岳彦	東京大学	大学院新領域創成科学研究科	in situ measurement of Raman scattering for heterogeneous catalytic reactions	Takehiko Sasaki	The University of Tokyo
32	〃	板子　健太郎	東京大学	大学院新領域創成科学研究科	〃	Itako kentaro	The University of Tokyo
33	マイクロミキサを用いた機能性酸化物ナノ粒子の連続合成	陶　究	産業技術総合研究所	ナノシステム研究部門	Continuous synthesis of functional metal oxide nanoparticles using a micromxer	Sue Kiwamu	AIST
34	ナノ材料を用いた二次電池開発	細野　英司	産業技術総合研究所	エネルギー技術研究部門	Development of secondary battery by the nanomaterials	Eiji Hosono	AIST
35	透過型電子顕微鏡による機能性金属錯体の歪み測定	糸井　充穂	日本大学	医学部	Distortion measurement for multi-finctional metal complex by transmission electron microscope	Itoi Miho	Nihon University
36	新規磁石材料の微細構造解析	齋藤　哲治	千葉工業大学	工学部	Microstructural studies of newly developed permanent magnet materials	Tetsuji Saito	Chiba Institute of Technology
37	梯子型鉄系化合物の元素置換効果	大串　研也	東北大学	大学院理学研究科	Substitution effect on Fe-based ladder compounds	Kenya Ohgushi	Tohoku University
38	スピネル・パイロクロア酸化物の磁気的性質	岡本　佳比古	名古屋大学	大学院工学研究科	Magnetic properties of spinel and pyrochlore oxides	Yoshihiko Okamoto	Nagoya University
39	ハーフメタル型ホイスラー合金の磁性と輸送特性に関する研究	重田　出	鹿児島大学	大学院理工学研究科	Study on the magnetic and transport properties of half-metallic Heusler alloys	Shigeta Iduru	Kagoshima University
40	〃	重松　理史	鹿児島大学	大学院理工学研究科	〃	Satoshi Shigematsu	Kagoshima University
41	ホイスラー型化合物の磁性と伝導の研究	廣井　政彦	鹿児島大学	大学院理工学研究科	Study on the magnetic and electrical properties of Heusler compounds	Masahiko Hiroi	Kagoshima University
42	〃	田底　知也	鹿児島大学	大学院理工学研究科	〃	Tomoya Tazoko	Kagoshima University
43	ペロブスカイト酸化物 $PbVO_3$ の高圧下電気輸送特性の測定	岡　研吾	中央大学	理工学部	Investigation of the electronic transport of perovskite $PbVO_3$ under high-pressure	Kengo Oka	Chuo University
44	新規サイト秩序型ペロブスカイト複酸化物の物性	志村　元	名古屋大学	大学院工学研究科	Properties of novel site ordered perovskite oxides	Gen Shimura	Nagoya University

No.	課題名	氏名	所属		Title	Name	Organization
45	新強誘電体 $K_5Nb_9O_{25}$ 単結晶の育成	小松　隆一	山口大学	大学院理工学研究科	Growth of a new ferroelectric phase, $K_5Nb_9O_{25}$ single crystal	Ryuichi Komatsu	Yamaguchi University
46	Cu－Ni－X（X=Co, Fe）系単結晶性合金中の磁性微粒子析出過程と磁気特性の関係	竹田　真帆人	横浜国立大学	大学院工学研究院	Precipitation behavior and magnetic properties of fine magnetic particles in Cu - Ni base alloys single crystal	Mahoto Takeda	Yokohama National University
47	〃	金　俊燮	横浜国立大学	大学院工学府	〃	Kim Junseop	Yokohama National University
48	〃	坂倉　響	横浜国立大学	大学院工学府	〃	Hibiki Sakakura	Yokohama National University
49	高圧合成法による新規 5d 遷移金属化合物の探索	徳永　祐介	東京大学	大学院新領域創成科学研究科	Exploration of new 5d transition metal compounds by means of high-pressure synthesis	Yusuke Tokunaga	The University of Tokyo
50	〃	藤間　友理	東京大学	大学院新領域創成科学研究科	〃	Yuri Fujimiya	The University of Tokyo
51	〃	前島　夏奈	東京大学	大学院新領域創成科学研究科	〃	Kana Maeshima	The University of Tokyo

物質合成・評価設備 U クラス / Materials Synthesis and Characterization U Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	アルミ系近似結晶中の正 20 面体クラスターの金属結合–共有結合転換	金沢　育三	東京学芸大学	教育学部	Metallic-covalent bonding conversion of icosahedral cluster in Al-based approximant crystals	Ikuzo　Kanazawa	Tokyo Gakugei University
2	〃	佐々木　友彰	東京学芸大学	大学院教育学研究科	〃	Tomoaki Sasaki	Tokyo Gakugei University
3	正 20 面体クラスター固体の電気伝導と磁性	木村　薫	東京大学	大学院新領域創成科学研究科	Electrical conductivity and magnetic properties of icosahedral cluster solids	Kaoru Kimura	The University of Tokyo
4	〃	廣戸　孝信	東京大学	大学院新領域創成科学研究科	〃	Takanobu Hiroto	The University of Tokyo
5	単体元素半導体 Te の弱磁場磁気抵抗測定	小林　夏野	岡山大学	理学部	Magnetoresistance on semiconducting Te in low magnetic eld	Kaya Kobayashi	Okayama University
6	グラフェンのテラヘルツ光領域における光吸収スペクトルの制御	松木　孝憲	東京大学	大学院新領域創成科学研究科	Control of graphene optical spectrum in terahertz region	Takanori Matsuki	The University of Tokyo
7	ケミカルループ法における酸素キャリア材料の劣化挙動の観察	大友　順一郎	東京大学	大学院新領域創成科学研究科	Degradation of oxygen carrier materials in chemical loop systems	Junichiro Otomo	The University of Tokyo
8	〃	斉藤　佑耶	東京大学	大学院新領域創成科学研究科	〃	Yuya Saito	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
9	超臨界流体中の表面バリア放電プラズマによるアモルファスカーボンおよびダイヤモンドライクカーボンのナノコーティング	シュタウス スヴェン	東京大学	大学院新領域創成科学研究科	Fabrication of amorphous and diamond-like carbon nanocoatings by surface dielectric barrier discharges generated in supercritical fluids	Sven Stauss	The University of Tokyo

長期留学研究員 / Long Term Young Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	超流動ヘリウム 3-A 相の半整数量子渦の研究	木村　豊	大阪市立大学	大学院理学研究科	Study of the half quantized vortex in superfluid ^{3}He-A phase	Kimura Yutaka	Osaka City University
2	熱輸送測定によるスピン液体の研究	渡邊　大樹	京都大学	大学院理学研究科	Study of spin liquids by thermal transport measurement	Daiki Watanabe	Kyoto university
3	多重極限物性測定装置の開発と量子臨界物性の研究	山本　貴士	大阪大学	大学院理学研究科	Development of experimental measuring equipments under multiplex extreme conditions and studies on quantum critical phenomena	Kazuki Sato	Osaka University
4	窒素ドープ炭素材料の酸素還元反応メカニズムの解明	木内　久雄	東京大学	大学院工学系研究科	Study of the oxygen reduction reaction of nitrogen-doped carbon materials	Kiuchi Hisao	The University of Tokyo
5	中性子回折実験用高圧セル装置の開発と、水素結合を持つ化合物の高温高圧下その場観察	飯塚　理子	愛媛大学	地球深部ダイナミクス研究センター	Development of high-pressure cell for neutron diffractin and in-situ observation of hydrogen-bonding materials	Riko Iizuka	Ehime University

平成 27 年度　共同利用課題一覧（後期）Joint Research List (2015 Latter Term)

嘱託研究員 / Commission Researcher）

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：中辻　知							
1	X 線回析実験による非クラマース系におけるスピンと軌道の複合自由度の研究	澤　博	名古屋大学	大学院工学研究科	X-ray diffraction study of spin-orbital coupled states of non-Kramers systems	Hiroshi Sawa	Nagoya University
2	価数異常に伴う量子臨界スケーリングの研究	三宅　和正	豊田理化学研究所		Theoretical study on charge critical fluctuations associated with valence instability	Kazumasa Miyake	Toyota Physical and Chemical Research Institute
3	フラストレート磁性体における量子物性の探究	木村　健太	大阪大学	大学院基礎工学研究科	The search for quantum state in frustrated magnets	Kenta Kimura	Osaka University
4	極低温磁化装置の開発と磁気測定	柄木　良友	琉球大学	教育学部	Development of low temperature magnetic measurements	Yoshitomo Karaki	University of the Ryukyus
5	価数揺動重い電子系イッテルビウム化合物における価数クロスオーバーと格子定数変化	久我　健太郎	理化学研究所	放射光科学総合研究センター	Investigation of quantum critical phenomena in valence fluctuating and heavy fermion Yb-based compound	Kentarou Kuga	RIKEN
担当所員：吉信　淳							
6	銅合金触媒における二酸化炭素の水素化・メタノール合成に関する研究	森川　良忠	大阪大学	大学院工学研究科	Study on methanol synthesis by hydrogenation of carbon dioxide over Cu alloy catalyst	Yoshitada Morikawa	Osaka University
7	生体物質のセンサー応用を目指した高分解能電子エネルギー損失分光を用いた振動分光研究	米田　忠弘	東北大学	多元物質科学研究所	High resolution vibration spectroscopy of bio-molecules for sensor application	Tadahiro Komeda	Tohoku University
8	酸化物半導体光触媒における水分解反応の研究	松本　吉泰	京都大学	大学院理学研究科	Study of water splitting reaction on oxide semiconductor catalysts	Yoshiyasu Matsumoto	Kyoto University
9	SiC 表面上に成長させたエピタキシャルグラフェンの化学修飾	Md. Zakir Hossain	群馬大学	大学院理工学府	Chemical modification of epitaxial graphene grown on SIC substree[and its spectroscopic characterization	Md. Zakir Hossain	Gunma University
10	固体表面に吸着した有機分子の光学物性及び振動状態の評価	桑原　裕司	大阪大学	大学院工学研究科	Investigation of optical and vibrational properties of organic molecules on sold surfaces	Yuji Kuwahara	Osaka University
11	有機薄膜太陽電池の薄膜構造制御	山田　容子	奈良先端科学技術大学院大学	物質創成科学研究科	Control of mano-structure of organic thin-film solar cell	Hiroko Yamada	Nara Institute of Science and Technology
担当所員：大谷　義近							
12	2 次元原子層を利用したスピン流回路の創製	新見　康洋	大阪大学	大学院理学研究科	Creation of spin current circuits using two-dimensional atomic layers	Yasuhiro Niimi	Osaka University

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：長谷川　幸雄							
13	^{3}He-^{4}He 希釈冷凍機と 14T 超伝導マグネットを組み合わせた複合極限環境下における STM の開発	河江　達也	九州大学	大学院工学研究院	Development of STM at very low-temperatures and strong magnetic fields	Tastuya Kawae	Kyushu University
担当所員：上床　美也							
14	有機伝導体の圧力効果	村田　恵三	大阪経済法科大学	21 世紀社会総合研究センター	Effect of pressure on the organic conductor	Keizo　Murata	Osaka University of Economics and Law
15	多重極限関連圧力装置の調整	高橋　博樹	日本大学	文理学部	Adjustment of cubic anvil apparatus	Hiroki Takahashi	Nihon University
16	希土類化合物の単結晶試料評価とその圧力効果	藤原　哲也	山口大学	大学院理工学研究科	Effect of Pressure on the Ce Compounds	Tetsuya Fujiwara	Yamaguchi University
17	希土類 122 化合物における圧力効果	繁岡　透	山口大学	大学院理工学研究科	Pressure effect of rare earth 122 compounds	Toru Shigeoka	Yamaguchi University
18	磁性体の圧力効果	巨海　玄道	久留米工業大学		Effect of pressure on the magnetic materials	Gendo Oomi	Kurume Institute of Technology
19	圧力下 NMR 測定法に関する開発	藤原　直樹	京都大学	大学院人間・環境学研究科	Development of NMR measurement method under high pressure	Naoki Fujiwara	Kyoto University
20	低温用マルチアンビル装置の開発	辺土　正人	琉球大学	理学部	Development of multi-anvil apparatus for low temperature	Masato Hedo	University of the Ryukyus
21	中性子回析に用いる圧力装置の開発	片野　進	埼玉大学	大学院理工学研究科	Developments of high pressure cell for neutron diffraction	Susumu Katano	Saitama University
22	擬一次元有機物質の圧力下物性研究	糸井　充穂	日本大学	医学部	Study on pressure induced superconductivity of quasi organic conductor	Miho Itoi	Nihon University
23	高圧下の比熱測定装置の開発	梅原　出	横浜国立大学	工学部	Development of apparatus for specific heat measurements under high pressure	Izuru Umehara	Yokohama National University
24	磁化測定装置の開発	名嘉　節	物質・材料研究機構		Development of the magnetometer	Takashi Naka	NIMS
25	AgPdCu 合金圧力セルを用いた磁場中比熱測定	河江　達也	九州大学	大学院工学研究院	Development of pressure cell for specific heat measurements under magnetic field	Tastuya Kawae	Kyushu University
26	3d 遷移金属化合物の圧力下に関する圧力効果	鹿又　武	東北学院大学	工学総合研究所	Effect of pressure on the 3d transition compounds	Takeshi Kanomata	Tohoku Gakuin University
27	希釈冷凍機温度で使用可能な 10GPa 級超高圧発生装置の開発	松林　和幸	電気通信大学	大学院情報理工学研究科	Development of 10GPa class high pressure apparatus for low temperature	Kazuyuki Matsubayashi	The University of Electro-Communications

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：山下　穣							
28	超低温度における重い電子系物質の量子振動測定	宍戸　寛明	大阪府立大学	大学院工学研究科	Quantum oscillation measurements of heavy-fermion materials at ultra-low temperatures	Hiroaki Shishido	Osaka Prefecture University
担当所員：柴山　充弘							
29	小型集束型小角散乱装置の高性能化及びそれによる応用研究	古坂　道弘	北海道大学	大学院工学研究院	Development of a compact focusing small-angle neutron scattering instrument and application research using the instrument	Michihiro Furusaka	Hokkaido University
30	中性子散乱装置の共同利用・開発による強相関電子系物質の構造物性の研究	岩佐　和晃	東北大学	大学院理学研究科	Structural studies of strongly correlated electron systems by usage of neutron scattering and instrumental developments	Kazuaki Iwasa	Tohoku University
31	湾曲大型２次元中性子検出器と低温振動写真撮影装置の開発	木村　宏之	東北大学	多元物質科学研究所	Development of Large-area curved two dimensional neutron detector and low temperature oscillating photographic device	Hiroyuki Kimura	Tohoku University
32	中性子散乱装置のアップグレードと共同利用研究の推進	藤田　全基	東北大学	金属材料研究所	Upgrading of the neutron scattering device and promotion of the research and public use	Masaki Fujita	Tohoku University
33	中性子散乱装置のアップグレード後の研究計画の実施と共同利用の推進	田畑　吉計	京都大学	大学院工学研究科	Progress of the joint research by using the neutron scattering instruments	Yoshikazu Tabata	Kyoto University
34	〃	松村　武	広島大学	大学院先端物質科学研究科	〃	Takeshi Matsumura	Hiroshima University
35	J-PARC/MLF と JRR-3 共存時代に向けた３軸型中性子散乱装置の高度化	松浦　直人	総合科学研究機構	東海事業センター	Upgrade of 3-axis neutron spectrometer for the oncoming coexistence of J-PARC/MLF and JRR-3	Masato Matsuura	CROSS
36	中性子分光器を用いた強相関電子系物質の微視的研究	桑原　慶太郎	茨城大学	大学院理工学研究科	Neutron scattering study of strongly correlated electron systems by using neutron spectrometers	Keitaro Kuwahara	Ibaraki University
37	高度化した３軸分光器を用いた共同利用の推進と物質科学研究の実施	横山　淳	茨城大学	理学部	Executing user program and study of material science with the advanced triple-axis spectrometers	Makoto Yokoyama	Ibaraki University
38	C1-3　ULS 極小角散乱装置 IRT	杉山　正明	京都大学	原子炉実験所	Development of micro-focusing small-angle neutron scattering spectrometer	Masaaki Sugiyama	Kyoto University
39	集光テスト用小型 SANS の開発及び冷中性子反射率計 / 干渉計のアップグレード	日野　正裕	京都大学	原子炉実験所	Development of compact focusing SANS instrument and improvement of cold neutron reflectometer and interferometer	Masahiro Hino	Kyoto University
40	集光テスト用小型 SANS の開発及び冷中性子反射率計・干渉計のアップグレード	北口　雅暁	名古屋大学	現象解析研究センター	Development of compact SANS and improvement of cold neutron reflectometer and interferometer	Masaaki Kitaguchi	Nagoya University
41	流動場でのソフトマターの構造変化に関する研究	高橋　良彰	九州大学	先導物質化学研究所	Studies on structural change of soft matter under flow field	Yoshiaki Takahashi	Kyushu University
42	三軸分光器を用いた極端条件下における物質科学研究の実施	阿曽　尚文	琉球大学	理学部	Material science studies under extreme conditions by using triple-axis spectrometers	Naofumi Aso	University of the Ryukyus

No.	課題名	氏名	所属		Title	Name	Organization
43	非イオン界面活性剤ベシクルにおける高圧下の２分子膜の熱揺らぎ	川端　庸平	首都大学東京	大学院理工学研究科	Bilayer undulation of a nonionic vesicle under high pressure	Youhei Kawabata	Tokyo Metropolitan University
44	中性子散乱研究計画の実施と共同利用の推進	伊藤　晋一	高エネルギー加速器研究機構	物質構造科学研究所	Propelling the inter university research cooperation	Shinichi Itoh	KEK
45	冷中性子干渉イメージング装置開発研究	大竹　淑恵	理化学研究所	光量子工学研究領域	Research and development of interferometric imaging instruments for cold neutron	Yoshie Otake	RIKEN
46	三軸分光器の高度化およびそれを用いたスピンダイナミクス研究	佐藤　卓	東北大学	多元物質科学研究所	Improvement of triple-axis spectrometer and its application to the spin dynamics research	Taku Sato	Tohoku University
47	高度化した三軸分光器を用いた強相関電子系物質の研究	南部　雄亮	東北大学	金属材料研究所	Study of strongly correlated electron systems using advanced triple-axis spectrometers	Yusuke Nambu	Tohoku University
48	小角中性子散乱による Li イオン電池用ゲル電解質の構造研究	藤井　健太	山口大学	大学院理工学研究科（工学系）	SANS study on high-toughness ion gels for Li-ion batteries	Kenta Fujii	Yamaguchi University
49	C1-2　SANS-U 及び C2-3-1　iNSE 装置 IRT	井上　倫太郎	京都大学	原子炉実験所	Development of small-angl neutron scattering and spin echo spectorometer	Rintaro Inoue	Kyoto University
担当所員：金道　浩一							
50	強磁場量子ビーム科学のためのパルスマグネットの開発	鳴海　康雄	東北大学	金属材料研究所	Developments of pulse magnets for synchrotron and neutron experiments in pulsed high magnetic fields	Yasuo Narumi	Tohoku University
51	85 テスラマグネットを用いた超音波測定の開発	吉澤　正人	岩手大学	大学院工学研究科	Development for ultrasonic measurements by use of 85 T-magnet	Masahito Yoshizawa	Iwate University
52	〃	中西　良樹	岩手大学	大学院工学研究科	〃	Yoshiki Nakanishi	Iwate University
担当所員：辛　埴							
53	高温超伝導体の高分解能光電子分光	藤森　淳	東京大学	大学院理学系研究科	Ultra-high resolution photoemission spectroscopy on high Tc superconductor	Atsushi Fujimori	The University of Tokyo
54	60-eV レーザーを用いた時間分解光電子分光の開発	石坂　香子	東京大学	大学院工学系研究科	The development of time-resolved photoemission using 60eV laser	Kyoko Ishizaka	The University of Tokyo
55	鉄系超伝導体のレーザー光電子分光	下志万　貴博	東京大学	大学院工学系研究科	Laser-ARPES on Fe superconductor	Takahiro Shimojima	The University of Tokyo
56	Bi 系超伝導体の角度分解光電子分光	竹内　恒博	豊田工業大学		Angle-resolved photoemission study on high Tc cuprate	Tsunehiro Takeuchi	Toyota Technological Institute
57	高分解能光電子分光による強相関物質の研究	横谷　尚睦	岡山大学	大学院自然科学研究科	Ultra-high resolution study on strongly correlated materials	Takayoshi Yokoya	Okayama University

No.	課題名	氏名	所属		Title	Name	Organization
58	酸化バナジウムの高分解能光電子分光	江口　律子	岡山大学	大学院自然科学研究科	Photoemission study on vanadium oxides	Ritsuko Eguchi	Okayama University
59	有機化合物の光電子分光	金井　要	東京理科大学	理工学部	Photoemission study on organic compounds	Kaname Kanai	Tokyo University of Science
60	重い電子系ウラン化合物の高分解能光電子分光	藤森　伸一	日本原子力研究開発機構	量子ビーム応用研究センター	Ultra high resolution photoemission study on heavy fermion Uranium compounds	Shinichi Fujimori	JAEA
61	レーザー光電子分光による酸化物薄膜の研究	津田　俊輔	物質・材料研究機構		Laser-photoemission study on oxide films	Shunsuke Tsuda	NIMS
62	４ｆ電子系物質の高分解能光電子分光	松波　雅治	豊田工業大学		Photoemission study on 4f materials	Masaharu Matsunami	Toyota Technological Institute
63	超高空間分解能光電子顕微鏡による磁区構造観察	中川　剛志	九州大学	大学院総合理工学研究院	Observation of magnetic domain structures by ultra-high resolution photoemission electron microscopy	Takeshi Nakagawa	Kyushu University
64	Mn 化合物の時間分解光電子分光	大川　万里生	東京理科大学	理学部	Time resolved photoemission on Mn compounds	Mario Okawa	Tokyo University of Science
65	収差補正型光電子顕微鏡の建設と利用研究	小嗣　真人	東京理科大学	基礎工学部	Construction and utilization research of aberration correction photoelectron emission microscopy	Masato Kotsugi	Tokyo University of Science
66	時間分解・マイクロビームラインの開発と研究	室　隆桂之	高輝度光科学研究センター		Development of micr- and time-resolved beamline	Takayuki Muro	JASRI
67	光電子分光法を用いた各種分子性結晶の電子状態の研究及び装置の低温化	木須　孝幸	大阪大学	大学院基礎工学研究科	Research on electron state of molecular crystals using photoemission spectroscopy	Takayuki Kisu	Osaka University
68	トポロジカル絶縁体の電子状態の解明	木村　昭夫	広島大学	大学院理学研究科	Electronic-structure study of topological insulators	Akio Kimura	Hiroshima University
担当所員：松田　巌							
69	高輝度放射光軟Ｘ線を用いた時間分解光電子分光による表面ダイナミクス研究	近藤　寛	慶應義塾大学	理工学部	Study of surface dynamics by time-resolved photoemission spectroscopy with high-brilliant soft x-ray synchrotron radiation	Hiroshi Kondoh	Keio University
70	軟Ｘ線アンジュレータビームラインの分光光学系の開発研究	雨宮　健太	高エネルギー加速器研究機構	物質構造科学研究所	Research and development of soft X-ray undulator beamline	Kenta Amemiya	KEK
71	光電子スピン検出器の開発・研究	奥田　太一	広島大学	放射光科学研究センター	Research and development of a new photoelectron spin detector	Taichi Okuda	Hiroshima University
72	光電子顕微鏡による磁性ナノ構造物質の磁化過程	木下　豊彦	高輝度光科学研究センター		Magnetization in process of magnetic nano structure by PEEM	Toyohiko Kinoshita	JASRI
73	高輝度軟Ｘ線を利用した強相関物質の電子状態研究	組頭　広志	高エネルギー加速器研究機構	物質構造科学研究所	Study of electronic states in strongly correlated materials with high brilliant soft-Xray	Hiroshi Kumigashira	KEK

No.	課題名	氏名	所属		Title	Name	Organization
74	二次元表示型スピン分解光電子エネルギー分析器の開発	大門　寛	奈良先端科学技術大学院大学	物質創成科学研究科	Development of 2D display type spin resolved photoelectron energy analyzer	Hiroshi Daimon	Nara Institute of Science and Technology
75	分子吸着系における時間分解光電子分光の研究	間瀬　一彦	高エネルギー加速器研究機構	物質構造科学研究所	Study of time-resolved photoemission spectroscopy for molecular adsorption system	Kazuhiko Mase	KEK
76	共鳴磁気光学カー効果の散乱理論研究	田口　宗孝	奈良先端科学技術大学院大学	物質創成科学研究科	Study of scattering theory for the resonant magneto-optical Kerr effect	Taguchi Munetaka	Nara Institute of Science and Technology
担当所員：原田　慈久							
77	軟Ｘ線吸収／発光分光法によるリチウムイオン電池電極材料の電子物性研究	細野　英司	産業技術総合研究所	エネルギー技術研究部門	Study on the electronic property of electrode materials for Li-ion batteries by soft X-ray absorption/emission spectroscopy	Eiji Hosono	AIST
78	〃	朝倉　大輔	産業技術総合研究所	エネルギー技術研究部門	〃	Daisuke Asakura	AIST
79	高分解能光電子分光による酸化バナジウムの研究	藤原　秀紀	大阪大学	大学院基礎工学研究科	Study on vanadium oxides by high resolution Photoemission	Hidenori Fujiwara	Osaka University
80	軟Ｘ線発光・共鳴非弾性散乱分光の磁気円・線二色性測定システムの構築	菅　滋正	大阪大学	産業科学研究所	Construction of a noble system for circular and linear dichroism in soft X-ray emission and RIXS spectroscopy	Suga Shigemasa	Osaka University
81	極小角Ｘ線散乱と軟Ｘ線吸収・発光分光によるソフトマテリアルの物性研究	雨宮　慶幸	東京大学	大学院新領域創成科学研究科	Study on the physical properties of soft materials by a combination of ultra-small-angle X-ray scattering and soft X-ray absorption/emission spectroscopy	Yoshiyuki Amemiya	The University of Tokyo
82	二次元原子薄膜トランジスタの電子状態のナノ分析（Ｉ）	吹留　博一	東北大学	電気通信研究所	Nanoscale analysis of electronic states of graphene device	Hirokazu Fukidome	Tohoku University
83	省エネ・創エネ・蓄電デバイスのオペランド分光	尾嶋　正治	東京大学	放射光連携研究機構	Operando nano-spectroscopy for energy efficient, power generation and energy storage devices	Masaharu Oshima	The University of Tokyo
担当所員：和達　大樹							
84	共鳴硬・軟Ｘ線散乱による構造物性と磁性研究	村上　洋一	高エネルギー加速器研究機構	物質構造科学研究所	Studying structures and magnetism of materials by resonant hard and soft x-ray scattering	Youichi Murakami	KEK
85	三次元 nanoESCA による実デバイスのオペランド電子状態解析	永村　直佳	物質・材料研究機構		Operando analysis of the electronic structure of actual devices by 3DnanoESCA	Naoka Nagamura	NIMS
86	共鳴軟Ｘ線散乱を用いた外場下での電子秩序状態の解明	山崎　裕一	東京大学	大学院工学系研究科	Observation of electric ordered state under external field by resonant soft x-ray scattering	Yuichi Yamasaki	The University of Tokyo

一般研究員 / General Researcher

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：榊原　俊郎							
1	強相関電子系化合物の秩序相に対する結晶対称性および軌道縮退の効果	横山　淳	茨城大学	理学部	Effects of crystal symmetry and orbital degeneracy in ordered states of strongly correlated electron systems	Makoto Yokoyama	Ibaraki University
2	〃	佐近　優美	茨城大学	大学院理工学研究科	〃	Yumi Sakon	Ibaraki University
3	超伝導対称性決定のための実験的、理論的研究	町田　一成	立命館大学	理工学部	Theoretical and experimental studies of determination of superconducting symmetry	Kazunari Machida	Ritsumeikan University
4	六方晶 $Pr_2Pt_6Ga_{15}$ の極低温磁化・比熱測定	松本　裕司	名古屋工業大学	大学院工学研究科	Magnetization and specific heat measurements of $Pr_2Pt_6Ga_{15}$ at low temperature	Yuji Matsumoto	Nagoya Institute of Technology
5	〃	植田　拓也	名古屋工業大学	大学院工学研究科	〃	Takuya Ueda	Nagoya Institute of Technology
6	近藤半導体の秩序状態における極低温磁化測定	田山　孝	富山大学	大学院理工学研究部（理学）	Low-temperature magnetization measurements of ordered states in Kondo semiconductor	Takashi Tayama	University of Toyama
7	〃	湯谷　大志郎	富山大学	大学院理工学教育部 (理学)	〃	Daishirou Yutani	University of Toyama
8	極低温磁化測定による $SmTr_2Zn_{20}$ (Tr = Rh, Ir) の一次転移と磁場誘起相の検証	加瀬　直樹	新潟大学	大学院自然科学研究科	Magnetization measurements of anti-ferromagnetic compound $SmTr_2Zn_{20}$ (Tr = Rh, Ir) with first-order transition and field-induced phase transition	Kase Naoki	Niigata University
9	〃	棚橋　正貴	新潟大学	大学院自然科学研究科	〃	Tanahashi Masataka	Niigata University
10	層状 BiS_2 化合物 $LnOBiS_2$ における異常低エネルギー励起の起源解明	東中　隆二	首都大学東京	大学院理工学研究科	Investigation of the origin of the exotic low temperature excitation in $LnOBiS_2$	Ryuji Higashinaka	Tokyo Metropolitan University
11	〃	浅野　卓也	首都大学東京	大学院理工学研究科	〃	Takuya Asano	Tokyo Metropolitan University
12	ルテニウム酸化物 Sr_2RuO_4 における一軸性圧力下比熱測定	矢口　宏	東京理科大学	理工学部	Specific heat measurements of the ruthenate Sr_2RuO_4 under uniaxial pressure	Hiroshi Yaguchi	Tokyo University of Science
13	〃	山崎　照夫	東京理科大学	理工学部	〃	Teruo Yamazaki	Tokyo University of Science
14	スピンと軌道の特異な結合を有する物質の高圧合成	有馬　孝尚	東京大学	大学院新領域創成科学研究科	High-pressure syntheses of materials with unique spin-orbital coupling	Takahisa Arima	The University of Tokyo
15	〃	徳永　祐介	東京大学	大学院新領域創成科学研究科	〃	Yusuke Tokunaga	The University of Tokyo

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16	〃	阿部　伸行	東京大学	大学院新領域創成科学研究科	〃	Nobuyuki Abe	The University of Tokyo
17	〃	松浦　慧介	東京大学	大学院新領域創成科学研究科	〃	Keisuke Matsuura	The University of Tokyo
18	〃	鷲見　浩樹	東京大学	大学院新領域創成科学研究科	〃	Hiroki Sumi	The University of Tokyo
19	〃	藤間　友理	東京大学	大学院新領域創成科学研究科	〃	Yuri Fujima	The University of Tokyo
20	有機無機ハイブリット磁性体の低温物性	山口　博則	大阪府立大学	大学院理学系研究科	Low temperature physical properties of metal-radical complex matarials	Hironori Yamaguchi	Osaka Prefecture University
21	〃	佐々木　裕太	大阪府立大学	大学院理学系研究科	〃	Yuta Sasaki	Osaka Prefecture University
22	〃	岡田　将孝	大阪府立大学	大学院理学系研究科	〃	Masataka Okada	Osaka Prefecture University
23	$Tb_2+xTi_{2-x}O_7+y$ における量子スピン液体状態の研究	門脇　広明	首都大学東京	大学院理工学研究科	Quantum spin liquid in $Tb_2+xTi_{2-x}O_7+y$	Hiroaki Kadowaki	Tokyo Metropolitan University
24	〃	枝元　広紀	首都大学東京	大学院理工学研究科	〃	Hiroki Edamoto	Tokyo Metropolitan University
担当所員：瀧川　仁							
25	有機一次元三角格子モット絶縁体における磁場誘起相転移の探索	清水　康弘	名古屋大学	大学院理学研究科	Magnetic eld induced transition in an organic Mott insulator with one-dimensional triangular lattice	Yasuhiro Shimizu	Nagoya University
担当所員：森　初果							
26	強相関有機導体で発現する電荷過冷却液体・電荷ガラス状態における電荷 - 格子相互作用の研究	橋本　顕一郎	東北大学	金属材料研究所	Study of the charge-lattice interaction in the charge supercooled liquid and glass states in strongly correlated organic compounds	Kenichiro Hashimoto	Tohoku University
担当所員：中辻　知							
27	Ce および Yb 系強相関化合物における磁場中ミリケルビン領域での物性測定	海老原　孝雄	静岡大学	理学部	Low temperature physical properties at magnetic fields in strongly correlated electron system	Takao Ebihara	Shizuoka University
担当所員：リップマー　ミック							
28	遷移金属酸化物ヘテロ界面金属層における 3d、5d 遷移金属ドープの影響	李　美希	奈良先端科学技術大学院大学	物質創成科学研究科	Effects of the 3d,5d transition metal on metallic conductivity at transition metal oxides hetero interface	Mihee Lee	Nara Institute of Science and Technology

No.	課題名	氏名	所属		Title	Name	Organization
29	真空蒸着法で製膜されたペロブスカイト太陽電池の構造・機能性の評価	川嶋　一裕	東京大学	大学院新領域創成科学研究科	A study of structural and functional properties of perovskite solar cells fabricated by vacuum evapolation method	Kazuhiro Kawashima	The University of Tokyo
30	新規ウルツァイト型四面体強誘電体材料の創成	安井　伸太郎	東京工業大学	応用セラミックス研究所	The creation of novel wurtzite-type tetrahedral ferroelectric materials	Shintaro Yasui	Tokyo Institute of Technology
31	パルスレーザー堆積法による多成分系ナノ相分離酸化物薄膜の構造と物性	松本　祐司	東北大学	大学院工学研究科	Structural and material-property characterization of multi component oxide films with nano-scale phase separation	Yuji Matsumoto	Tohoku University
32	〃	丸山　伸伍	東北大学	大学院工学研究科	〃	Shingo Maruyama	Tohoku University
33	〃	川平　祐太	東北大学	大学院工学研究科	〃	Yuta Kawahira	Tohoku University
34	太陽電池用シリコン還元プロセスにおけるニッケルフラックス効果の解析	伊高　健治	弘前大学	北日本新エネルギー研究所	Nickel Flux-effect under the direct reduction process for solar grade silicon	Kenji Itaka	Hirosaki University
担当所員：家　泰弘							
35	Pb 置換 Bi 系超伝導体のホール係数測定（３）	神戸　士郎	山形大学	大学院理工学研究科	Hall coefficient measurement of Pb-substituted Bi-based superconductors(3)	Shiro Kambe	Yamagata University
36	〃	魏　毓良	山形大学	工学部	〃	Gi Yokuryou	Yamagata University
37	〃	鈴木　沙耶	山形大学	大学院理工学研究科	〃	Saya Suzuki	Yamagata University
38	〃	鈴木　健弘	山形大学	大学院理工学研究科	〃	Takehiro Suzuki	Yamagata University
39	〃	増川　拓未	山形大学	大学院理工学研究科	〃	Takumi Masukawa	Yamagata University
担当所員：吉信　淳							
40	水の光分解触媒素材用酸窒化物及び酸硫化物の構造と物性の研究	山田　太郎	東京大学	大学院工学系研究科	Structural and physical studies of photoactive oxynitrides and oxysulfides as materials for water splitting catalysts	Taro Yamada	The University of Tokyo
41	〃	鐘　苗	東京大学	大学院工学系研究科	〃	Zhong Miao	The University of Tokyo
42	〃	西山　洋	東京大学	大学院工学系研究科	〃	Hiroshi Nishiyama	The University of Tokyo
43	〃	後藤　陽介	東京大学	大学院工学系研究科	〃	Yosuke Goto	The University of Tokyo

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44	〃	坂井　延寿	東京大学	大学院工学系研究科	〃	Enju Sakai	The University of Tokyo
45	〃	守屋　映祐	東京大学	大学院工学系研究科	〃	Yosuke Moriya	The University of Tokyo
46	〃	岩瀬　元希	明治大学	研究・知財戦略機構	〃	Motoki Iwase	Meiji University
47	Ag(110) 上に作成した (1 × 1)TiO_2 薄膜の STM による構造解析	枝元　一之	立教大学	理学部	STM study on the structure of a (1 × 1) TiO_2 film formed on Ag(110)	Rikio Settai	Rikkyo University
48	HREELS による非占有バンドでの電子格子相互作用：単結晶グラファイトの研究	田中　慎一郎	大阪大学	産業科学研究所	The electron-phonon coupling in the empty bands investigated by the HREELS: A study of single crystalline graphite	Shin-ichiro Tanaka	Osaka University
49	Si(001) 表面上の準安定共吸着過程の透過 FTIR 測定	大野　真也	横浜国立大学	大学院工学研究院	FTIR measurements of metastable physisorption processes on Si(001)	Shinya Ohno	Yokohama National University
50	〃	清水　正太郎	横浜国立大学	大学院工学府	〃	Shimizu Shotaro	Yokohama National University
51	水素終端 Si(110)-(1 × 1) 表面のエッチング過程	須藤　彰三	東北大学	大学院理学研究科	Wet chemical etching process of the hydrogen terminated Si(110)-(1 × 1) surfaces	Shozo Suto	Tohoku University
52	〃	川本　絵里奈	東北大学	大学院理学研究科	〃	Erina Kawamoto	Tohoku University
53	脳内物質ドーパミン分子の高分解能振動分光	米田　忠弘	東北大学	多元物質科学研究所	High resolution vibration spectroscopy of dopamine molecules	Tadahiro Komeda	Tohoku University
54	〃	高岡　毅	東北大学	多元物質科学研究所	〃	Tsuyoshi Takaoka	Tohoku University
55	〃	朝見　翔	東北大学	多元物質科学研究所	〃	Sho Asami	Tohoku University
担当所員：勝本　信吾							
56	グラフェン、カーボンナノチューブ、及び二次元単原子層の新奇物性の研究	春山　純志	青山学院大学	大学院理工学研究科	Study of novel phenomena in graphene, carbon nanotube, and 2D mono-atomic layers	Jyunji Haruyama	Aoyama Gakuin University
57	〃	大畠　智佳	青山学院大学	大学院理工学研究科	〃	Chika Ohata	Aoyama Gakuin University
58	〃	野村　くみ子	青山学院大学	大学院理工学研究科	〃	Kumiko Nomura	Aoyama Gakuin University
59	〃	深井　佳乃	青山学院大学	大学院理工学研究科	〃	Yoshino Fukai	Aoyama Gakuin University

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60	〃	片桐　勇人	青山学院大学	大学院理工学研究科	〃	Yoto Katagiri	Aoyama Gakuin University
61	交流熱伝導率測定のための温度計開発	井澤　公一	東京工業大学	大学院理工学研究科	Development of thermometry for ac thermal-conductivity measurements	Koichi Izawa	Tokyo Institute of Technology
担当所員：小森　文夫							
62	レアメタルフリー磁性材料の磁気異方性発現メカニズムの解析	小嗣　真人	東京理科大学	基礎工学部	Analysis of magnetic anisotropy of rare-metal-free magnetic materials	Masato Kotsugi	Tokyo University of Science
63	Ag 超薄膜 /Si(111) 基板界面への水素吸蔵	中辻　寛	東京工業大学	大学院総合理工学研究科	Hydrogen absorption at the interface of Ag thin film and Si(111) substrate	Kan Nakatsuji	Tokyo Institute of Technology
64	金属／半導体表面上ナノ構造の形成とナノ構造を持つ表面における光学応答の時間分解測定	河村　紀一	日本放送協会	放送技術研究所	Time resolved spectroscopy of optical responses from nano-structures on metal / semiconductor surfaces	Norikazu Kawamura	NIPPON HOSO KYOKAI
65	Al-Pd-Ru 準結晶・近似結晶における空孔濃度の研究	金沢　育三	東京学芸大学	教育学部	Positron-annihilation studies of Al-Pd-Mn quasicrystal and its approximant crystals	Ikuzo Kanazawa	Tokyo Gakugei University
66	〃	佐々木　友彰	東京学芸大学	大学院教育学研究科	〃	Tomoaki Sasaki	Tokyo Gakugei University
担当所員：長谷川　幸雄							
67	二ホウ化物薄膜上エピタキシャルシリセン及びゲルマニウム層の低温走査トンネル顕微鏡観察	高村　由起子	北陸先端科学技術大学院大学	マテリアルサイエンス研究科	Low temp. STM investigation of epitaxial silicene and germanium on diboride	Yukiko Takamura	Japan Advanced Institute of Science and Technology
68	〃	アントワーヌ　フロランス	北陸先端科学技術大学院大学	マテリアルサイエンス研究科	〃	Antoine Fleurence	Japan Advanced Institute of Science and Technology
69	〃	米澤　隆宏	北陸先端科学技術大学院大学	マテリアルサイエンス研究科	〃	Takahiro Yonezawa	Japan Advanced Institute of Science and Technology
70	重い電子系超伝導の実空間観察のための超低温・強磁場の小型 STM の開発	河江　達也	九州大学	大学院工学研究院	Development of a miniature STM for low-temperature and high-eld measurements of heavy fermion superconductors	Tastuya Kawae	Kyushu University
71	〃	高田　弘樹	九州大学	大学院工学府	〃	Hiroki Takata	Kyushu University
72	〃	志賀　雅亘	九州大学	大学院工学府	〃	Masanobu Shiga	Kyushu University
担当所員：山下　穣							
73	三角格子構造をもつ有機導体の電荷グラス状態における熱伝導率測定	橋本　顕一郎	東北大学	金属材料研究所	Thermal conducitivity measurements in a charge-glass state of an organic compound with a triangular lattice	Kenichiro Hashimoto	Tohoku University

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74	超流動 He-3,A1 相中のスピン流れと電場の交差相関の探索	白濱　圭也	慶應義塾大学	理工学部	Study of cross-correlation between spin flow and electric field in superfluid He-3 A1	Keiya Shirahama	Keio University
75	〃	山口　明	兵庫県立大学	大学院物質理学研究科	〃	Akira Yamaguchi	The University of Hyogo
76	〃	村川　智	東京大学	低温センター	〃	Satoshi Murakawa	The University of Tokyo
77	〃	互井　通裕	慶應義塾大学	大学院理工学研究科	〃	Michihiro Tagai	Keio University
担当所員：上床　美也							
78	導電性ラングミュア・ブロジェット膜の高圧下の電気的性質に関する研究	三浦　康弘	桐蔭横浜大学	大学院工学研究科	Studies on electrical properties of conductive langmuir-blodgett films under high pressure	Yasuhiro Miura	Toin University of Yokohama
79	平面四配位鉄酸化物における電荷移動転移温度の圧力依存性	山本　隆文	京都大学	大学院工学研究科	Pressure dependence of charge transfer transition temperature of square planar iron oxide	Takafumi Yamamoto	Kyoto University
80	〃	小林　洋治	京都大学	大学院工学研究科	〃	Yoji Kobayashi	Kyoto University
81	〃	竹入　史隆	京都大学	大学院工学研究科	〃	Takeiri Fumitaka	Kyoto University
82	〃	村上　泰斗	京都大学	大学院工学研究科	〃	Taito Murakami	Kyoto University
83	三元系化合物 $EuCuP_2$ の比熱測定	藤原　哲也	山口大学	大学院理工学研究科	Specific measurement of ternary compound $EuCuP_2$	Tetsuya Fujiwara	Yamaguchi University
84	〃	繁岡　透	山口大学	大学院理工学研究科	〃	Toru Shigeoka	Yamaguchi University
85	Pr-Zn-Ge 三元系新規化合物の合成および単結晶育成	藤原　哲也	山口大学	大学院理工学研究科	Synthesis and single crystal growth of Pr-Zn-Ge novel ternary intermetallics	Tetsuya Fujiwara	Yamaguchi University
86	〃	繁岡　透	山口大学	大学院理工学研究科	〃	Toru Shigeoka	Yamaguchi University
87	$LaFe_2P_2$ の高圧力下電気抵抗測定	藤原　哲也	山口大学	大学院理工学研究科	Resistivity measurement of $LaFe_2P_2$ under high pressure	Tetsuya Fujiwara	Yamaguchi University
88	〃	繁岡　透	山口大学	大学院理工学研究科	〃	Toru Shigeoka	Yamaguchi University
89	一次元電荷秩序系有機導体 δ c-$(BPDT\text{-}TTF)_2ICl_2$ の温度圧力相図の研究	橋本　顕一郎	東北大学	金属材料研究所	Study of the temperature-pressure phase diagram of the one-dimensional charge-ordered organic compound δ c -$(BPDT\text{-}TTF)_2ICl_2$	Kenichiro Hashimoto	Tohoku University

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90	〃	小林　亮太	東北大学	大学院理学研究科	〃	Ryota Kobayashi	Tohoku University
91	多形化合物 RIr_2Si_2(R= 希土類）の磁気転移　5	繁岡　透	山口大学	大学院理工学研究科	Magnetic transition of polymorphic compound RIr_2Si_2(R=rare earth) 5	Toru Shigeoka	Yamaguchi University
92	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
93	擬三元系 (Ho,R)Rh_2Si_2 単結晶の磁気特性 2	繁岡　透	山口大学	大学院理工学研究科	Magnetic characteristics of pseudoternary system (Ho,Gd) Rh_2Si_2 single crystal 2	Toru Shigeoka	Yamaguchi University
94	〃	藤原　哲也	山口大学	大学院理工学研究科	〃	Tetsuya Fujiwara	Yamaguchi University
95	圧力下で価数転移を示す Eu 化合物の探索	本多　史憲	東北大学	金属材料研究所	Investigation of valence transition of Eu compounds under high pressure	Honda Fuminori	Tohoku University
96	〃	大貫　惇睦	琉球大学	理学部	〃	Yoshichika Onuki	University of the Ryukyus
97	$Yb_2Pt_6X_{15}$(X=Al, Ga) の高圧下電気抵抗測定	松本　裕司	名古屋工業大学	大学院工学研究科	Electrical resistivity measurements of $Yb_2Pt_6X_{15}$(X=Al, Ga) under high pressure	Yuji Matsumoto	Nagoya Institute of Technology
98	〃	中村　友紀	名古屋工業大学	大学院工学研究科	〃	Yuki Nakamura	Nagoya Institute of Technology
99	有機導体研究に向けた静水圧高圧技術の開発	村田　惠三	大阪経済法科大学	21 世紀社会総合研究センター	Development of high pressure technique orienting to the research of organic concductors	Keizo Murata	Osaka University of Economics and Law
100	ハロゲン架橋金混合原子価錯体 , $Cs_2Au_2X_6$ (X = Cl, Br, I) の特異な原子価状態に由来する高圧下伝導挙動の研究	榎本　真哉	東京理科大学	理学部	Investigation of the high pressure effect on the conductivity of a series of halogen-bridged gold mixed valence complexes, $Cs_2Au_2X_6$ (X = Cl, Br, I).	Masaya Enomoto	Tokyo University of Science
101	〃	小島　憲道	豊田理化学研究所		〃	Kojima Norimichi	Toyota Physical and Chemical Research Institute
102	充填スクッテルダイト化合物の超伝導転移温度の圧力変化	川村　幸裕	室蘭工業大学	大学院工学研究科	Pressure effect of superconducting transition temperature on filled skutterudite compounds	Yukihiro Kawamura	Muroran Institute of Technology
103	〃	出南　真吾	室蘭工業大学	大学院工学研究科	〃	Shingo Deminami	Muroran Institute of Technology
104	Co 基ホイスラー合金における圧力誘起マルテンサイト変態に関する研究	重田 出	鹿児島大学	大学院理工学研究科	Study on pressure-induced martensitic phase transformation in Co-based Heusler alloys	Shigeta Iduru	Kagoshima University
105	〃	藤本　祐太郎	鹿児島大学	大学院理工学研究科	〃	Yutaro Fujimoto	Kagoshima University
106	YbH_2+x の磁性と伝導	中村　修	岡山理科大学	学外連携推進室	Magnetic and transport properties in YbH_2+x	Osamu Nakamura	Okayama University of Science

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107	Sr_2MO_4 (M = V, Cr) の高圧下電気抵抗測定	桜井　裕也	物質・材料研究機構		Resistivity measurements under pressure for Sr_2MO_4 (M = V, Cr)	Hiroya Sakurai	NIMS
108	強相関型セリウム合金の磁性と超伝導	雨海　有佑	室蘭工業大学	大学院工学研究科	Magnetism and superconductivity in the strongly correlated Ce alloys	Yusuke Amakai	Muroran Institute of Technology
109	$YbCo_2Zn_{20}$ の Co 元素位置の置換効果 II	阿曽　尚文	琉球大学	理学部	Substitution effect at Co element in $YbCo_2Zn_{20}$ II	Naofumi Aso	University of the Ryukyus
110	〃	小林　理気	琉球大学	理学部	〃	Riki Kobayashi	University of the Ryukyus
111	〃	比嘉　泰之	琉球大学	大学院理工学研究科	〃	Yasuyuki higa	University of the Ryukyus
112	回転希釈冷凍機を用いた量子液体・固体研究	白濱　圭也	慶應義塾大学	理工学部	Study of quantum fluids and solids using rotating dilution refrigerator	Keiya Shirahama	Keio University
113	〃	高橋　大輔	足利工業大学	共通課程	〃	Daisuke Takahashi	Ashikaga Institute of Technology
114	〃	村川　智	東京大学	低温センター	〃	Satoshi Murakawa	The University of Tokyo
115	〃	立木　智也	慶應義塾大学	大学院理工学研究科	〃	Tomoya Tsuiki	Keio University
116	$YbCo_2Zn_{20}$ の Zn 元素位置の置換効果 II	阿曽　尚文	琉球大学	理学部	Substitution effect at Zn element in $YbCo_2Zn_{20}$ II	Naofumi Aso	University of the Ryukyus
117	〃	小林　理気	琉球大学	理学部	〃	Riki Kobayashi	University of the Ryukyus
118	〃	高村　治希	琉球大学	大学院理工学研究科	〃	Haruki Takamura	University of the Ryukyus
119	強相関型セリウム化合物の量子相転移と磁気的性質	村山　茂幸	室蘭工業大学	大学院工学研究科	Quantum phase transition and magnetic properties in the strongly correlated Ce compounds	Shigeyuki Murayama	Muroran Institute of Technology
120	Mn_2Sb 基のメタ磁性転移への元素置換効果	三井　好古	鹿児島大学	大学院理工学研究科	Substitution effect of metamagnetic transition of Mn_2Sb-based magnetic material	Yoshifuru Mitsui	Kagoshima University
121	〃	若森　太音	鹿児島大学	大学院理工学研究科	〃	Taoto Wakamori	Kagoshima University
122	Cr 基遍歴電子強磁性体の磁気特性	三井　好古	鹿児島大学	大学院理工学研究科	Magnetic properties of Cr-based itinerant ferromagnetic materials	Yoshifuru Mitsui	Kagoshima University
123	〃	吉永　総志	鹿児島大学	大学院理工学研究科	〃	Soshi Yoshinaga	Kagoshima University

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124	$CeTX_3$(T: 遷移金属 ,X:Ge,Si) の圧力下電気抵抗測定	広瀬　雄介	新潟大学	理学部	Electrical resistivity measurement of $CeTX_3$ (T:Transition Metal, X:Si,Ge) under high pressure	Hirose Yusuke	Niigata University
125	〃	目黒　凌平	新潟大学	大学院自然科学研究科	〃	Ryohei Meguro	Niigata University
126	ホイスラー化合物強磁性体 Fe_2CoGa の高圧化磁化測定	伊藤　昌和	鹿児島大学	大学院理工学研究科	Magnetization of Heusler compoundFe_2CoGa under pressure	Masakazu Ito	Kagoshima University
127	〃	松隈　秀憲	鹿児島大学	大学院理工学研究科	〃	Hidenori Matsuguma	Kagoshima University
128	Mn_2Sb 基メタ磁性体の磁気特性	小山　佳一	鹿児島大学	大学院理工学研究科	Magnetic properties of Mn_2Sb-based metamagnets	Keiichi Koyama	Kagoshima University
129	〃	アッドライン　ンゴジ　ムウッド	鹿児島大学	大学院理工学研究科	〃	Adline Ngozi Nwodo	Kagoshima University
130	有機分子性導体の高圧物性の研究	鳥塚　潔	武蔵野大学	教育学部	Studies on high pressure properties of organic molecular conductors	Kiyoshi Torizuka	Musashino University
131	圧力誘起価数転移の探索と高圧下輸送特性	辺土　正人	琉球大学	理学部	Searching of pressure-induced valence transition and transport properties under high pressure	Masato Hedo	University of the Ryukyus
132	〃	安次富　洋介	琉球大学	大学院理工学研究科	〃	Yousuke Ashitomi	University of the Ryukyus
133	遷移金属化合物の高圧力下の輸送特性	仲間 隆男	琉球大学	理学部	Pressure effect on transport properties of transition metal compounds	Takao Nakama	University of the Ryukyus
134	〃	照屋　淳志	琉球大学	大学院理工学研究科	〃	Teruya Atsushi	University of the Ryukyus
135	〃	屋良　朝之	琉球大学	大学院理工学研究科	〃	Tomoyuki Yara	University of the Ryukyus
136	価数揺動物質の高圧力中輸送特性の研究	仲間 隆男	琉球大学	理学部	Trasport properties of valence fluctuating compounds under pressure	Takao Nakama	University of the Ryukyus
137	〃	鈴木　史記	琉球大学	大学院理工学研究科	〃	Fuminori Suzuki	University of the Ryukyus
138	ウルマナイト型化合物の高圧下における物性研究	仲間 隆男	琉球大学	理学部	Physical properties of the Ullmannite-type compounds under high pressure	Takao Nakama	University of the Ryukyus
139	〃	西村　健吾	琉球大学	大学院理工学研究科	〃	Kengo Nishimura	University of the Ryukyus
140	空間反転対称性のない遷移金属間化合物とその関連物質の高圧下輸送特性	辺土　正人	琉球大学	理学部	Transport properties of non-centrosymmetric transition metals compounds under high pressure	Masato Hedo	University of the Ryukyus

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141	〃	垣花　将司	琉球大学	大学院理工学研究科	〃	Masashi Kakihana	University of the Ryukyus
142	TmB_4 の磁気準周期秩序相における圧力効果	伊賀　文俊	茨城大学	理学部	Pressure effect on the magnetic quasi-period ordered phase in TmB_4	Fumitoshi Iga	Ibaraki University
143	〃	道村　真司	埼玉大学	研究機構科学分析支援センター	〃	Shinji Michimura	Saitama University
144	希土類化合物における価数揺らぎの研究	中野　智仁	新潟大学	大学院自然科学研究科	Study of the valence fluctuation of rare-earth compounds	Nakano Tomohito	Niigata University
145	〃	高橋　英亮	新潟大学	大学院自然科学研究科	〃	Eisuke Takahashi	Niigata University
146	層状希土類化合物における新奇量子臨界現象の探索とその圧力効果	中野　智仁	新潟大学	大学院自然科学研究科	Investigation of novel quantum critical phenomena in layerd rare earth compound and its pressure effect	Nakano Tomohito	Niigata University
147	〃	寺島　宗一郎	新潟大学	大学院自然科学研究科	〃	Terashima Soichiro	Niigata University
148	平行平板間の超流動ヘリウム 3-A 相での新奇量子渦の検出	石川　修六	大阪市立大学	理学研究科	Investigation of the novel quantized vortices in superfluid ^{3}He-A phase between parallel plates	Osamu Ishikawa	Osaka City University
149	鉄系超伝導体関連化合物 $K_xFe_{2-y}S_2$ の圧力下電気抵抗測定	小林　寿夫	兵庫県立大学	大学院物質理学研究科	Electrical resistivity measurement under high pressure on $K_xFe_{2-y}S_2$ related with iron based superconductors	Hisao Kobayashi	The University of Hyogo
担当所員：川島　直輝							
150	テンソルネットワーク変分法の並列化	原田　健自	京都大学	大学院情報学研究科	Parallelization of a tensor network variational method	Kenji Harada	Kyoto University
担当所員：廣井　善二							
151	超高圧プレスを用いた新規プロトニクス酸化物のソフト化学的合成法の検討	山口　周	東京大学	大学院工学系研究科	Oxide-Protonics materials synthesis by combined use of soft chemical method and high pressure	Shu Yamaguchi	The University of Tokyo
152	〃	三好　正悟	東京大学	大学院工学系研究科	〃	Shogo Miyoshi	The University of Tokyo
153	〃	田中　和彦	東京大学	大学院工学系研究科	〃	Kazuhiko Tanaka	The University of Tokyo
154	〃	本多　慶一郎	東京大学	大学院工学系研究科	〃	Keiichiro Honda	The University of Tokyo
155	溶融亜鉛メッキ合金相の応力誘起変態	山口　周	東京大学	大学院工学系研究科	Stress-induced phase transformation of Fe-Zn alloy formed in hot-dip process	Shu Yamaguchi	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
156	〃	三好　正悟	東京大学	大学院工学系研究科	〃	Shogo Miyoshi	The University of Tokyo
157	〃	田中　和彦	東京大学	大学院工学系研究科	〃	Kazuhiko Tanaka	The University of Tokyo
158	対向型ダブルトロイダルアンビルを用いた 20 GPa までの圧力発生	篠崎　彩子	名古屋大学	大学院環境学研究科	High pressure experiments up to 20 GPa using the opposed-anvil type pressure apparatus	Ayako Shiozaki	Nagoya University
159	Eu 固溶平面四配位鉄酸化物の高圧 X 線回折測定	陰山　洋	京都大学	大学院工学研究科	High pressure X-ray diffraction measuremnt for Eu-substituted square iron oxide	Hiroshi Kageyama	Kyoto University
160	〃	セドリック タッセル	京都大学	大学院工学研究科	〃	Cedric Tassel	Kyoto University
161	〃	山本　隆文	京都大学	大学院工学研究科	〃	Takafumi Yamamoto	Kyoto University
162	〃	松本　勇輝	京都大学	大学院工学研究科	〃	Yuki Matsumoto	Kyoto University
163	分子性希ガス化合物の高圧合成と評価	丹羽　健	名古屋大学	大学院工学研究科	High pressure synthesis and characterization of molecular noble gas compounds	Ken NIWA	Nagoya University
164	〃	松崎　郁弥	名古屋大学	大学院工学研究科	〃	Matsuzaki Fumiya	Nagoya University
165	鉄族元素を含むイオン伝導性結晶の高圧合成	丹羽　健	名古屋大学	大学院工学研究科	High pressure synthesis of novel ion conductive oxides containing iron group elements	Ken Niwa	Nagoya University
166	〃	廣瀬　瑛一	名古屋大学	大学院工学研究科	〃	Eiichi Hirose	Nagoya University
167	新規 A サイト秩序型ペロブスカイト複酸化物の高圧高温合成	志村　元	名古屋大学	大学院工学研究科	High pressure synthesis of novel A-site ordered perovskites	Shimura Gen	Nagoya University
168	難窒化性後期遷移金属窒化物の高圧合成	白子　雄一	名古屋大学	大学院工学研究科	High pressure synthesis of late transition metal nitrides	Yuichi Shirako	Nagoya University
169	〃	寺部　俊紀	名古屋大学	大学院工学研究科	〃	Terabe Toshiki	Nagoya University
170	新規アンチポストペロブスカイト及びその関連窒化物の高圧合成	白子　雄一	名古屋大学	大学院工学研究科	High pressure synthesis of new nitrides with anti-post-perovskite or the related structure	Yuichi Shirako	Nagoya University
171	〃	山田　祥吾	名古屋大学	大学院工学研究科	〃	Shogo Yamada	Nagoya University
172	超高圧合成手法を用いた燐に富む新規遷移金属燐化物の創製	長谷川　正	名古屋大学	大学院工学研究科	Synthesis of novel phosphor-rich transition-metal phosphides in ultra-high pressures	Masashi Hasegawa	Nagoya University

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173	〃	西堂園　啓太	名古屋大学	大学院工学研究科	〃	Keita Nishidouzono	Nagoya University
174	アルカリ土類金属元素を含む新充填スクッテルダイト化合物の高圧合成	関根　ちひろ	室蘭工業大学	大学院工学研究科	High-pressure synthesis of alkaline earth metal based new filled skutterudite compounds	Chihiro Sekine	Muroran Institute of Technology
175	〃	三影　勇人	室蘭工業大学	大学院工学研究科	〃	Hayato Mikage	Muroran Institute of Technology
176	高圧下でのアミノ酸のペプチド化反応の観察	鍵　裕之	東京大学	大学院理学系研究科	Peptide formation of amino acids under high pressure	Hiroyuki Kagi	The University of Tokyo
177	〃	藤本　千賀子	東京大学	大学院理学系研究科	〃	Chikako Fujimoto	The University of Tokyo
178	高温高圧条件におけるマントル鉱物と窒素との反応性の探索	鍵　裕之	東京大学	大学院理学系研究科	Reactivity of nitrogen with minerals at mantle conditions	Hiroyuki Kagi	The University of Tokyo
179	〃	篠崎　彩子	名古屋大学	大学院環境学研究科	〃	Ayako Shiozaki	Nagoya University
180	〃	久保　俊智	東京大学	大学院理学系研究科	〃	Toshinori Kubo	The University of Tokyo
担当所員：中辻　知							
181	磁性不純物による三角スピンチューブのスピンダイナミクスの変化	真中　浩貴	鹿児島大学	大学院理工学研究科	Magnetic impurity effect on spin dynamics of triangular spin tubes	Hirotaka Manaka	Kagoshima University
182	$Ce(Ru_{1-x}Rh_x)_2Al_{10}$ 単結晶試料の高エネルギーX線ラウエ装置による結晶方位同定	阿曽　尚文	琉球大学	理学部	Alignment of $Ce(Ru_{1-x}Rh_x)_2Al_{10}$ single crystals by high-energy X-ray Laue diffaction	Naofumi Aso	University of the Ryukyus
183	〃	小林　理気	琉球大学	理学部	〃	Riki Kobayashi	University of the Ryukyus
184	〃	高村　治希	琉球大学	大学院理工学研究科	〃	Haruki Takamura	University of the Ryukyus
担当所員：吉澤　英樹							
185	重い電子系化合物が示す非従来型超伝導と磁性の相関	横山　淳	茨城大学	理学部	Interplay between unconventional superconductivity and magnetism in heavy-fermion compounds	Makoto Yokoyama	Ibaraki University
186	〃	大高　凌	茨城大学	大学院理工学研究科	〃	Ryo Otaka	Ibaraki University
187	希土類合金 $Gd_{1-x}La_x$ の磁気秩序	山崎　照夫	東京理科大学	理工学部	Magnetic orders of the rare-earth alloy $Gd_{1-x}La_x$	Teruo Yamazaki	Tokyo University of Science

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188	〃	栗原　舞	東京理科大学	大学院理工学研究科	〃	Mai Kurihara	Tokyo University of Science
189	鉄系超伝導体 $FeTe_{1-x}Chx$ (Ch=S, Se) の Te 雰囲気中アニール効果	山崎　照夫	東京理科大学	理工学部	Effect of Te-annealing in the Fe-based superconducters $FeTe_{1-x}Chx$ (Ch=S, Se)	Teruo Yamazaki	Tokyo University of Science
190	〃	久保田　聡	東京理科大学	大学院理工学研究科	〃	Satoshi Kubota	Tokyo University of Science
191	鉄系超伝導体 $FeTe_{1-x}S_x$ の純良単結晶における O_2 雰囲気中アニールの効果	矢口　宏	東京理科大学	理工学部	Effect of O_2-annealing in the pure single crystals of the Fe-based superconducters $FeTe_{1-x}S_x$	Hiroshi Yaguchi	Tokyo University of Science
192	〃	山崎　照夫	東京理科大学	理工学部	〃	Teruo Yamazaki	Tokyo University of Science
193	〃	飯泉　武顕	東京理科大学	大学院理工学研究科	〃	Takeaki Iizumi	Tokyo University of Science
194	$YbCo_2Zn_{20}$ 置換系試料の極低温比熱測定	阿曽　尚文	琉球大学	理学部	Specific heat measurement at very low temperature in substituted $YbCo_2Zn_{20}$ system	Naofumi Aso	University of the Ryukyus
195	〃	小林　理気	琉球大学	理学部	〃	Riki Kobayashi	University of the Ryukyus
196	〃	比嘉　泰之	琉球大学	大学院理工学研究科	〃	Yasuyuki higa	University of the Ryukyus
担当所員：山室　修							
197	低分子量アモルファスポリスチレンのガラス転移温度近傍における動的性質	筑紫　格	千葉工業大学	工学部	Dynamic Study of amorphous polystyrene with low molecular weight near the glass transition temperature	Itaru Tsukushi	Chiba Institute of Technology
198	〃	西山　枝里	千葉工業大学	大学院工学研究科	〃	Eri Nishiyama	Chiba Institute of Technology
199	〃	藤村　順	千葉工業大学	大学院工学研究科	〃	Fujimura Jun	Chiba Institute of Technology
担当所員：金道　浩一							
200	断熱消磁法を組み合わせた 1K 以下の温度域におけるパルス強磁場システム開発	野口　悟	大阪府立大学	21 世紀科学研究機構	Research and development of pulsed magnets combined with adiabatic refrigerator below 1 K	Satoru Noguchi	Osaka Prefecture University
201	〃	飯田　賢斗	大阪府立大学	大学院工学研究科	〃	Kento Iida	Osaka Prefecture University
202	希土類金属間化合物の強磁場物性研究	海老原　孝雄	静岡大学	理学部	Physical properties in rare earth intermetallic compounds at high magnetic fields	Takao Ebihara	Shizuoka University

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203	チタン系化合物における幾何学的競合効果と強磁場物性	浅野　貴行	福井大学	大学院工学研究科	Geometrically frustrated effect and magnetic properties under high-magnetic fields on titanium compounds	Takayuki Asano	University of Fukui
204	〃	一二三　優汰	福井大学	大学院工学研究科	〃	Yuta Hifumi	University of Fukui
205	幾何学的フラストレート磁性体の強磁場磁化測定	菊池　彦光	福井大学	大学院工学研究科	Magnetization studies of the frustrated magnets	Hikomitsu Kikuchi	University of Fukui
206	〃	国枝　賢治	福井大学	大学院工学研究科	〃	Kenji Kunieda	University of Fukui
207	$Ca_2CoSi_2O_7$ における強磁場下比熱測定	赤木　暢	大阪大学	大学院理学研究科ー	Specific heat measurements of $Ca_2CoSi_2O_7$ in high magnetic fields	Mitsuru Akaki	Osaka University
208	10MJ コンデンサーバンク用大型ワイドボアパルスマグネットの開発	萩原　政幸	大阪大学	大学院理学研究科	Development of a large wide-bore pulse magnet for a 10 MJ capacitor bank	Masayuki Hagiwara	Osaka University
209	〃	谷口　一也	大阪大学	大学院理学研究科	〃	Kazuya Taniguchi	Osaka University
210	重い電子系 $CeFe_{1-x}Cr_xPO$ の低温比熱測定による磁気的性質の解明	神原　陽一	慶應義塾大学	理工学部	Specific heat measurements for understanding magnetic properties of heavy-fermion oxypnictide $CeFe_{1-x}Cr_xPO$	Yoichi Kamihara	Keio University
211	〃	井田　和則	慶應義塾大学	大学院理工学研究科	〃	Kazunori Ida	Keio University
212	高温超伝導体のパルス強磁場下輸送現象	掛谷　一弘	京都大学	大学院工学研究科	Transport phenomena in high-Tc superconductors under pulsed high magnetic fields	Itsuhiro Kakeya	Kyoto University
213	〃	小森　祥央	京都大学	大学院工学研究科	〃	Sachio Komori	Kyoto University
214	〃	野村　義樹	京都大学	大学院工学研究科	〃	Yoshiki Nomura	Kyoto University
215	ホイスラー化合物の強磁場磁化	廣井　政彦	鹿児島大学	大学院理工学研究科	Magnetizaiton of some Heusler compounds in high magnetic field	Masahiko Hiroi	Kagoshima University
216	〃	田底　知也	鹿児島大学	大学院理工学研究科	〃	Tomoya Tazoko	Kagoshima University
217	フラストレート格子をもつ遷移金属フッ化物単結晶の強磁場磁性	植田　浩明	京都大学	大学院理学研究科	magnetism of single crystals of transition metal fluorides with frustrated lattices under high magnetic field	Hiroaki Ueda	Kyoto University
218	〃	後藤　真人	京都大学	大学院理学研究科	〃	Masato Goto	Kyoto University
219	〃	篠原　翔	京都大学	大学院理学研究科	〃	Sho Shinohara	Kyoto University

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220	局所的電荷自由度を有するフラストレート系クラスター磁性体の強磁場磁化過程	道岡　千城	京都大学	大学院理学研究科	High field magnetization of spin frustrating cluster magnets with local charge fluctuations	Chishiro Michioka	Kyoto University
221	〃	原口　祐哉	京都大学	大学院理学研究科	〃	Yuya Haraguchi	Kyoto University
222	〃	勝間　勇人	京都大学	大学院理学研究科	〃	Hayato Katsuma	Kyoto University
223	有機／無機スピン系の低温・強磁場中におけるスピン状態の解明	小野　俊雄	大阪府立大学	大学院理学系研究科	Unraveling the spin states in the low temperature and high magnetic field region of organic/inorganic spin systems	Toshio Ono	Osaka Prefecture University
224	〃	遠藤　耀司	大阪府立大学	大学院理学系研究科	〃	Youji Endo	Osaka Prefecture University
225	〃	井川　直哉	大阪府立大学	大学院理学系研究科	〃	Naoya Ikawa	Osaka Prefecture University
226	〃	笠谷　和宏	大阪府立大学	大学院理学系研究科	〃	Kazuhiro Kasatani	Osaka Prefecture University
227	〃	奥田　恭平	大阪府立大学	大学院理学系研究科	〃	Kyohei Okuda	Osaka Prefecture University
228	〃	三宅　陽太	大阪府立大学	大学院理学系研究科	〃	Yota Miyake	Osaka Prefecture University
229	スピネル $FeCr_2S_{1-x}Se_x$ の高磁場物性	伊藤　昌和	鹿児島大学	大学院理工学研究科	Magnetic properties of spinel $FeCr_2S_{1-x}Se_x$ in high magnetic field	Masakazu Ito	Kagoshima University
230	〃	松隈　秀憲	鹿児島大学	大学院理工学研究科	〃	Hidenori Matsuguma	Kagoshima University
231	Valence skipping 超伝導参照物質 $(Ca,Sr)FeO_3$ の磁化特性と比熱	伊賀　文俊	茨城大学	理学部	Magnetic and thermal properties of valence-skipping superconductor reference $(Ca,Sr)FeO_3$	Fumitoshi Iga	Ibaraki University
232	〃	菊地　翔弥	茨城大学	大学院理工学研究科	〃	Kikuchi Shoya	Ibaraki University
233	〃	川和　英司	茨城大学	大学院理工学研究科	〃	Eiji Kawawa	Ibaraki University
234	近藤半導体 $(Yb, R)B_{12}$ (R=Zr, Sc, Y) の 80T 級磁場下での強磁場物性	伊賀　文俊	茨城大学	理学部	High field physical property of Kondo insulator $(Yb, R)B_{12}$ (R=Zr, Sc, Y) up to 80T class by using the pulse magnet	Fumitoshi Iga	Ibaraki University
235	〃	和田　徹	茨城大学	大学院理工学研究科	〃	Toru Wada	Ibaraki University
236	高圧合成希土類 12 ホウ化物の磁化特性と比熱	伊賀　文俊	茨城大学	理学部	Magnetic and thermal properties of rare earth dodeca-borides produced by high pressure synthesis	Fumitoshi Iga	Ibaraki University

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237	〃	植松　直之	茨城大学	大学院理工学研究科	〃	Naoyuki Uematsu	Ibaraki University
238	金属ナノ結晶の磁化特性	稲田　貢	関西大学	システム理工学部	Magnetic properties of metal nanocrystals	Mitsuru Inada	Kansai University
239	〃	中谷　勇哉	関西大学	大学院理工学研究科	〃	Yuya Nakatani	Kansai University
240	金属ナノクラスターネットワークの磁気抵抗測定	稲田　貢	関西大学	システム理工学部	Electronic transport properties of metal cluster networks under high-magnetic field	Mitsuru Inada	Kansai University
241	〃	三宅　伴季	関西大学	大学院理工学研究科	〃	Tomoki Miyake	Kansai University
242	不純物 Fe 置換 Bi-2212 のパルス強磁場下輸送特性	渡辺　孝夫	弘前大学	大学院理工学研究科	Transport properties in Fe doped Bi-2212 under high pulsed magneticFields	Takao Watanabe	Hirosaki University
243	鉄カルコゲナイド超伝導体薄膜の強磁場下輸送特性の評価	前田　京剛	東京大学	大学院総合文化研究科	Measurement of transport properties of iron-chalcogenide film under ultrahigh magnetic fields	Atutaka Maeda	The University of Tokyo
244	〃	今井　良宗	東京大学	大学院総合文化研究科	〃	Yoshinori Imai	The University of Tokyo
245	〃	澤田　雄一	東京大学	大学院総合文化研究科	〃	Yuichi Sawada	The University of Tokyo
246	不純物 Fe 置換 Bi-2212 のパルス強磁場下輸送特性	臼井　友洋	弘前大学	大学院理工学研究科	Transport properties in Fe doped Bi-2212 under high pulsed magneticFields	Tomohiro Usui	Hirosaki University
247	〃	寺本　祐基	弘前大学	大学院理工学研究科	〃	Yuki Teramoto	Hirosaki University
担当所員：松田　康弘							
248	希土類金属間化合物の超強磁場物性研究	海老原　孝雄	静岡大学	理学部	Physical properties at super high magnetic fields in rare earth intermetallic compounds	Takao Ebihara	Shizuoka University
249	キラルフェリ磁性体における磁気キラル二色性	有馬　孝尚	東京大学	大学院新領域創成科学研究科	Magneto-chiral dichroism in a chiral ferrimagnet	Takahisa Arima	The University of Tokyo
250	〃	阿部　伸行	東京大学	大学院新領域創成科学研究科	〃	Nobuyuki Abe	The University of Tokyo
251	〃	豊田　新悟	東京大学	大学院新領域創成科学研究科	〃	Toyoda Shingo	The University of Tokyo
252	〃	根津　正謙	東京大学	大学院新領域創成科学研究科	〃	Naoaki Netsu	The University of Tokyo

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253	$CeIr(In_{1-x}Cd_x)_5$ の強磁場磁化測定	摂待　力生	新潟大学	理学部	High-field magnetization of $CeIr(In_{1-x}Cd_x)_5$	Rikio Settai	Niigata University
254	〃	角田　竜馬	新潟大学	大学院自然科学研究科	〃	tsunoda ryoma	Niigata University
255	横型シングルターンコイルを用いた $Cu_3Mo_2O_9$ の飽和磁場の探索	黒江　晴彦	上智大学	理工学部	Investigation of saturation magnetization in $Cu_3Mo_2O_9$ using horizontal single-turn coil system	Haruhiko Kuroe	Sophia University
256	近藤半導体 $(Yb,R)B_{12}$ および価数揺動物質 $(Y,Tm)B_6$ のワンターンコイル 120T パルス磁場下での強磁場磁化過程	伊賀　文俊	茨城大学	理学部	High field magnetization of Kondo insulator $(Yb,R)B_{12}$ and valence fluctuation material $(Y,Tm)B_6$ by using one-turn coil in a 120 T pulse magnet	Fumitoshi Iga	Ibaraki University
257	〃	小山内　湧人	茨城大学	大学院理工学研究科	〃	Yuto Osanai	Ibaraki University
258	酸素−窒素混合固体における磁場誘起相転移	小林　達生	岡山大学	大学院自然科学研究科	Field-induced phase transition in O_2-N_2 mixed solid	Tatsuo Kobayashi	Okayama University
259	希土類金属間化合物の超磁場物性研究	ジュマエダ・ジャトミカ	静岡大学	総合科学技術研究科	Physical properties at super high magnetic fields in rare earth intermetallic compounds	Jumaeda Jatmika	Shizuoka University
担当所員：徳永　将史							
260	強磁場を利用した FeMn 基形状記憶合金の物性調査	キョキョウ	東北大学	大学院工学研究科	Investigation on physical properties of FeMn-based shape memory alloys	Xiao Xu	Tohoku University
261	単体元素半導体 Te の強磁場中の磁気抵抗測定	小林　夏野	岡山大学	理学部	Magnetoresistance in pulsed magnetic field on semiconducting tellurium	Kaya Kobayashi	Okayama University
262	ブリージングパイロクロア格子反強磁性体の強磁場磁化過程	岡本　佳比古	名古屋大学	大学院工学研究科	High field magnetization measurements of breathing pyrochlore lattice antiferromagnets	Yoshihiko Okamoto	Nagoya University
263	カゴ状物質 SmT_2Al_{20} における磁場に鈍感な強相関電子物性の起源探索	東中　隆二	首都大学東京	大学院理工学研究科	Investigation of field-insensitive nature of heavy-fermion compounds SmT_2Al_{20}	Ryuji Higashinaka	Tokyo Metropolitan University
264	〃	山田　瑛	首都大学東京	大学院理工学研究科	〃	Akira Yamada	Tokyo Metropolitan University
265	パルス強磁場を用いたグラファイトの磁場誘起秩序相の研究	矢口　宏	東京理科大学	理工学部	Study of magnetic-field induced phase transitions in graphite using pulsed magnetic fields	Hiroshi Yaguchi	Tokyo University of Science
266	重い電子系化合物 $YbAgCu_4$ の強磁場磁化	広瀬　雄介	新潟大学	理学部	The high-field magnetization of the heavy fermion compound $YbAgCu_4$	Hirose Yusuke	Niigata University
267	〃	角田　竜馬	新潟大学	大学院自然科学研究科	〃	Tsunoda Ryoma	Niigata University
268	非破壊パルス・マグネットを用いた $Cu_3Mo_2O_9$ の磁歪測定 II	黒江　晴彦	上智大学	理工学部	Magnetostriction in $Cu_3Mo_2O_9$ under pulsed magnetic field II	Haruhiko Kuroe	Sophia University

No.	課題名	氏名	所属		Title	Name	Organization
269	$Pr_{1-x}Sr_x(Mn_1-yFey)O_3$ の反強磁性と熱電特性に関する研究	中津川　博	横浜国立大学	大学院工学研究院	Antiferromagnetism and thermoelectric properties in $Pr_{1-x}Sr_x(Mn_1-yFey)O_3$	Hiroshi Nakatsugawa	Yokohama National University
270	強磁場磁化過程による有機ラジカルー希土類ヘテロ錯体の交換相互作用評価	木原　工	東北大学	金属材料研究所	Evaluation of exchange interactions in lanthanoid-radical complexes by magnetization measurements in pulsed high magnetic fields	Takumi Kihara	Tohoku University
271	〃	金友　拓哉	電気通信大学	情報理工学研究科	〃	Takuya Kanetomo	The University of Electro-Communications
272	ペロブスカイ型酸化物 $1-xBiCoO_{3-x}PbTiO_3$ における Co^{3+} 中間スピン状態の確認	山本　孟	東京工業大学	応用セラミックス研究所	Confirmation of intermediate spin state of Co^{3+} in perovskite $1-xBiCoO_{3-x}PbTiO_3$.	Hajime Yamamoto	Tokyo Institute of Technology
273	新規重い電子系化合物 UPd_2Cd_{20} の強磁場磁化	廣瀬　雄介	新潟大学	理学部	High-field magnetization of the new heavy fermion compound UPd_2Cd_{20}	Hirose Yusuke	Niigata University
274	〃	土塔 寛	新潟大学	大学院自然科学研究科	〃	Hiroshi Doto	Niigata University
担当所員：嶽山　正二郎							
275	ダイヤモンド型量子スピン鎖 $K_3Cu_3AlO_2(SO_4)_4$ のパルス強磁場中磁化測定	満田　節生	東京理科大学	理学部	Magnetization study on S =1/2 diamond chain system $K_3Cu_3AlO_2(SO_4)_4$ in pulsed high magnetic fields	Setsuo Mitsuda	Tokyo University of Science
276	縦型シングルターンコイルを用いた $Cu_3Mo_2O_9$ の４K 以下での磁化測定	黒江　晴彦	上智大学	理工学部	Study of magnetization in $Cu_3Mo_2O_9$ below 4 K using vertical single-turn coil system	Haruhiko Kuroe	Sophia University
277	マルチカゴメストリップ（MKS) 格子を持つフラストレート磁性体の強磁場磁化	佐藤　博彦	中央大学	理工学部	High-field magnetization of the frustrated magnets containing multi-kagome-strip (MKS) lattice	Hirohiko Sato	Chuo University
278	〃	大塚　大祐	中央大学	大学院理工学研究科	〃	Daisuke Otsuka	Chuo University
279	磁気光学測定を用いたハロゲン化金属ペロブスカイト型結晶の励起子特性の研究	松下　智紀	東京大学	大学院工学系研究科	Study on excitonic properties of organometallic lead halide perovskite using magneto-optical measurement	Tomonori Matsushita	The University of Tokyo
280	〃	中村　唯我	東京大学	大学院工学系研究科	〃	Yuiga Nakamura	The University of Tokyo
担当所員：秋山　英文							
281	微小共振器構造を組み合わせた原子層ドープ GaAs からの発光特性評価	矢口　裕之	埼玉大学	大学院理工学研究科	Characterization of luminescence properties of atomic layer doped GaAs with a micro-cavity structure	Hiroyuki Yaguchi	Saitama University
282	〃	高宮　健吾	埼玉大学	総合技術支援センター	〃	Kengo Takamiya	Saitama University
283	〃	須藤　真樹	埼玉大学	大学院理工学研究科	〃	Masaki Sutou	Saitama University

No.	課題名	氏名	所属		Title	Name	Organization
担当所員：小林　洋平							
284	モードロックレーザー開発	井手口　拓郎	東京大学	大学院理学系研究科	Development of mode-locked lasers	Takuro Ideguchi	The University of Tokyo
担当所員：辛　埴							
285	III-V 族半導体基板上に作製したビスマス１次元構造のスピン偏極電子状態	大坪　嘉之	大阪大学	大学院生命機能研究科	Electronic structure and its spin polarization of one-dimensional bismuth surface layers grown on III-V semiconductor substrates	Yoshiyuki Ohtsubo	Osaka University
286	〃	岸　潤一郎	大阪大学	大学院理学研究科	〃	Kishi Junichiro	Osaka University
287	鉄系超伝導体の時間分解角度分解光電子分光	下志万　貴博	東京大学	工学部	Time-resolved and angle-resolved photoemission study on the iron-based superconeductors	Takahiro Shimojima	The University of Tokyo
288	トポロジカル表面バンドを有するビスマス化合物における超伝導状態の直接観測	坂野　昌人	東京大学	大学院工学系研究科	Direct observation of superconducting state in bismuth compound with topologically protected surface bands	Masato Sakano	The University of Tokyo
289	空間反転対称性の破れた物質におけるスピン分極の観測	石坂　香子	東京大学	大学院工学系研究科	Observation of spin polarization in inversion-symmetry broken materials	Kyoko Ishizaka	The University of Tokyo
290	角度分解光電子分光による鉄系超伝導体における擬ギャップの研究	園部　竜也	東京大学	大学院工学系研究科	APRES Study on Pseudogap in Iron-Pnictides	Tatsuya Sonobe	The University of Tokyo
291	バルク敏感高分解能スピン分解光電子分光を用いたハーフメタル強磁性体の本質的電子状態の観測	横谷　尚睦	岡山大学	大学院自然科学研究科	Observation of intrinsic electronic states of half-metallic ferromagnets studied by bulk-sensitive high-resolution spin-resolved photoemission spectroscopy	Takayoshi Yokoya	Okayama University
292	〃	藤原　弘和	岡山大学	大学院自然科学研究科	〃	Hirokazu Fujiwara	Okayama University
293	黒リンの非平衡キャリアダイナミクス	木村　昭夫	広島大学	大学院理学研究科	Nonequilibrium carrier dynamics in Black Phosphorus	Akio Kimura	Hiroshima University
294	〃	頼　燎平	広島大学	大学院理学研究科	〃	Ryohei Yori	Hiroshima University
295	単一３次元ディラックコーンを有するディラック半金属の TrARPES	陳　家華	広島大学	大学院理学研究科	TrARPES of Dirac semimetals with a single three-dimensional Dirac cone	Chen Jiahua	Hiroshima University
296	トポロジカル絶縁体表面の非平衡ダイナミクスの解明	木村　昭夫	広島大学	大学院理学研究科	Unveiling nonequilibrium dynamics of Dirac fermions in topological insulators	Akio Kimura	Hiroshima University
297	〃	角田　一樹	広島大学	大学院理学研究科	〃	Kazuki Sumida	Hiroshima University
298	III-V 族半導体基板上に作製したビスマス１次元構造のスピン偏極電子状態２	大坪　嘉之	大阪大学	大学院生命機能研究科	Electronic structure and its spin polarization of one-dimensional bismuth surface layers grown on III-V semiconductor substrates II	Yoshiyuki Ohtsubo	Osaka University

No.	課題名	氏名	所属		Title	Name	Organization
299	〃	岸　潤一郎	大阪大学	大学院生命機能研究科	〃	Kishi Junichiro	Osaka University
担当所員：末元　徹							
300	メタマテリアルを利用したテラヘルツ波スピン分光	中嶋　誠	大阪大学	レーザーエネルギー学研究センター	Terahertz spin spectroscopy using metamarials	Makoto Nakajima	Osaka University
301	〃	加藤　康作	大阪大学	レーザーエネルギー学研究センター	〃	Kosaku Kato	Osaka University
302	〃	黒宮　章太	大阪大学	レーザーエネルギー学研究センター	〃	Shota Kuromiya	Osaka University
303	テラヘルツ分光装置を用いた酸化物磁性材料の研究	大越　慎一	東京大学	大学院理学系研究科	Study of magnetic oxide using terahertz spectroscopy	Shinichi Ohkoshi	The University of Tokyo
304	〃	生井　飛鳥	東京大学	大学院理学系研究科	〃	Asuka Namai	The University of Tokyo
305	〃	吉清　まりえ	東京大学	大学院理学系研究科	〃	Marie Yoshikiyo	The University of Tokyo
306	ペロブスカイト鉛ハライド薄膜の赤外分光	牧野　哲征	福井大学	工学部	Infrared spectroscopy in perovskite lead halide thin films	Takayuki Makino	University of Fukui
307	〃	山崎　裕斗	福井大学	大学院工学研究科長	〃	Yuto Yamazaki	University of Fukui
担当所員：松田　巌							
308	レアメタルフリー磁性材料の磁気異方性発現メカニズムの解析	小嗣　真人	東京理科大学	基礎工学部	Analysis of magnetic anisotropy of rare-metal-free magnetic materials	Kotsugi Masato	Tokyo University of Science

物質合成・評価設備 P クラス / Materials Synthesis and Characterization P Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	遷移金属酸窒化物、酸水素化物における構造物性研究	山浦　淳一	東京工業大学	元素戦略研究センター	Study of structural physics on transition metal oxynitrides and oxyhydrides	Junichi Yamaura	Tokyo Institute of Technology
2	〃	真木　祥千子	東京工業大学	元素戦略研究センター	〃	Sachiko Maki	Tokyo Institute of Technology
3	電子が複合自由度を持つ遷移金属系物質の純良単結晶育成と物性評価	片山　尚幸	名古屋大学	大学院工学研究科	Growth of single crystals of transition metal compounds with charge, orbital and spin degrees of freedom	Naoyuki Katayama	Nagoya University

No.	課題名	氏名	所属		Title	Name	Organization
4	〃	菅原　健人	名古屋大学	大学院工学研究科	〃	Kento Sugawara	Nagoya University

物質合成・評価設備 G クラス / Materials Synthesis and Characterization G Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	高温高圧水中の固体酸・塩基触媒反応の速度論的解析	大島　義人	東京大学	大学院新領域創成科学研究科	Kinetic analysis of solid acid and base catalyzed reactions in sub- and supercritical water	Yoshito Oshima	The University of Tokyo
2	〃	秋月　信	東京大学	大学院新領域創成科学研究科	〃	Makoto Akizuki	The University of Tokyo
3	高温高圧水処理における固体触媒反応の速度論的解析	大島　義人	東京大学	大学院新領域創成科学研究科	Kinetic analysis of solid catalyzed reactions in sub- and supercritical water	Yoshito Oshima	The University of Tokyo
4	〃	井上　拓紀	東京大学	大学院新領域創成科学研究科	〃	Hiroki Inoue	The University of Tokyo
5	高温高圧水を反応場とした多段階有機合成反応	大島　義人	東京大学	大学院新領域創成科学研究科	Multi-step organic synthesis in sub- and supercritical water	Yoshito Oshima	The University of Tokyo
6	〃	中井　佑輔	東京大学	大学院新領域創成科学研究科	〃	yusuke nakai	The University of Tokyo
7	プロトン伝導性電解質を用いた電解合成反応における触媒開発と速度論的解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Development of electro-catalysts and kinetics analysis for electrolysis using proton conducting fuel cells	Junichiro Otomo	The University of Tokyo
8	〃	高坂　文彦	東京大学	大学院新領域創成科学研究科	〃	Fumihiko Kosaka	The University of Tokyo
9	イオン - 電子混合伝導体を用いた異相界面接合体の作製及び 界面輸送現象の解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Material synthesis of hetero junction layers using mixed ion conductors and analysis of transport phenomenon of its interface	Junichiro Otomo	The University of Tokyo
10	〃	松岡　修平	東京大学	大学院新領域創成科学研究科	〃	Shuhei Mastuoka	The University of Tokyo
11	プロトン伝導性固体電解質を用いたアンモニア電解合成と速度論解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Electrochemical Synthesis and Kinetic Analysis of Ammonia using Proton Conducting Solid Electrolyte	Junichiro Otomo	The University of Tokyo
12	〃	中村　剛久	東京大学	大学院新領域創成科学研究科	〃	Takehisa Nakamura	The University of Tokyo
13	超臨界水を利用した有機無機混合廃棄物の処理と金属化合物のリサイクル	大島　義人	東京大学	大学院新領域創成科学研究科	Decomposing mixtures of organic and inorganic waste and recycling metal compounds using supercritical water	Yoshito Oshima	The University of Tokyo
14	〃	升川　駿	東京大学	大学院新領域創成科学研究科	〃	Masukawa Shun	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
15	固体酸化物型燃料電池のカチオン拡散現象の検討	大友　順一郎	東京大学	大学院新領域創成科学研究科	Study of cation diffusion of solid oxide fuel cell	Junichiro Otomo	The University of Tokyo
16	〃	岡村　晋太郎	東京大学	大学院新領域創成科学研究科	〃	Shintaro Okamura	The University of Tokyo
17	固体酸化物形燃料電池の電極 / 電解質界面におけるカチオン拡散現象評価	大友　順一郎	東京大学	大学院新領域創成科学研究科	Evaluation of cation diffusion in the electrode/electrolyte interface of solid oxide fuel cell	Junichiro Otomo	The University of Tokyo
18	〃	橋北　直人	東京大学	大学院新領域創成科学研究科	〃	Naoto Hashikita	The University of Tokyo
19	ITFC におけるプロトン伝導体の材料設計および触媒開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Material design and development of catalyst for ITFC using proton conductor	Junichiro Otomo	The University of Tokyo
20	〃	小城　元	東京大学	大学院新領域創成科学研究科	〃	Kojo Gen	The University of Tokyo
21	ペロブスカイト型酸化物を用いたケミカルルーピングシステムの開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Evaluation of long term stability and reduction kinetics of metal oxides supported on perovskite oxides as oxygen carriers in chemical looping systems	Junichiro Otomo	The University of Tokyo
22	〃	オーチェン ジェームズ オーチェン	東京大学	大学院新領域創成科学研究科	〃	Ochieng James Ochieng	The University of Tokyo
23	溶融塩中金属酸化物還元を利用した空気電池の開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Development of air battery with redox reaction of metal oxide in molten salt	Junichiro Otomo	The University of Tokyo
24	〃	月村　玲菜	東京大学	大学院新領域創成科学研究科	〃	Reina Tsukimura	The University of Tokyo
25	高温高圧水を用いた廃太陽電池からの無機有価物の回収	布浦　鉄兵	東京大学	環境安全研究センター	Hydrothermal treatment of waste solar panels for recovery of inorganic materials	Teppei Nunoura	The University of Tokyo
26	〃	對馬　宏明	東京大学	大学院新領域創成科学研究科	〃	Hiroaki Tsushima	The University of Tokyo
27	高温高圧水を利用した微粒子の in situ 有機修飾技術の開発	大島　義人	東京大学	大学院新領域創成科学研究科	The development of in situ organic modification technology of fine particles in high temperature and pressure water	Yoshito Oshima	The University of Tokyo
28	〃	岳　磊	東京大学	大学院新領域創成科学研究科	〃	Lei Yue	The University of Tokyo
29	高温高圧水を反応場とした層状固体触媒反応	大島　義人	東京大学	大学院新領域創成科学研究科	Study of layered solid catalyzed reaction in sub- and supercritical water	Yoshito Oshima	The University of Tokyo
30	〃	佐々木　栞	東京大学	大学院新領域創成科学研究科	〃	Shiori Sasaki	The University of Tokyo
31	ケミカルループ法における高活性酸素キャリア複合粒子の開発	大友　順一郎	東京大学	大学院新領域創成科学研究科	Development of oxygen carrier composite particles with high activity in a chemical loop method	Junichiro Otomo	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
32	〃	味谷　和之	東京大学	大学院新領域創成科学研究科	〃	Kazuyuki Miya	The University of Tokyo
33	超臨界水熱法による酸化物ナノ粒子の合成と構造解析	大島　義人	東京大学	大学院新領域創成科学研究科	Structure analysis of metal oxide nanoparticles synthesized under supercritical water	Yoshito Oshima	The University of Tokyo
34	〃	横　哲	東京大学	大学院新領域創成科学研究科	〃	Akira Yoko	The University of Tokyo
35	ケミカルループ法における酸素キャリア材料の劣化挙動の観察	大友　順一郎	東京大学	大学院新領域創成科学研究科	Degradation of oxygen carrier materials in chemical loop systems	Junichiro Otomo	The University of Tokyo
36	〃	斉藤　佑耶	東京大学	大学院新領域創成科学研究科	〃	Yuya Saito	The University of Tokyo
37	複合酸化物ナノ粒子の超臨界水熱合成手法の検討	大島　義人	東京大学	大学院新領域創成科学研究科	Study of compound oxide nano-particles using supercritical hydrothermal synthesis	Yoshito Oshima	The University of Tokyo
38	〃	加藤　進介	東京大学	大学院新領域創成科学研究科	〃	Shinsuke Kato	The University of Tokyo
39	超臨界水による担持金属酸化物微粒子の合成	大島　義人	東京大学	大学院新領域創成科学研究科	Preparation of fine metal oxide particles on the surface of supports using supercritical water	Yoshito Oshima	The University of Tokyo
40	〃	李　夢婷	東京大学	大学院新領域創成科学研究科	〃	Li Mengting	The University of Tokyo
41	メソポーラスマテリアル・グラフェンオキサイドに担持した金属触媒のキャラクタリゼーション	佐々木　岳彦	東京大学	大学院新領域創成科学研究科	Characterization of metal catalysts prepared on mesoporous materials and graphene oxides	Takehiko Sasaki	The University of Tokyo
42	〃	Etty Nurlia Kusumawati	東京大学	大学院理学系研究科	〃	Etty Nurlia Kusumawati	The University of Tokyo
43	三角格子をもつ遷移金属化合物の磁気異方性の評価	植田　浩明	京都大学	大学院理学研究科	characterization of magnetic anisotropy of transition metal compounds with a triangular lattice	Hiroaki Ueda	Kyoto University
44	〃	後藤　真人	京都大学	大学院理学研究科	〃	Masato Goto	Kyoto University
45	〃	谷奥　泰明	京都大学	大学院理学研究科	〃	Yasuaki Tanioku	Kyoto University
46	正 20 面体クラスター固体の電気伝導と磁性	木村　薫	東京大学	大学院新領域創成科学研究科	Electrical conductivity and magnetic properties of Icosahedral cluster solids	Kaoru Kimura	The University of Tokyo
47	〃	廣戸　孝信	東京大学	大学院新領域創成科学研究科	〃	Takanobu Hiroto	The University of Tokyo
48	強誘電性を示す電子 - プロトン相関系単一分子性導体の顕微紫外可視分光測定	佐々木　孝彦	東北大学	金属材料研究所	UV-visible spectrophotometry of an electron-proton correlated single-component molecular conductor with ferroelectricity	Tajahiko Sasaki	Tohoku University

No.	課題名	氏名	所属		Title	Name	Organization
49	〃	伊藤　桂介	東北大学	金属材料研究所	〃	Keisuke Ito	Tohoku University
50	触媒反応の insitu ラマン散乱測定	佐々木　岳彦	東京大学	大学院新領域創成科学研究科	in situ measurement of Raman scattering for　heterogeneous catalytic reactions	Takehiko Sasaki	The University of Tokyo
51	天然鉱物の微細組織と結晶性の実態	永嶌　真理子	山口大学	大学院理工学研究科	Evaluation of micro-texture and crystallinity of natural minerals	Mariko Nagashima	Yamaguchi University
52	マイクロミキサを用いた機能性酸化物ナノ粒子の連続合成	陶　究	産業技術総合研究所	化学プロセス研究部門	Continuous synthesis of functional metal oxide nanoparticles using a micromxer	Kiwamu Sue	AIST
53	新規磁石材料の微細構造解析	齋藤　哲治	千葉工業大学	工学部	Microstructural studies of newly developed permanent magnet materials	Tetsuji Saito	Chiba Institute of Technology
54	透過型電子顕微鏡による機能性金属錯体の歪み測定	糸井　充穂	日本大学	医学部	Distortion measurement for multifunctional metal complex by transmission electron microscope	Miho Itoi	Nihon University
55	アーク加熱風洞を用いた宇宙往還機の熱防御システム (TPS) の動的酸化に関する研究	桃沢　愛	東京都市大学	工学部	Dynamic oxidation of thermal protection system using arc-heater	Ai Momozawa	Tokyo City University
56	〃	佐野　宗一郎	東京大学	大学院工学系研究科	〃	Soichiro Sano	The University of Tokyo
57	単体元素半導体 Te の弱磁場磁気抵抗測定	小林　夏野	岡山大学	理学部	Magnetoresistance on semiconducting Te in low magnetic field	Kaya Kobayashi	Okayama University
58	ラーベス相化合物 YbM_2 (M = 後期遷移金属) の電子物性測定	白子　雄一	名古屋大学	大学院工学研究科	Measurements for electric properties of Laves phase compounds YbM_2 (M = late transition metals)	Yuichi Shirako	Nagoya University
59	〃	齋藤　雄太	名古屋大学	大学院工学研究科	〃	Yuta Saito	Nagoya University
60	新規遷移金属硫化物固溶体の電子・磁気物性	長谷川　正	名古屋大学	大学院工学研究科	Electronic and magnetic properties of novel transition metal sulfide solid solutions	Masashi Hasegawa	Nagoya University
61	〃	秋田　貴弘	名古屋大学	大学院工学研究科	〃	Takahiro Akita	Nagoya University
62	ハーフメタル型ホイスラー合金の磁性と輸送特性に関する研究	重田　出	鹿児島大学	大学院理工学研究科	Study on the magnetic and transport properties of half-metallic Heusler alloys	Shigeta Iduru	Kagoshima University
63	〃	重松　理史	鹿児島大学	大学院理工学研究科	〃	Satoshi Shigematsu	Kagoshima University
64	スピネル硫化物の磁気的性質	岡本　佳比古	名古屋大学	大学院工学研究科	Magnetic properties of spinel sulfides	Yoshihiko Okamoto	Nagoya University
65	ホイスラー型化合物の磁性と伝導の研究	廣井　政彦	鹿児島大学	大学院理工学研究科	Study on the magnetic and electrical properties of Heusler compounds	Masahiko Hiroi	Kagoshima University

No.	課題名	氏名	所属		Title	Name	Organization
66	〃	田底　知也	鹿児島大学	大学院理工学研究科	〃	Tomoya Tazoko	Kagoshima University
67	梯子型鉄系化合物の元素置換効果	大串　研也	東北大学	大学院理学研究科	Substitution effect on Fe-based ladder compounds	Kenya Ohgushi	Tohoku University
68	新規 5d 遷移金属化合物の探索	有馬　孝尚	東京大学	大学院新領域創成科学研究科	Exploration of new 5d transition metal compounds	Takahisa Arima	The University of Tokyo
69	〃	徳永　祐介	東京大学	大学院新領域創成科学研究科	〃	Yusuke Tokunaga	The University of Tokyo
70	〃	阿部　伸行	東京大学	大学院新領域創成科学研究科	〃	Shingo Toyoda	The University of Tokyo
71	〃	豊田　新悟	東京大学	大学院新領域創成科学研究科	〃	Shingo Toyoda	The University of Tokyo
72	〃	松浦　慧介	東京大学	大学院新領域創成科学研究科	〃	Keisuke Matsuura	The University of Tokyo
73	〃	根津　正謙	東京大学	大学院新領域創成科学研究科	〃	Netsu Naoaki	The University of Tokyo
74	〃	鷲見　浩樹	東京大学	大学院新領域創成科学研究科	〃	Hiroki　Sumi	The University of Tokyo
75	〃	前島　夏奈	東京大学	大学院新領域創成科学研究科	〃	Kana Maeshima	The University of Tokyo
76	〃	藤間　友理	東京大学	大学院新領域創成科学研究科	〃	Yuri Fujimiya	The University of Tokyo
77	Cu－Ni－X（X=Co,Fe）系単結晶性合金中の磁性微粒子析出過程と磁気特性の関係	竹田　真帆人	横浜国立大学	大学院工学研究院	Precipitation behavior and magnetic properties of fine magnetic particles in single crystals of Cu - Ni base alloys	Mahoto Takeda	Yokohama National University
78	〃	金　俊燮	横浜国立大学	大学院工学府	〃	Kim Junseop	Yokohama National University
79	〃	坂倉　響	横浜国立大学	大学院工学府	〃	Hibiki Sakakura	Yokohama National University

物質合成・評価設備 U クラス / Materials Synthesis and Characterization U Class Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	超臨界流体中の表面バリア放電プラズマによるアモルファスカーボンおよびダイヤモンドライクカーボンのナノコーティング	シュタウス スヴェン	東京大学	大学院新領域創成科学研究科	Fabrication of amorphous and diamond-like carbon nanocoatings by surface dielectric barrier discharges generated in supercritical fluids	Sven Stauss	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
2	SEM による KAGRA 重力波検出器用超低損失ミラーのコンタミネーションスタディー	廣瀬　榮一	東京大学	宇宙線研究所	A contamination study of ultra-low loss mirrors for the KAGRA gravitational wave detector using SEM	Eiichi Hirose	The University of Tokyo
3	〃	長谷川　邦彦	東京大学	宇宙線研究所	〃	Kunihiko Hasegawa	The University of Tokyo
4	グラフェンのテラヘルツ光領域における光吸収スペクトルの制御	松木　孝憲	東京大学	大学院新領域創成科学研究科	Control of Graphene Optical Spectrum in Terahertz region	Takanori Matsuki	The University of Tokyo
5	アルミ系近似結晶中の正 20 面体クラスターの金属結合–共有結合転換	金沢　育三	東京学芸大学	自然科学系	Metallic-covalent bonding conversion of icosahedral cluster in Al-based approximant crystals	Ikuzo Kanazawa	Tokyo Gakugei University
6	〃	佐々木 友彰	東京学芸大学	自然科学系	〃	Tomoaki Sasaki	Tokyo Gakugei University
7	自己組織化現象を用いたガスセンシングデバイスの作成に関する研究（仮）	割澤　伸一	東京大学	大学院新領域創成科学研究科	Study on the creation of the gas sensing device using a self-organizing phenomenon (provisional)	Shinichi Warisawa	The University of Tokyo
8	〃	中村　高道	東京大学	大学院新領域創成科学研究科	〃	Takamichi Nakamura	The University of Tokyo
9	核–マントル間の塩素分配に関する実験的研究	桑原　秀治	東京大学	大学院新領域創成科学研究科	Chlorine partitioning between earth’ s core and mantle	Hideharu Kuwahara	The University of Tokyo

長期留学研究員 / Long Term Young Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	中性子回折実験用高圧セル装置の開発と、水素結合を持つ化合物の高温高圧下その場観察	飯塚　理子	愛媛大学	地球深部ダイナミクス研究センター	Development of high-pressure cell for neutron diffraction and in-situ observation of hydrogen-bonding materials	Riko Iizuka	Ehime University

短期留学研究員 / Short term Young Researcher

No.	課題名	氏名	所属		Title	Name	Organization
1	第一原理におけるゼーベック係数の計算	高 成柱	大阪大学	基礎工学研究科	Seebeck coefficient calculation from first-principle	Ko Sonjy	Osaka University

平成 27 年度　中性子科学研究施設　共同利用課題一覧 / Joint Research List of Neutron Scattering Researcher 2015

No.	課題名	氏名	所属		Title	Name	Organization
・申請装置 4G: GPTAS							
1	GPTAS（汎用 3 軸中性子分光器）IRT 課題	佐藤　卓	東北大学	多元物質科学研究所	IRT: GPTAS (Triple Axis Spectrometer)	Taku J Sato	Tohoku University
2	次世代ナトリウムイオン電池電解質溶液の構造解析	亀田　恭男	山形大学	理学部	Structure of electrolyte solutions for novel sodium ion batteries	Yasuo Kameda	Yamagata University
3	$Dy_3Al_5O_{12}$ ガーネットにおけるクーロン相の探索	佐藤　卓	東北大学	多元物質科学研究所	Search for coulomb phase in the $Dy_3Al_5O_{12}$ garnet	Taku J Sato	Tohoku University
4	時間分割中性子散乱測定による磁気構造変化過程の実時間追跡	元屋　清一郎	東京理科大学	理工学部	Real-time observation of magnetic structural change by means of time-resolved neutron scattering experiments	Kiyoichiro Motoya	Tokyo University of Science
5	中性子回折法による六方晶フェライト $Ba_2Zn_2Fe_{12}O_{22}$ および $BaFe_{12}O_{19}$ の超交換相互作用の研究	内海　重宜	諏訪東京理科大学	工学部	Study on superexchange interaction of $Ba_2Zn_2Fe_{12}O_{22}$ and $BaFe_{12}O_{19}$ systems by neutron diffraction	Shigenori Utsumi	Tokyo University of Science, Suwa
6	パイロクロア磁性体における格子ー軌道ースピン観測とスピン流、異常 ホール効果への影響	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Neutron study on pyrochlore oxide materials	Hazuki Furukawa	Ochanomizu University
7	強磁性超伝導体における磁性と超伝導の研究	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	A study of magnetic state in ferromagnetic superconductors.	Hazuki Furukawa	Ochanomizu University
8	Sr_2Ruo_4 の非弾性散乱	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Inelastic neutron scattering experiments on Sr_2RuO_4	Hazuki Furukawa	Ochanomizu University
9	Fe 系超伝導体の磁性と超伝導の研究	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	A study of magnetic state on Fe-based superconductors	Hazuki Furukawa	Ochanomizu University
10	$CeRhIn_5$ の圧力下中性子回折実験による磁性と超伝導の相関の研究	小林　理気	東京大学	物性研究所	Neutron diffraction study on $CeRhIn_5$ under pressure	Riki Kobayashi	The University of Tokyo
11	$YbCo_2Zn_{20}$ における圧力誘起磁気秩序相の研究	松林　和幸	東京大学	物性研究所	Pressure-induced magnetic phase transition in $YbCo_2Zn_{20}$	Kazuyuki Matsubayashi	The University of Tokyo
12	重い電子系化合物の隠れた秩序状態に対する一軸応力効果	横山　淳	茨城大学	理学部理学科	Effect of uniaxial stress on hidden order state in heavy-fermion compounds	Makoto Yokoyama	Ibaraki University
13	シャンダイト型遷移金属化合物 $Co_3Sn_{2-x}In_xS_2$ におけるカイラル秩序	田畑　吉計	京都大学	大学院工学研究科	Chiral order of shandite-type transition-metal compound $Co_3Sn_{2-x}In_xS_2$	Yoshikazu Tabata	Kyoto University
14	$EuRu_2P_2$ の磁気構造解析	藤原　哲也	山口大学	大学院理工学研究科	Magnetic structure analysis of $EuRu_2P_2$	Tetsuya Fujiwara	Yamaguchi University
15	$EuCo_2P_2$ の磁気構造解析	藤原　哲也	山口大学	大学院理工学研究科	Magnetic structure analysis of $EuCo_2P_2$	Tetsuya Fujiwara	Yamaguchi University

No.	課題名	氏名	所属		Title	Name	Organization
16	強誘電体の相転移機構（変位型及び秩序–無秩序型）に関する統一的理解の確立	重松　宏武	山口大学	教育学部	Establishment of the unified explanation about the phase transition mechanism (displacive and order-disorder type) in Ferroelectrics	Hirotake Shigematsu	Yamaguchi University
17	スピンアイスにおけるトポロジカル相転移	門脇　広明	首都大学東京	理工学研究科	Topological phase transition in spin ice	Hiroaki Kadowaki	Tokyo Metoropolitan University
18	ホールドープ型鉄系超伝導体のスピン揺動	李　哲虎	産業技術総合研究所	エネルギー技術研究部門	Spin fluctuations of hole-doped iron-based superconductors	Chul-Ho Lee	AIST
・申請装置 5G: PONTA							
19	PONTA（高性能偏極中性子散乱装置）IRT 課題	益田　隆嗣	東京大学	物性研究所	IRT: PONTA (Polarized Neutron Triple Axis Spectrometer)	Takatsugu Masuda	The University of Tokyo
20	中性子回折によるアルカリ金属ナノクラスター強磁性体の研究	中野　岳仁	大阪大学	大学院理学研究科物	Neutron diffraction study on ferromagnetism of alkali-metal nanoclusters arrayed in zeolite crystal	Takehito Nakano	Osaka University
21	時間分割中性子散乱測定による磁気構造変化過程の実時間追跡	元屋　清一郎	東京理科大学	理工学部	Real-time observation of magnetic structural change by means of time-resolved neutron scattering experiments	Kiyoichiro Motoya	Tokyo University of Science
22	マルチフェロイックス $Ba_2CoGe_2O_7$ におけるエレクトロマグノンの偏極解析	左右田　稔	東京大学	物性研究所	Polarization analyses of electromagnon in multiferroics $Ba_2CoGe_2O_7$	Minoru Soda	The University of Tokyo
23	マルチフェロイック $Ca_2CoSi_2O_7$ の磁場下における新規磁気相	左右田　稔	東京大学	物性研究所	Non-trivial magnetic phase induced by magnetic field in $Ca_2CoSi_2O_7$	Minoru Soda	The University of Tokyo
24	鉄系超伝導体のネマティック相の起源 - 偏極中性子散乱 -	池内　和彦	総合科学研究機構	東海事業センター	Polarized neutron study of the nematic state in Fe-based superconductor	Kazuhiko Ikeuchi	CROSS
25	偏極中性子散乱による $LaCo_{0.8}Rh_{0.2}O_3$ の新奇な強磁性磁気秩序の研究	浅井　晋一郎	東京大学	物性研究所	Polarized neutron diffraction study on a novel type of ferromagnetic order in $LaCo_{0.8}Rh_{0.2}O_3$	Shinichiro Asai	The University of Tokyo
26	スピン格子結合系における磁気相転移と電気分極の一軸応力制御	満田　節生	東京理科大学	理学部	Uniaxial-stress control of magnetic phase transition and electric polarization in a spin-lattice coupled system	Setsuo Mitsuda	Tokyo University of Science
27	Magnetic structures of 1D frustrated chain compound $NaCuMoO_4(OH)$	益田　隆嗣	東京大学	物性研究所	Magnetic structures of 1D frustrated chain compound $NaCuMoO_4(OH)$	Takatsugu Masuda	The University of Tokyo
28	カイラル磁性体 $CsCuCl_3$ のカイラルらせん磁気構造の検出	高阪　勇輔	広島大学	大学院理学研究科	Chiral helimagnetic structure in chiral inorganic compound $CsCuCl_3$	Yusuke Kousaka	Hiroshima University
29	URu_2Si_2 の隠れた秩序に伴う多重極秩序の直接観測	高阪　勇輔	広島大学	大学院理学研究科	Direct observation of the “Hidden Order” due to multipole ordering in URu_2Si_2	Yusuke Kousaka	Hiroshima University
30	$Cu_{2.85}Zn_{0.15}Mo_2O_9$ の磁気構造の決定	長谷　正司	物質・材料研究機構	中性子散乱グループ	Determination of the magnetic structure of $Cu_{2.85}Zn_{0.15}Mo_2O_9$	Masashi Hase	NIMS
31	PONTA IRT 課題　偏極中性子線を用いた磁気散乱中性子線ホログラフィー	林　好一	東北大学	金属材料研究所	IRT: PONTA (Polarized Neutron Triple Axis Spectrometer)	Kouichi Hayashi	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
・申請装置 6G: TOPAN							
32	TOPAN（東北大理：３軸型偏極中性子分光器）IRT 課題	岩佐　和晃	東北大学	大学院理学研究科	IRT: TOPAN (Tohoku-University Polarization Analysis Neutron Spectrometer)	Kazuaki Iwasa	Tohoku University
33	PrT_2Zn_{20} (T = Ru, Rh, Os, Ir) における２チャンネル近藤効果	岩佐　和晃	東北大学	大学院理学研究科	Two-channel Kondo effect in PrT_2Zn_{20} (T = Ru, Rh, Os, Ir)	Kazuaki Iwasa	Tohoku University
34	全対称型多極子秩序による金属–非金属転移に対する磁気不純物効果	岩佐　和晃	東北大学	大学院理学研究科	Magnetic impurity effect on the metal-nonmetal transition associated with totally-symmetric electron multipole ordering	Kazuaki Iwasa	Tohoku University
35	$Ce_3T_4Sn_{13}$ (T = Co, Rh) における磁気励起で見出す二重ギャップ電子状態	岩佐　和晃	東北大学	大学院理学研究科	Double-gap electronic state evidenced from magnetic excitation in $Ce_3T_4Sn_{13}$ (T = Co, Rh)	Kazuaki Iwasa	Tohoku University
36	質量勾配をもつ非一様系での偏在的原子振動モードであるグレードンの検証	岩佐　和晃	東北大学	大学院理学研究科	Gradon as a localized atomic motion in mass-graded inhomogeneous systems	Kazuaki Iwasa	Tohoku University
37	遍歴電子反強磁性体 Mn_3Si における動的スピン階層構造の研究	平賀　晴弘	高エネルギー加速器研究機構	物質構造科学研究所	Study on dynamical spin hierarchy structure in itinerant-electron antiferromagnet Mn_3Si	Haruhiro Hiraka	KEK
38	LiFeAs の格子振動にみられる軌道自由度の効果の観測	池内　和彦	総合科学研究機構	東海事業センター	Orbital effect on lattice vibrations in LiFeAs	Kazuhiko Ikeuchi	CROSS
39	新規 T’ 構造ホールドープ銅酸化物 $Pr_{2-x}Ca_xCuO_4$ における磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of spin correlations in novel T’ -structured cuprate oxide $Pr_{2-x}Ca_xCuO_4$	Masaki Fujita	Tohoku University
40	新規スピンラダー系 $BiCu_2PO_6$ の磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of magnetic correlations in novel spin-ladder system $BiCu_2PO_6$	Masaki Fujita	Tohoku University
41	Al 置換した La214 系銅酸化物高温超伝導体のストライプ秩序と超伝導の研究	鈴木　謙介	東北大学	金属材料研究所	Study of Al-induced stripe order and superconductivity in Al-substituted La-214 cuprate	Kensuke Suzuki	Tohoku University
・申請装置 C1-1: HER							
42	HER（高エネルギー分解能３軸型中性子分光器）IRT 課題	横山　淳	茨城大学	理学部理学科	IRT: HER(High Energy Resolution Triple-Axis Spectrometer)	Makoto Yokoyama	Ibaraki University
43	鉄系梯子型物質 $BaFe_2Se_3$ の磁気陽動	南部　雄亮	東北大学	多元物質科学研究所	Spin dynamics of the iron-based ladder compound $BaFe_2Se_3$	Yusuke Nambu	Tohoku University
44	PrT_2Zn_{20} (T = Ru, Rh, Os, Ir) における２チャンネル近藤効果	岩佐　和晃	東北大学	大学院理学研究科	Two-channel Kondo effect in PrT_2Zn_{20} (T = Ru, Rh, Os, Ir)	Kazuaki Iwasa	Tohoku University
45	全対称型多極子秩序による金属–非金属転移に対する磁気不純物効果	岩佐　和晃	東北大学	大学院理学研究科	Magnetic impurity effect on the metal-nonmetal transition associated with totally-symmetric electron multipole ordering	Kazuaki Iwasa	Tohoku University
46	$Ce_3T_4Sn_{13}$ (T = Co, Rh) における磁気励起で見出す二重ギャップ電子状態	岩佐　和晃	東北大学	大学院理学研究科	Double-gap electronic state evidenced from magnetic excitation in $Ce_3T_4Sn_{13}$ (T = Co, Rh)	Kazuaki Iwasa	Tohoku University

No.	課題名	氏名	所属		Title	Name	Organization
47	$DyFe_2Zn_{20}$ における磁気異方性増強を伴う逐次磁気相転移	岩佐　和晃	東北大学	大学院理学研究科	Successive magnetic phase transition with enhancement in magnetic anisotropy of $DyFe_2Zn_{20}$	Kazuaki Iwasa	Tohoku University
48	$Ca_2CoSi_2O_7$ におけるエレクトロマグノンとスピン・ネマティック相互作用	左右田　稔	東京大学	物性研究所	Electromagnon and spin-nematic interaction in $Ca_2CoSi_2O_7$	Minoru Soda	The University of Tokyo
49	マルチフェロイックス $Ba_2CoGe_2O_7$ における磁気異方性の電場制御	左右田　稔	東京大学	物性研究所	Electric control of magnetic anisotropy in $Ba_2CoGe_2O_7$	Minoru Soda	The University of Tokyo
50	スピン格子結合系 $CuFeO_2$ のスピン波分散関係の一軸応力変化	満田　節生	東京理科大学	理学部	Spin wave dispersion relation in a spin-lattice coupled system $CuFeO_2$ ander uniaxial stress	Setsuo Mitsuda	Tokyo University of Science
51	擬スピン 1/2 ブリージングパイロクロア磁性体 $Ba_3Yb_2Zn_5O_{11}$ の非弾性中性子散乱研究	益田　隆嗣	東京大学	物性研究所	Magnetic excitation of S = 1/2 breathing pyrochlore compound $Ba_3Yb_2Zn_5O_{11}$	Takatsugu Masuda	The University of Tokyo
52	新規 T' 構造ホールドープ銅酸化物 $Pr_{2-x}Ca_xCuO_4$ における磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of spin correlations in novel T' -structured cuprate oxide $Pr_{2-x}Ca_xCuO_4$	Masaki Fujita	Tohoku University
53	量子スピン液体の研究	門脇　広明	首都大学東京	理工学研究科	Quantum spin liquid	Hiroaki Kadowaki	Tokyo Metoropolitan University
54	量子臨界点近傍にある $YbCo_2Zn_{20}$ の磁気励起	阿曽　尚文	琉球大学	理学部	Magnetic excitations in $YbCo_2Zn_{20}$ in vicinity of a quantum critical point	Naofumi Aso	University of the Ryukyus
55	空間反転対称性をもたない超伝導体 $CeRhSi_3$ の磁気励起	阿曽　尚文	琉球大学	理学部	Magnetic fluctuations in a non-centrosymmetric superconductor $CeRhSi_3$	Naofumi Aso	University of the Ryukyus
56	4d 局在電子系 $La_5Mo_4O_{16}$ における構造及び磁気相転移の温度依存性の詳細な測定	飯田　一樹	総合科学研究機構	利用促進部	Detailed measurements of temperature dependences of structural and magnetic phase transitions in localized 4d electrons system $La_5Mo_4O_{16}$	Kazuki Iida	CROSS
57	ホールドープ型鉄系超伝導体のスピン揺動	李　哲虎	産業技術総合研究所	エネルギー技術研究部門	Spin fluctuations of hole-doped iron-based superconductors	Chul-Ho Lee	AIST
58	カゴメ三角格子反強磁性体 $NaBa_2Mn_3F_{11}$ の磁気状態	益田　隆嗣	東京大学	物性研究所	Magnetic state in Kagome-Triangular lattice antiferromagnet $NaBa_2Mn_3F_{11}$	Takatsugu Masuda	The University of Tokyo
・申請装置 C1-2: SANS-U							
59	SANS-U（二次元位置測定小角散乱装置）IRT 課題	柴山　充弘	東京大学	物性研究所	IRT: SANS-U (Small Angle Neutron Scattering Instrument, University of Tokyo)	Mitsuhiro Shibayama	The University of Tokyo
60	プロパノール＋イミダゾリウム系イオン液体二成分溶液の相分離メカニズムの解明	下村　拓也	室蘭工業大学	大学院工学研究科	Phase separation of propanol+imidazolium-based ionic liquid binary solutions	Takuya Shimomura	Muroran Institute of Technology
61	イミダゾリウム系イオン液体とグライムの混合状態	下村　拓也	室蘭工業大学	大学院工学研究科	Mixing state of imidazolium-based ionic liquid+glyme solutions	Takuya Shimomura	Muroran Institute of Technology
62	ナノディスクの構造と集積化挙動の評価	中野　実	富山大学	大学院医学薬学研究部	Structure and stacking behavior of nanodiscs	Minoru Nakano	University of Toyama

No.	課題名	氏名	所属		Title	Name	Organization
63	膜貫通ペプチドのフリップフロップ誘起能の評価	中野　実	富山大学	大学院医学薬学研究部	Induction of Flip-Flop by transmembrane peptides	Minoru Nakano	University of Toyama
64	膜脂質のダイナミクスに及ぼす膜の曲率の評価	中野　実	富山大学	大学院医学薬学研究部	Effects of curvature on dynamics of membrane lipids	Minoru Nakano	University of Toyama
65	小角中性子散乱による α - クリスタリンのサブユニット交換	井上　倫太郎	京都大学	原子炉実験所	Subunit exchange in alpha crystallin as studied by small angle neutron scattering	Rintaro Inoue	Kyoto University
66	放射線誘起反応に基づく機能性高分子多孔ゲルの合成と中性子小角散乱法による構造解析	佐藤　信浩	京都大学	原子炉実験所	SANS analysis of radiation-fabricated advanced porous polymer gels	Nobuhiro Sato	Kyoto University
67	MnSi における磁気スキルミオンの電流駆動	南部　雄亮	東北大学	多元物質科学研究所	Current driven motion of skyrmions in MnSi	Yusuke Nambu	Tohoku University
68	中性子小角散乱実験による Sr_2RuO_4 の異常金属状態の研究	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Anomalous vortex state in Sr_2RuO_4 studied by SANS experiments	Hazuki Furukawa	Ochanomizu University
69	空間反転対称性の破れた超伝導体のヘリカル磁束格子の観測	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Herical vortex phase on non-centrosymmetric superconductors	Hazuki Furukawa	Ochanomizu University
70	Fe 系超伝導体の磁束研究	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Vortex study on Fe-based superconductors	Hazuki Furukawa	Ochanomizu University
71	希釈冷凍機温度領域における $CeCoIn_5$ の磁束構造の磁場方向依存性	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Field direction dependence of vortex lattice structure on $CeCoIN_5$ in Dilution temperature	Hazuki Furukawa	Ochanomizu University
72	強磁性超伝導体における自発的磁束格子構造の研究	古川　はづき	お茶の水女子大学	大学院人間文化創成科学研究科	Spontaneous vortex phase in ferromagnetic superconductors	Hazuki Furukawa	Ochanomizu University
73	イオン液体中に閉じ込められた水の”疑似シャペロン”効果	吉田　亨次	福岡大学	理学部	Pseudo-chaperone effect of confined water in ionic liquids	Koji Yoshida	Fukuoka University
74	HPT 加工により発現する純鉄中の特異な磁気構造の解明	大場　洋次郎	京都大学		Characterization of unusual magnetic scattering in reproduced by high-pressure torsion straining	Yojiro Oba	Kyoto University
75	金属磁性体 MnP における長周期ドメイン磁気構造の観測	山崎　照夫	東京理科大学	理工学部	Observation of the long period magnetic domain structure in metallic helimagnet MnP	Teruo Yamazaki	Tokyo University of Science
76	GM1 含有 Bicelle に結合したタンパク質の構造変化	杉山　正明	京都大学	原子炉実験所	Structural change of protein connecting to Bicelle with GM1	Masaaki Sugiyama	Kyoto University
77	全イオン性高分子ミセルのナノ構造と刺激応答	松岡　秀樹	京都大学	工学研究科	Nanostructure and stimuli-sensitivity of totally ionic block copolymer micelles.	Hideki Matsuoka	Kyoto University
78	高分子量成分の制御による高い耐熱性・耐久性を持つセパレータ開発のための基礎研究	松葉　豪	山形大学	大学院理工学研究科	Observation of structure of high-molecular weight component for high-performance separator	Go Matsuba	Yamagata University
79	電場印加時のゲル内での DNA の構造解析	柴山　充弘	東京大学	物性研究所	Investigation of DNA structure in polymer gels under electric field	Mitsuhiro Shibayama	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
80	毛髪の内部構造解析	柴山　充弘	東京大学	物性研究所	Mesoscopic structural analysis of hair	Mitsuhiro Shibayama	The University of Tokyo
81	オブアルブミンの凝集過程における N 末端の両親媒性部位の効果	柴山　充弘	東京大学	物性研究所	Effect of N-terminal amphiphilic region on aggregation of ovalbumin	Mitsuhiro Shibayama	The University of Tokyo
82	イオン液体中における刺激応答性高分子の圧力応答性相転移	柴山　充弘	東京大学	物性研究所	Pressure-responsive phase behavior of polymer in ionic liquid	Mitsuhiro Shibayama	The University of Tokyo
83	時分割 SANS 測定によるイオン液体中における均一高分子網目構造形成過程の解明	柴山　充弘	東京大学	物性研究所	Gelation mechanism of Tetra-armed network structure in ionic liquid studied by time-resolved small angle neutron scattering	Mitsuhiro Shibayama	The University of Tokyo
84	スピン誘導型強誘電体における誘電 (磁気) ドメイン駆動	満田　節生	東京理科大学	理学部	Ferroelectric domain wall motion in a electromagnetic multiferroic $CuFeO_2$	Setsuo Mitsuda	Tokyo University of Science
85	高分子網目内部の架橋点の可視化	西　健吾	東京大学	物性研究所	Visualization of cross-link points in polymer network	Kengo Nishi	The University of Tokyo
86	界面不活性の働きをする界面活性剤	貞包　浩一朗	立命館大学	理工学部	Surfactant molecules behaving as a surface-inactive agent	Koichiro Sadakane	Ritsumeikan University
87	高圧条件下における２成分混合溶液の新奇な臨界挙動	貞包　浩一朗	立命館大学	理工学部	Novel critical behavior in a mixture of water / organic solvent under high-pressure condition	Koichiro Sadakane	Ritsumeikan University
88	中性子小角散乱によるタンパク質凝縮物の構造解析	野島　達也	東京工業大学	フロンティア研究機構	Precise structural analyses on protein condensate by small angle neutron scattering	Tatsuya Nojima	Tokyo Institute of Technology
89	シシケバブ生成における分子量効果	金谷　利治	京都大学	化学研究所	Effects of molecular weights on shish-kebab formation	Toshiji Kanaya	Kyoto University
90	イミダゾリウム系イオン液体とベンゼン誘導体の混合状態に対する 陽イオン−π相互作用の効果	高椋　利幸	佐賀大学	大学院工学系研究科	Effects of cation- π interaction on mixing state of imidazolium-based ionic liquid and benzene derivatives	Toshiyuki Takamuku	Saga University
91	ポリマーブレンドの相溶性に及ぼす成分ポリマーの一次構造（トポロジー）の影響	高野　敦志	名古屋大学	工学研究科	Influence of topology on the miscibility of a polymer blend	Atsushi Takano	Nagoya University
92	塑性変形により形成する金属ガラスの不均一構造解析	足立　望	豊橋技術科学大学	機会工学系	Deformation induced nanoscale structural inhomogeneity in bulk metallic glass	Nozomu Adachi	Toyohashi University of Technology
・申請装置 C1-3: ULS							
93	ULS（極小角散乱装置）IRT 課題	大竹　淑恵	理化学研究所	光量子工学研究領域	IRT: ULS (Ultra Small Angle Scattering Instrument)	Yoshie Ohtake	RIKEN
94	結晶内電場を用いた中性子電気双極子能率探索のための結晶評価	北口　雅暁	名古屋大学	現象解析研究センター	Study of crystal-diffraction for search of neutron EDM	Masaaki Kitaguchi	Nagoya University
・申請装置 C1-3: mf-SANS							

No.	課題名	氏名	所属		Title	Name	Organization
95	C1-3（小型集束型小角散乱装置）IRT 課題	古坂　道弘	北海道大学	大学院工学研究科	IRT: mf-SANS (mini-focusing Small Angle Neutron Scattering Instrument)	Michihiro Furusaka	Hokkaido University
・申請装置 C2-3-1: iNSE							
96	iNSE（中性子スピンエコー装置）IRT 課題	柴山　充弘	東京大学	物性研究所	IRT: iNSE (New issp Neutron Spin Echo Spectrometer)	Mitsuhiro Shibayama	The University of Tokyo
97	鉄系梯子型物質 $BaFe_2Se_3$ の中性子スピンエコー	南部　雄亮	東北大学	多元物質科学研究所	Neutron spin echo measurements on the iron-based ladder compound $BaFe_2Se_3$	Yusuke Nambu	Tohoku University
98	高級アルコールの構造緩和とレオロジー	山口　毅	名古屋大学	大学院工学研究科	Structural relaxation and rheology of higher alcohols	Tsuyoshi Yamaguchi	Nagoya University
99	界面不活性の働きをする界面活性剤	貞包　浩一朗	立命館大学	理工学部物理科学科	Surfactant molecules behaving as a surface-inactive agent	Koichiro Sadakane	Ritsumeikan University
・申請装置 C3-1-1: AGNES							
100	AGNES（高分解能パルス冷中性子分光器）IRT 課題	山室　修	東京大学	物性研究所	IRT: AGNES (Angle Focusing Cold Neutron Spectrometer)	Osamu Yamamuro	The University of Tokyo
101	Zn-Ln-Zn 単分子磁石のスピンダイナミクス	古府　麻衣子	東京大学	物性研究所	Spin dynamics in sigle-molecule magnets Zn-Ln-Zn	Maiko Kofu	The University of Tokyo
102	Vibrational excitations of H atoms in nanocrystalline palladium hydride	古府　麻衣子	東京大学	物性研究所	Vibrational excitations of H atoms in nanocrystalline palladium hydride	Maiko Kofu	The University of Tokyo
103	イミダゾリウム系イオン液体およびその液晶相の速いダイナミクス	山室　修	東京大学	物性研究所	Fast dynamics of imidaozlium based ionic liquids and their liquid crystalline phases	Osamu Yamamuro	The University of Tokyo
104	パラジウムナノ粒子中の水素原子の速いダイナミクス	山室　修	東京大学	物性研究所	Fast dynamics of hydrogen atoms in palladium nano-particles	Osamu Yamamuro	The University of Tokyo
105	逆浸透膜表面における水のダイナミクス	山室　修	東京大学	物性研究所	Dynamics of water on surface of reverse osmotic membranes	Osamu Yamamuro	The University of Tokyo
106	リラクサー磁性体 $LuFeCoO_4$ におけるナノドメインのダイナミクス	左右田　稔	東京大学	物性研究所	Interaction between slow dynamics of nuclear and magnetic domains in relaxor magnet $LuFeCoO_4$	Minoru Soda	The University of Tokyo
107	水／逆浸透膜系の遅いダイナミクス	山室　修	東京大学	物性研究所	Slow dynamics of water/(reverse osmotic membranes) systems	Osamu Yamamuro	The University of Tokyo
108	ROM-11.5D_2O の遅いダイナミクス	山室　修	東京大学	物性研究所	Slow dynamics of ROM-11.5D_2O	Osamu Yamamuro	The University of Tokyo
・申請装置 C3-1-2: MINE1							

No.	課題名	氏名	所属		Title	Name	Organization
109	MINE1（京大炉：多層膜中性子干渉計・反射率計）IRT 課題	日野　正裕	京都大学	原子炉実験所	IRT: MINE (Multilayer Interferometer and Refrectometer for Neutron) 1	Masahiro Hino	Kyoto University
112	2 次元中性子集光デバイスの開発	日野　正裕	京都大学	原子炉実験所	Development of 2-dimensional focusing device	Masahiro Hino	Kyoto University
・申請装置 C3-1-2: MINE2							
110	MINE2（京大炉：多層膜中性子干渉計・反射率計）IRT 課題	日野　正裕	京都大学	原子炉実験所	IRT: MINE (Multilayer Interferometer and Refrectometer for Neutron) 2	Masahiro Hino	Kyoto University
111	超冷中性子光学のためのデバイス開発	北口　雅暁	名古屋大学	現象解析研究センター	Development of optical devices for ultra cold neutrons	Masaaki Kitaguchi	Nagoya University
113	2 次元中性子集光デバイスの開発	日野　正裕	京都大学	原子炉実験所	Development of 2-dimensional focusing device	Masahiro Hino	Kyoto University
114	高分子 / 水界面における生体分子の吸着状態の解析	松野　寿生	九州大学	大学院工学研究院	Analyses of adsorbed biomolecules at the polymer/water interface	Hisao Matsuno	Kyushu University
115	混合液体中における高分子薄膜の膨潤挙動	田中　敬二	九州大学	工学研究院	Swelling behavior of polymer thin films in mixed non-solvents	Keiji Tanaka	Kyushu University
・申請装置 T1-1: HQR							
116	HQR（高分解能中性子散乱装置）IRT 課題	吉沢　英樹	東京大学	物性研究所	IRT: HQR (High Q Resolution Triple Axis Spectrometer)	Hideki Yoshizawa	The University of Tokyo
117	時間分割中性子散乱測定による磁気構造変化過程の実時間追跡	元屋　清一郎	東京理科大学	理工学部	Real-time observation of magnetic structural change by means of time-resolved neutron scattering experiments	Kiyoichiro Motoya	Tokyo University of Science
118	$PbCuSO_4(OH)_2$ の磁場によって誘起される新奇量子相	安井　幸夫	明治大学	理工学部	Magnetic-field-induced anomalous quantum phase of $PbCuSO_4(OH)_2$	Yukio Yasui	Meiji University
119	$CeRhIn_5$ の圧力下中性子回折実験による磁性と超伝導の相関の研究	小林　理気	東京大学	物性研究所	Neutron diffraction study on $CeRhIn_5$ under pressure	Riki Kobayashi	The University of Tokyo
120	スピン格子結合系における磁気相転移と電気分極の一軸応力制御	満田　節生	東京理科大学	理学部	Uniaxial-stress control of magnetic phase transition and electric polarization in a spin-lattice coupled system	Setsuo Mitsuda	Tokyo University of Science
121	空間反転対称性を欠く二次元的系 $CeNiC_2$ の磁気構造	片野　進	埼玉大学	理工学研究科	Magnetic structures of the non-centrosymmetrical 2D system $CeNiC_2$	Susumu Katano	Saitama University
122	$EuRu_2P_2$ の磁気構造解析	藤原　哲也	山口大学	大学院理工学研究科	Magnetic structure analysis of $EuRu_2P_2$	Fujiwara Tetsuya	Yamaguchi University
123	$EuCo_2P_2$ の磁気構造解析	藤原　哲也	山口大学	大学院理工学研究科	Magnetic structure analysis of $EuCo_2P_2$	Fujiwara Tetsuya	Yamaguchi University

No.	課題名	氏名	所属		Title	Name	Organization
124	新規スピンラダー系 $BiCu_2PO_6$ の磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of magnetic correlations in novel spin-ladder system $BiCu_2PO_6$	Masaki Fujita	Tohoku University
125	強誘電体の相転移機構（変位型及び秩序–無秩序型）に関する統一的理解の確立	重松　宏武	山口大学	教育学部	Establishment of the unified explanation about the phase transition mechanism (displacive and order-disorder type) in Ferroelectrics	Hirotake Shigematsu	Yamaguchi University
126	Rb_2MoO_4 における多形転移とソフトフォノン	重松　宏武	山口大学	教育学部	Polymorph transition and soft phonon in Rb_2MoO_4	Hirotake Shigematsu	Yamaguchi University
127	$SrFeO_3$ の multi-q 磁気状態における長時間緩和現象	中島　多朗	理化学研究所	創発物性科学研究センター	Long-time magnetic relaxation in the multi-q state of $SrFeO_3$	Taro Nakajima	RIKEN
128	2 等辺三角格子反強磁性体 $CoNb_2O_6$ における交換相互作用定数の一軸応力による制御	満田　節生	東京理科大学	理学部	Anisotropic control of exchange interactions in a frustrated isosceles triangular lattice Ising antiferromagnet $CoNb_2O_6$	Setsuo Mitsuda	Tokyo University of Science
・申請装置 T1-2: AKANE							
129	AKANE（東北大金研：三軸型中性子分光器 ）IRT 課題	大山　研司	東北大学	原子分子材料科学高等研究機構	IRT: AKANE (Advanced Kinken Neutron Spectrometer)	Kenji Ohoyama	Tohoku University
130	遍歴電子反強磁性体 Mn_3Si における動的スピン階層構造の研究	平賀　晴弘	高エネルギー加速器研究機構	物質構造科学研究所	Study on dynamical spin hierarchy structure in itinerant-electron antiferromagnet Mn_3Si	Haruhiro Hiraka	KEK
131	マルチフェロイック物質 $SmMn_2O_5$ の磁気秩序と強誘電性	木村　宏之	東北大学	多元物質科学研究所	Antiferromagnetism and ferroelectricity in multiferroic compounds of $SmMn_2O_5$	Hiroyuki Kimura	Tohoku University
132	マルチフェロイック物質 YMn_2O_5 における磁性と強誘電性の磁性イオン置換効果	木村　宏之	東北大学	多元物質科学研究所	Substitution effect of magnetic ions on magnetism and ferroelectricity in multiferroic YMn_2O_5	Hiroyuki Kimura	Tohoku University
133	新規 T’ 構造ホールドープ銅酸化物 $Pr_{2-x}Ca_xCuO_4$ における磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of spin correlations in novel T’ -structured cuprate oxide $Pr_{2-x}Ca_xCuO_4$	Masaki Fujita	Tohoku University
134	新規スピンラダー系 $BiCu_2PO_6$ の磁気相関の研究	藤田　全基	東北大学	金属材料研究所	Study of magnetic correlations in novel spin-ladder system $BiCu_2PO_6$	Masaki Fujita	Tohoku University
135	Al 置換した La214 系銅酸化物高温超伝導体のストライプ秩序と超伝導の研究	鈴木　謙介	東北大学	金属材料研究所	Study of Al-induced stripe order and superconductivity in Al-substituted La-214 cuprate	Kensuke Suzuki	Tohoku University
136	CrX (Cr=Si, Ge) のカイラル磁気構造の検証	高阪　勇輔	広島大学	大学院理学研究科	Chiral magnetic structure in CrX (X=Si, Ge)	Yusuke Kousaka	Hiroshima University
137	MPO_4 (M: 遷移金属) のカイラル磁気構造の検証	高阪　勇輔	広島大学	大学院理学研究科	Chiral magnetism in MPO_4 (M: Transition Metal)	Yusuke Kousaka	Hiroshima University
138	幾何学的フラストレート系 $(Mn,Mg)Cr_2O_4$ におけるらせん磁気構造のクロスオーバー	高阪　勇輔	広島大学	大学院理学研究科	Crossover between conical and screw magnetic phase in $(Mn,Mg)Cr_2O_4$	Yusuke Kousaka	Hiroshima University
139	ホールドープ型鉄系超伝導体のスピン揺動	李　哲虎	産業技術総合研究所	エネルギー技術研究部門	Spin fluctuations of hole-doped iron-based superconductors	Chul-Ho Lee	AIST

No.	課題名	氏名	所属		Title	Name	Organization
・申請装置 T1-3: HERMES							
140	HERMES（東北大金研：中性子粉末回折装置）IRT 課題	大山　研司	東北大学	原子分子材料科学高等研究機構	IRT: HERMES(Kinken Powder Diffractometer for High Efficiency and High Resolution MEasurementS)	Kenji Ohoyama	Tohoku University
141	新酸窒化物の構造の解明	タッセル　セドリック	京都大学	大学院工学研究科	Investigation of the structure and magnetism of a new oxynitride family	Cedric Tassel	Kyoto University
142	層状ペロブスカイト型酸化物の結晶構造とイオン拡散経路	八島　正知	東京工業大学	大学院理工学研究科	Crystal structure and ion-diffusion path of layered perovskite-type oxides	Masatomo Yashima	Tokyo Institute of Technology
143	可視光応答型酸窒化物光触媒の構造物性	八島　正知	東京工業大学	大学院理工学研究科	Crystal structure and photocatalytic activity of visible-light responsive photocatalyts	Masatomo Yashima	Tokyo Institute of Technology
144	層状遷移金属オキシカルコゲナイドの磁気構造	分島　亮	北海道大学	大学院理学研究院	Magnetic structures of layered transition metal oxychalcogenides	Makoto Wakeshima	Hokkaido University
145	二層三角格子反強磁性体 $Fe_2Ga_2S_5$ の結晶構造と磁気構造	南部　雄亮	東北大学	多元物質科学研究所	Crystal and magnetic structures of the bilayer triangular antiferromagnet $Fe_2Ga_2S_5$	Yusuke Nambu	Tohoku University
146	希土類–遷移金属複合酸化物の磁気構造	土井　貴弘	北海道大学	大学院理学研究院	Magnetic structure of rare earth and transition metal oxides	Yoshihiro Doi	Hokkaido University
147	反転対称性の破れた磁性体 $Re_5Ru_3Al_2$(Re=Ce,Pr,Nd) の磁気秩序構造	奥山　大輔	東北大学	多元物質科学研究所	Magnetic structure of $Re_5Ru_3Al_2$(Re=Ce,Pr,Nd) without spatial inversion symmetry	Daisuke Okuyama	Tohoku University
148	異常高原子価鉄を持つ (Ba,Sr)FeO_3 の磁気構造と相境界の解明	山本　隆文	京都大学	工学研究科	Investigation for magnetic structure and phase boundary of (Ba,Sr)FeO_3 with an unusually high valence strate of iron	Takafumi Yamamoto	Kyoto university
149	正方 4 配位 Mn イオンを含む複合ペロブスカイト酸化物の磁気構造	山田　幾也	大阪府立大学	21 世紀科学研究機構　ナノ科学・材料研究センター	Magnetic structures of square-coordinated Mn complex perovskite oxides	Ikuya Yamada	Osaka Prefecture University
150	異常高原子価鉄ペロブスカイト酸化物の磁気構造	山田　幾也	大阪府立大学	21 世紀科学研究機構　ナノ科学・材料研究センター	Magnetic structures of Fe^{4+}-congaining complex perovskite oxides	Ikuya Yamada	Osaka Prefecture University
151	クロム複合硫化物の結晶構造と磁気転移	手塚　慶太郎	宇都宮大学	工学研究科	Crystal structures and magnetic transitions of chromium complex sulfides	Keitaro Tezuka	Utsunomiya University
152	電子ドープ型マンガン酸化物の磁化の反転と磁気構造	松川　倫明	岩手大学	工学部	Magnetization reversal and magnetic structure of electron doped manganites	Michiaki Matsukawa	Iwate university
153	シャンダイト型遷移金属化合物 $Co_3Sn_{2-x}In_xS_2$ の磁気構造解析	田畑　吉計	京都大学	大学院工学研究科	Magnetic structure of shandite-type transition-metal compound $Co_3Sn_{2-x}In_xS_2$	Yoshikazu Tabata	Kyoto University
154	Magnetic structures of frustrated magnets	益田　隆嗣	東京大学	物性研究所	Magnetic structures of frustrated magnets	Takatsugu Masuda	The University of Tokyo
155	一次元フラストレート鎖 ANi(VO_4)(OD) (A=Ca,Sr) の磁気構造	萩原　雅人	東京理科大学	理工学部	Magnetic structure of frustrated chain magnetism AM(VO_4)(OD) (A=Ca,Sr;M=Co,Ni)	Masato Hagihara	Tokyo University of Science

No.	課題名	氏名	所属		Title	Name	Organization
156	新規ペロブスカイト関連 AA' BO_4 型構造をもつ酸化物イオン伝導体の結晶構造とイオン伝導経路の解明	藤井　孝太郎	東京工業大学	理工学研究科	Structural investigation of the novel perovskite related AA' BO_4-type materials ? oxide-ionic and electronic conducting materials?	Kotaro Fuii	Tokyo Institute of Technology
157	T' 構造銅酸化物の超伝導発現と結晶構造の関係	藤田　全基	東北大学	金属材料研究所	Relation between superconducting mechanism and crystal structure in T' cuprate oxide	Masaki Fujita	Tohoku University
158	ホイスラー合金 Ru_2CrSi の反強磁性状態	重田　出	鹿児島大学	大学院理工学研究科	Antiferromagnetic state of Heusler alloy Ru_2CrSi	Iduru Shigeta	Kagoshima University
159	鉄ヒ素 112 系超伝導体の磁気秩序構造の研究	鈴木　謙介	東北大学	金属材料研究所	Study of magnetic structure of 112-type iron arsenide superconductor	Kensuke Suzuki	Tohoku University
160	ペロブスカイト型酸窒化物に対する水素化物イオン挿入	陰山　洋	京都大学	工学研究科	Hydride Insertion into Perovskite $O_x$ynitrides	Hiroshi Kageyama	Kyoto University
161	新規カイラル磁性体 CrX (X: Si, Ge) の磁気構造解析	高阪　勇輔	広島大学	大学院理学研究科	Magnetic structure analysis in new chiral magnetic compounds CrX (X: Si, Ge)	Yusuke Kousaka	Hiroshima University
162	新規カイラル磁性体 MPO_4 (M: 遷移金属) の磁気構造解析	高阪　勇輔	広島大学	大学院理学研究科	Magnetic structure analysis in new chiral magnetic compounds MPO_4 (M: transition metal)	Yusuke Kousaka	Hiroshima University
163	トポロジカルホール効果を示す金属らせん磁性体 $SrFeO_3$ における Rh 置換効果	中島　多朗	理化学研究所	創発物性科学研究センター	Rh-substitution effect on a metallic helimagnet $SrFeO_3$	Taro Nakajima	RIKEN
164	鉄系超伝導体の結晶構造と超伝導の相関	李　哲虎	産業技術総合研究所	エネルギー技術研究部門	Relationship between crystal structure and superconductivity in Fe-based superconductors	Chul-Ho Lee	AIST
165	平面４配位構造を有する正方格子磁性体マンガン酸塩化物の磁気基 底状態の研究	辻本　吉廣	物質材料研究機構	先端材料プロセスユニット	Neutron diffraction study of new square-lattice magnet $Sr_2MnO_2Cl_2$ with square planar coordination	Yoshihiro Tsujimoto	NIMS
166	平面ピラミッド配位構造を有する正方格子磁性体ニッケル酸ハロゲ ン化物の磁気基底状態の研究	辻本　吉廣	物質材料研究機構	先端材料プロセスユニット	Neutron diffraction study of new square-pyramidal coordinated nickel oxyhalides Sr_2NiO_3X (X = F, Cl)	Yoshihiro Tsujimoto	NIMS
167	ルテニウム含有ペロブスカイト型酸化物の中性子回折測定	野村　勝裕	産業技術総合研究所	ユビキタスエネルギー研究部門	Neutron diffraction study of ruthenium containing perovskite oxides.	Katsuhiro Nomura	AIST
・申請装置 T2-2: FONDER							
168	FONDER（中性子 4 軸回折装置）IRT 課題	木村　宏之	東北大学	多元物質科学研究所	IRT: FONDER (Four-circle-Off-center-type Neutron Diffractometer)	Hiroyuki Kimura	Tohoku University
169	塑性歪みを加えた Pt_3Fe 反強磁性体における強磁性の発現機構	小林　悟	岩手大学	工学部	Mechanism of ferromagnetism in plastically deformed Pt_3Fe antiferromagnet	Satoru Kobayashi	Iwate University
170	スピン三重項超伝導体 Sr_2RuO_4 の一軸圧力下中性子散乱実験	山崎　照夫	東京理科大学	理工学部	Neutron scattering of the triplet superconductor Sr_2RuO_4 under uniaxial pressures	Teruo Yamazaki	Tokyo University of Science
171	$DyFe_2Zn_{20}$ における磁気異方性増強を伴う逐次磁気相転移	岩佐　和晃	東北大学	大学院理学研究科	Successive magnetic phase transition with enhancement in magnetic anisotropy of $DyFe_2Zn_{20}$	Kazuaki Iwasa	Tohoku University

No.	課題名	氏名	所属		Title	Name	Organization
172	マルチフェロイック物質 $SmMn_2O_5$ の磁気秩序と強誘電性	木村　宏之	東北大学	多元物質科学研究所	Antiferromagnetism and ferroelectricity in multiferroic compounds of $SmMn_2O_5$	Hiroyuki Kimura	Tohoku University
173	マルチフェロイック物質 YMn_2O_5 における磁性と強誘電性の磁性イオン置換効果	木村　宏之	東北大学	多元物質科学研究所	Substitution effect of magnetic ions on magnetism and ferroelectricity in multiferroic YMn_2O_5	Hiroyuki Kimura	Tohoku University
174	孤立四面体量子スピン系の新モデル物質 $K_4Cu_4OCl_{10}$ の磁気構造	藤原　理賀	東京理科大学	理学部第一部	The magnetic structure of $K_4Cu_4OCl_{10}$ as new ideal isotropic quantum spin tetrahedral system.	Masayoshi Fujihara	Tokyo University of Science
175	$Ca_2Fe_{2-x}Al_xO_5$ におけるスピンフロップ転移時の磁気構造変化の観測	阿部　伸行	東京大学	新領域創成科学研究科	Magnetic structure study in magnetoelectric $Ca_2Fe_{2-x}Al_xO_5$	Nobuyuki Abe	The University of Tokyo
176	孤立四面体量子スピン系の新たなモデル物質 $K_4Cu_4OCl_{10}$ の磁気構造	藤原　理賀	東京理科大学	理学部	The magnetic structure of $K_4Cu_4OCl_{10}$ as new ideal isotropic quantum spin tetrahedral system.	Masayoshi Fujihara	Tokyo University of Science
・申請装置 Accessory							
177	アクセサリー IRT 課題	上床　美也	東京大学	物性研究所	IRT: Accessory	Yoshiya Uwatoko	The University of Tokyo

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No.	課題名	氏名	所属		Title	Name	Organization
播磨分室 / Harima Branch							
1	偏光を利用した高輝度軟 X 線実験技術開発の促進	松田　巌	東京大学	物性研究所	Promoting development of experimental techniques using polarized high-brilliant soft X-ray	Iwao Matsuda	The University of Tokyo
2	省エネ・創エネ・蓄電デバイスのオペランドナノ分光	尾嶋　正治	東京大学	放射光連携研究機構	Operando nano-spectroscopy for energy efficient, power generation and energy storage devices	Masaharu Oshima	The University of Tokyo
3	大気圧下の角度分解型超高分解能軟X線発光分光システムの開発	原田　慈久	東京大学	物性研究所	Development of angle resolved ultrahigh resolution soft X-ray emission spectroscopy in atmospheric pressure	Yoshihisa Harada	The University of Tokyo
4	オペランド 3D nano-ESCA を用いた二次元原子薄膜ヘテロ接合系の観察とデバイス応用 (I) 絶縁膜との界面相互作用	吹留　博一	東北大学	電気通信研究所	Operando analysis and device applications of hetero-junctioned 2D atomic layers (I) Establishment of operando spectromicroscopy using graphene as a model system	Hirokazu Fukidome	Tohoku University
5	オペランド軟 X 線吸収 / 発光分光によるリチウムイオン電池用電極材料の電子状態解析、および充放電反応に対する配位子軽元素の寄与の解明	朝倉　大輔	産業技術総合研究所	エネルギー技術研究部門	Operando soft x-ray absorption/emission spectroscopy studies of electrode materials for Li-ion batteries and investigation of the role of ligand elements against the charge-discharge reaction	Daisuke Asakura	AIST
6	酸素 K 吸収端共鳴非弾性X線散乱によるホールドープ型銅酸化物高温超伝導体の電荷励起	石井　賢司	日本原子力研究開発機構	量子ビーム応用研究センター	Charge excitations in high-T_c cuprates studied by resonant inelastic x-ray scattering at the oxygen K-edge	Kenji Ishii	JAEA
7	軟 X 線時間分解光電子分光を用いた重い電子系 Yb 化合物の価数揺動状態の研究	大川　万里生	東京理科大学	理学部	Soft x-ray time-resolved photoemission study on the valence fluctuation in heavy-fermion Yb compounds	Mario Okawa	Tokyo University of Science
8	ピコ秒時分割光電子ホログラフィーの開発	林　好一	東北大学	金属材料研究所	Development of picosecond time-resolved photoelectron holography	Kouichi Hayashi	Tohoku University
9	二酸化チタン表面における酸素欠陥の光励起キャリア寿命への影響	小澤　健一	東京工業大学	理工学研究科物質科学専攻	Influence of oxygen defects of titanium dioxide surfaces on the photoexcited carrier lifetime	Kenichi Ozawa	Tokyo Institute of Technology
10	顕微高分解能二次元光電子分光による機能性物質における「活性サイト」の構造物性解析	大門　寛	奈良先端科学技術大学院大学	大学物質創成科学研究科	Analysis of structures and electronic states of [active-site] in functional materials by microscopic high-resolution two-dimensional photoelectron spectroscopy	Hiroshi Daimon	NAIST
11	マルチフェロイック物質の磁場中 RIXS 測定	宮脇　淳	東京大学	物性研究所	RIXS of multiferroic materials in magnetic field	Jun Miyawaki	The University of Tokyo
12	雰囲気X線光電子分光によるグラフェン表面における CO_2 の吸着状態の研究	山本　達	東京大学	物性研究所	Adsorbed states of CO_2 on a graphene surface studied by ambient-pressure X-ray photoelectron spectroscopy	Susumu Yamamoto	The University of Tokyo
13	雰囲気光電子分光による化学修飾した銅表面における CO_2 の活性化および水素化反応	吉信　淳	東京大学	物性研究所	Activation and hydrogenation of CO_2 on chemically-modified Cu surfaces studied by ambient-pressure XPS	Jun Yoshinobu	The University of Tokyo
14	光電子ホログラフィー・原子サイト選択的 XPS による $ZnSnAs_2$:Mn 薄膜の室温強磁性発現機構の解明	内富　直隆	長岡技術科学大学	工学部	Revealing room-temperature ferromagnetism of $ZnSnAs_2$:Mn thin films by atomic and magnetic structure analysis based on photoelectron holography and site-selective XPS measurements	Naotaka Uchitomi	Nagaoka University of Technology
15	高分解能 Co 2p 共鳴非弾性 X 線散乱分光法による $LaCoO_3$ のスピン転移の観測	田口　幸広	大阪府立大学	大学院工学研究科	Observation of the spin-state transition of $LaCoO_3$ by using high-resolution Co 2p resonant inelastic x-ray scattering spectroscopy	Yukihiro Taguchi	Osaka Prefecture University

No.	課題名	氏名	所属		Title	Name	Organization
16	オペランド顕微分光を用いたグリーン次世代通信デバイスの研究開発　(I) GaN-HEMT におけるコラプス現象の解明	吹留　博一	東北大学	電気通信研究所	Research and development of green next-generation communication devices by using operando spectromicroscopy (I) Investigation of collapse phenomena in GaN-HEMT	Hirokazu Fukidome	Tohoku University
17	オペランド軟 X 線吸収 / 発光分光によるリチウムイオン電池用電極材料の電子状態解析、および充放電反応に対する配位子軽元素の寄与の解明　その２	朝倉　大輔	産業技術総合研究所	省エネルギー研究部門	Operando soft x-ray absorption/emission spectroscopy studies of electrode materials for Li-ion batteries and investigation of the role of ligand elements against the charge-discharge reaction II	Daisuke Asakura	AIST
18	雰囲気光電子分光による銅系モデル触媒における CO_2 およびフォルメートの水素化	吉信　淳	東京大学	物性研究所	Hydrogenation of CO_2 and formate on model Cu catalysts studied by ambient-pressure XPS	Jun Yoshinobu	The University of Tokyo
19	マルチフェロイック物質の磁場中 RIXS 測定 II	宮脇　淳	東京大学	物性研究所	RIXS of multiferroic materials in magnetic field II	Jun Miyawaki	The University of Tokyo
20	光電子ホログラフィ法によるボロンドープダイヤモンドのドーパントサイト観察	加藤　有香子	産業技術総合研究所		Analysis of dopant-site in boron doped diamond by using photoelectron holography	Yukako Kato	AIST
21		Grioni Marco	スイス連邦工科大学	ローザンヌ校	Monitoring the ferroelectric instability of $BaTiO_3$ by RIXS	Marco Grioni	Ecole Polytechnique Federale de Lausanne
22	軟 X 線発光 / 吸収分光測定によるアセトニトリル系高濃度電解液の電子状態分析	大久保　将史	東京大学	工学系研究科	Study on the electronic states of acetonitrile based superconcentrated electrolyte by soft X-ray absorption/emission spectroscopy	Masashi Okubo	The University of Tokyo
柏キャンパス E 棟 / Laser and Synchrotron Research Laboratory in Kashiwa							
23	スピン分解・角度分解分光による Pt/Ge(001) 一次元原子鎖の電子状態の研究	矢治　光一郎	東京大学	物性研究所	One-dimensional surface states of Pt-induced atomic nanowires on Ge(001) studied by spin- and angle-resolved photoelectron spectroscopy	Koichiro Yaji	The University of Tokyo
24	スピン・角度分解分光による Cu(111) 表面電子状態のスピン構造研究	矢治　光一郎	東京大学	物性研究所	Direct observation of the spin-polarized L-gap surface state on Cu(111) by spin- and angle-resolved photoelectron spectroscopy	Koichiro Yaji	The University of Tokyo
25	スピン・角度分解分光による YIG 基板上 Bi_2Se_3 及び Cr ドープ Bi_2Se_3 の界面電子状態の研究	松田　巌	東京大学	物性研究所	Interface state measurement of Bi_2Se_3 or Cr-doped Bi_2Se_3 on YIG by spin and angle-resolved photoelectron spectroscopy	Iwao Matsuda	The University of Tokyo
26	角度分解分光による $SrTiO_3$ の表面電子状態の研究	矢治　光一郎	東京大学	物性研究所	Electronic structure of $SrTiO_3$ studied by angle-resolved photoelectron spectroscopy	Koichiro Yaji	The University of Tokyo
27	ルテニウム酸化物及びイリジウム酸化物の表面電子スピン偏極	近藤　猛	東京大学	物性研究所	Spin-polarized surface electronic state in rutenate and iridate	Takeshi Kondo	The University of Tokyo
28			プリンストン大学	物理学部	Spin polarization measurements of the Fermi arc surface states of Weyl semimetal TaAs	Suyang Xu	Princeton University
29	Bi(111)/Si の偏光依存 ARPES	石田　行章	東京大学	物性研究所	Polarization-dependent ARPES on Bi(111)/Si	Yukiaki Ishida	The University of Tokyo
30	Bi(111) 表面電子状態のレーザー SARPES によるスピン偏極度の研究	矢治　光一郎	東京大学	物性研究所	Spin polarization of Bi(111) surface studied by laser SARPES	Koichiro Yaji	The University of Tokyo
31	高分解能スピン分解分光による Cu(111) 表面電子状態のスピン構造研究	矢治　光一郎	東京大学	物性研究所	Spin-polarized surface state on Cu(111) studied by high-resolution SARPES	Koichiro Yaji	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
32	Bi 系トポロジカル絶縁体のレーザー励起スピン分解光電子分光	黒田　健太	東京大学	物性研究所	SARPES using laser light on Bi-based topological insulators	Kenta Kuroda	The University of Tokyo
33	Pb/Ge(111) 表面のレーザー励起スピン・角度分解光電子分光	矢治　光一郎	東京大学	物性研究所	Laser-SARPES measurement of spin-polarized surface states on Pb/Ge(111)- β	Koichiro Yaji	The University of Tokyo
34		Baojie Feng	東京大学	物性研究所	Probing the electronic structure of WTe_2 using high resolution spin-ARPES	Baojie Feng	The University of Tokyo
35	レーザースピン分解光電子分光によるスピン軌道エンタングル状態の研究	黒田　健太	東京大学	物性研究所	Laser spin-resolved photoemission study on spin-orbital entangled materials	Kenta Kuroda	The University of Tokyo
36	空間反転対称性の破れた物質におけるスピン分極の観測	石坂　香子	東京大学	大学院工学系研究科	Observation of spin polarization in inversion-symmetry broken materials	Kyoko Ishizaka	The University of Tokyo
37	III-V 族半導体基板上に作成したビスマス 1 次元構造のスピン偏極電子状態	大坪　嘉之	大阪大学	生命機能研究科	Electronic structure and its spin polarization of one-dimensional bismuth surface layers grown of III-V semiconductor substrates	Yoshiyuki Ohtsubo	Osaka University
38	Ag(111) 表面電子状態の高分解能スピン・角度分解光電子分光	原沢　あゆみ	東京大学	物性研究所	High-resolution spin- and angle-resolved photoemission spectroscopy of electronic structure on Ag(111) surface	Ayumi Harasawa	The University of Tokyo

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No.	課題名	氏名	所属		Title	Name	Organization
1. 第一原理計算 / First-Principles Calculation of Materials Properties							
1	ハード及びソフトナノ物質の原子構造と電子物性	押山　淳	東京大学	工学系研究科	Atomic structures and slectronic properties of hard- and soft-nanomaterials	Atsushi Oshiyama	The University of Tokyo
2	極限的パルス光と物質の相互作用に対する実時間第一原理計算	矢花　一浩	筑波大学	計算科学研究センター	First-principles calculation of interactions between extreme pulse light and matter	Kazuhiro Yabana	University of Tsukuba
3	第一原理統計熱力学シミュレーションによる不均一触媒の構造と反応性の研究	森川　良忠	大阪大学	大学院工学研究科	First-principles statistical thermodynamics simulations on the structure and reactivity of heterogeneous catalysts	Yoshitada Morikawa	Osaka University
4	キラル磁性体 $Cr(NbS_2)_3$ の第一原理計算	獅子堂　達也	広島大学	大学院先端物質科学研究科	First-principles study of chiral magnet $Cr(NbS_2)_3$	Tatsuya Shishidou	Hiroshima University
5	物質構造と電子状態の第一原理シミュレーション手法の開発と応用	常行　真司	東京大学	大学院理学系研究科	Development and application of first-principles simulation of material structure and Electronic Properties	Shinji Tsuneyuki	The University of Tokyo
6	実空間差分法に基づく大規模第一原理電子状態・輸送特性計算手法の開発とシミュレーション	小野　倫也	筑波大学	計算科学研究センター	Development of first-principles electronic-structure and transport calculation method based on real-space finite-difference approach	Tomoya Ono	University of Tsukuba
7	第一原理 GW+Bethe-Salpeter 法による内核電子励起状態計算	野口　良史	東京大学	物性研究所	First-principles GW+Bethe-Salpeter calculations of core electron excitations	Yoshifumi Noguchi	The University of Tokyo
8	ハード及びソフトナノ物質の原子構造と電子物性	押山　淳	東京大学	工学系研究科	Atomic structures and electronic properties of ard- and soft-nanomaterials	Atsushi Oshiyama	The University of Tokyo
9	ナノ構造の量子伝導の第一原理計算	小林　伸彦	筑波大学	数理物質系物理工学域	First-principles study of quantum transport in nanostructures	Nobuhiko Kobayashi	University of Tsukuba
10	第一原理統計熱力学シミュレーションによる不均一触媒の構造と反応性の研究	森川　良忠	大阪大学	大学院工学研究科	First-principles statistical thermodynamics simulations on the structure and reactivity of heterogeneous catalysts	Yoshitada Morikawa	Osaka University
11	固液・固固界面の電子移動・イオン輸送に関する DFT 計算技術の開発と実証	館山　佳尚	物質・材料研究機構	国際ナノアーキテクトニクス研究拠点	DFT study on electron transfer and ionic transport at solid-liquid and solid-solid interfaces	Yoshitaka Tateyama	NIMS
12	第一原理メタダイナミックス計算による CARE 加工プロセスの解明 - 表面からの原子分離過程の解析 -	稲垣　耕司	大阪大学	大学院工学研究科	First-principles meta-dynamics analysis of catalytic referred etching method (analysis of atom removal process)	Kouji Inagaki	Osaka University
13	ESM 法による operando 条件下軟 X 線分光法のシミュレーション	大谷　実	産業技術総合研究所		Simulation of an operando soft x-ray spectroscopy using the ESM method	Minoru Otani	AIST
14	酸化物表面・界面における水素および酸素の反応解析	笠井　秀明	大阪大学	大学院工学研究科	Investigations of hydrogen and oxygen reactions on oxide surfaces and interfaces	Hideaki Kasai	Osaka University
15	半導体表面・界面におけるスピン軌道結合係数の第一原理計算	石井　史之	金沢大学	理工研究域数物科学系	Spin-orbit coupling parameters at surfaces and interfaces of semiconductors: first-principles study	Fumiyuki Ishii	Kanazawa University

No.	課題名	氏名	所属		Title	Name	Organization
16	第一原理計算による a-$InGaZnO_4$ の構造解析	安野　聡	高輝度光科学研究センター		First-principles study of the structure of a-$InGaZnO_4$	Satoshi Yasuno	JASRI
17	第一原理及び古典分子動力学計算を用いた固液界面の微視的研究	福井　賢一	大阪大学	大学院基礎工学研究科	Microscopic investigations of solid / liquid interfaces using first-principles and classical molecular dynamics	Ken-ichi Fukui	Osaka University
18	マルチフェロイクス物質への重元素ドープ効果	合田　義弘	東京工業大学	物質理工学院材料系	Doping effects of heavy elements for multiferroic materials	Yoshihiro Gohda	Tokyo Institute of Technology
19	実空間差分法に基づく大規模第一原理電子状態・輸送特性計算手法の開発とシミュレーション	小野　倫也	筑波大学	計算科学研究センター	Development of first-principles electronic-structure and transport calculation method based on real-space finite-difference approach	Tomoya Ono	University of Tsukuba
20	SiC を用いた次世代パワーデバイスの計算科学による設計	白石　賢二	名古屋大学	未来材料・システム研究所	Computational design of SiC-based future power devices	Kenji Shiraishi	Nagoya University
21	強誘電体を用いたスピンバレートロニクスの材料開発	山内　邦彦	大阪大学	産業科学研究所	Materials design toward spin-valleytronics by using ferroelectric oxides	Kunihiko Yamauchi	Osaka University
22	スピントロニクス材料および分子性磁性体の原子構造、磁気状態、電子状態の解析	小田　竜樹	金沢大学	理工研究域数物科学系	Analyses on atomic structure, magnetism, and electronic structure in spintronics materials and molecular magnets	Tatsuki Oda	Kanazawa University
23	遷移金属及びその合金や化合物の第一原理計算	小口　多美夫	大阪大学	産業科学研究所	First-principles palculations of transition metals and their alloys and compounds	Tamio Oguchi	Osaka University
24	スピントロニクス材料および分子性磁性体の原子構造、磁気状態、電子状態の解析	小田　竜樹	金沢大学	理工研究域数物科学系	Analyses on atomic structure, magnetism, and electronic structure in spintronics materials and molecular magnets	Tatsuki Oda	Kanazawa University
25	第一原理メタダイナミックス計算による CARE 加工プロセスの解明 - 表面からの原子分離過程の解析	稲垣　耕司	大阪大学	大学院工学研究科	First-principles meta-dynamics analysis of catalytic referred etching method (analysis of atom removal process)	Kouji Inagaki	Osaka University
26	有機・金属界面で誘起される磁気分極に関する理論的研究	柳澤　将	琉球大学	理学部	Theoretical investigation of spin polarization induced at the organic-metal interfaces	Susumu Yanagisawa	University of the Ryukyus
27	第一原理計算による Fe/Cu 超薄膜の構造および磁気構造解析	立津　慶幸	東京大学	大学院理学研究科	Structural and magnetic anisotropy analyses in Fe/Cu ultra-thin films by first-principles calculation	Yasutomi Tatetsu	The University of Tokyo
28	第一原理計算と革新的数理手法に基づく並列化超大規模電子構造理論	星　健夫	鳥取大学	大学院工学研究科	Parallelized ultra-large-scale electronic-structure theory based on first principle calculation and novel numerical method	Takeo Hoshi	Tottori University
29	固体表面上での水素及び酸素の反応における量子効果の影響	笠井　秀明	大阪大学	大学院工学研究科	Quantum effects of hydrogen and oxygen reactions on solid surfaces.	Hideaki Kasai	Osaka University
30	高圧力下における共有結合性液体の構造と電子状態の第一原理計算	下條　冬樹	熊本大学	大学院自然科学研究科	First-principles molecular-dynamics study of structural and electronic properties of covalent liquids under pressure	Fuyuki Shimojo	Kumamoto University
31	電位規制電極界面シミュレーション	杉野　修	東京大学	物性研究所	Constant-potential simulation of electrode interfaces	Osamu Sugino	The University of Tokyo
32	TiO_2(110) での酸素分子の吸着過程における負に帯電した酸素欠陥の役割解明	泰岡　顕治	慶應義塾	大学理工学部	The role of the negatively charged oxygen vacancy in the chemisorption process of oxygen molecules on TiO_2 (110)	Kenji Yasuoka	Keio University

No.	課題名	氏名	所属		Title	Name	Organization
33	密度汎関数理論に基づく非調和フォノン物性の数値的研究	只野　央将	東京大学	大学院工学系研究科	Numerical studies on anharmonic phonon properties based on density functional theory	Terumasa Tadano	The University of Tokyo
34	ナノ構造の量子伝導の第一原理計算	小林　伸彦	筑波大学	数理物質系物理工学域	First-principles study of quantum transport in nanostructures	Nobuhiko Kobayashi	University of Tsukuba
35	強誘電体を用いたスピンバレートロニクスの材料開発	山内　邦彦	大阪大学	産業科学研究所	Materials design toward spin-valleytronics by using ferroelectric oxides	Kunihiko Yamauchi	Osaka University
36	有機半導体成長過程の理論的研究	西館　数芽	岩手大学	工学部	Theoretical investigation of growing process of organic semiconductors	Kazume Nishidate	Iwate University
37	極限的パルス光と物質の相互作用に対する実時間第一原理計算	矢花　一浩	筑波大学	計算科学研究センター	First-principles calculation of interactions between extreme pulse light and matter	Kazuhiro Yabana	University of Tsukuba
38	第一原理計算に基づく硬磁性物質の保磁力起源の解明	平井　大介	東京大学	大学院理学系研究科	First-principles study of coercivity in hard magnetic materials	Daisuke Hirai	The University of Tokyo
39	電圧印加第一原理計算と統計手法による電気化学界面の理論解析	安藤　康伸	東京大学	工学系研究科	Theoretical analysis of electrochemical interfaces by first-principles calculation and statistical approach	Yasunobu Ando	The University of Tokyo
40	ナイロン分解酵素 NylC の耐熱化制御に関する理論的研究	重田　育照	筑波大学	大学院数理物質科学研究科	Theoretical design of heat resistivity of NylC	Yasuteru Shigeta	University of Tsukuba
41	金属／半導体界面における欠陥生成の研究：安定性とイオン化拡散	中山　隆史	千葉大学	理学部物理学科	Defect generation at metal/semiconductor interfaces: stability and ionization diffusion	Takashi Nakayama	Chiba University
42	ハイブリッド abinitioQM/MM シミュレーションによる生体高分子の理論解析	舘野　賢	兵庫県立大学	大学院生命理学研究科	Hybrid ab initio QM/MM simulations of biological macromolecular systems	Masaru Tateno	University of Hyogo
43	タンパク質折りたたみ過程の量子論的解析	重田　育照	筑波大学	大学院数理物質科学研究科	First-principles analyses on protein folding processes	Yasuteru Shigeta	University of Tsukuba
44	金属酸化物の振る舞いを特徴付ける構造単位の探索	赤木　和人	東北大学	原子分子材料科学高等研究機構	Exploration of structure motifs characterizing the behavior of metal oxides	Kazuto Akagi	Tohoku University
45	固液・固固界面の電子移動・イオン輸送に関する DFT 計算技術の開発と実証	館山　佳尚	物質・材料研究機構	国際ナノアーキテクトニクス研究拠点	DFT study on electron transfer and ionic transport at solid-liquid and solid-solid interfaces	Yoshitaka Tateyama	NIMS
46	界面と転位の原子構造と電子状態の研究	幾原　雄一	東京大学	大学院工学系研究科総合研究機構	Study of atomic structure and electronic states of interfaces and dislocations	Yuichi Ikuhara	The University of Tokyo
47	粒界の構造と電子状態の第一原理計算	幾原　雄一	東京大学	大学院工学系研究科総合研究機構	First-principles study of atomic and electronic structure of grain boundaries	Yuichi Ikuhara	The University of Tokyo
48	第一原理及び古典分子動力学計算を用いた電解質溶液 / 電極界面における電位依存性の評価	福井　賢一	大阪大学	大学院基礎工学研究科	First-principles and classical molecular dynamics investigations of electrolyte solution / electrode interfaces: potential dependence	Ken-ichi Fukui	Osaka University
49	時間依存密度汎関数法に基づく第一原理電子輸送シミュレーターの開発と応用	江上　喜幸	北海道大学	大学院工学研究院	Development and application of first-principles electron-transport simulator based on time-dependent density functional theory	Yoshiyuki Egami	Hokkaido University

No.	課題名	氏名	所属		Title	Name	Organization
50	ナノ構造のイオン輸送特性、電気特性および界面電子状態の理論解析	渡邉　聡	東京大学	大学院工学系研究科	Theoretical analyses on ionic transport properties, electrical properties and interfacial electronic states of nanostructures	Satoshi Watanabe	The University of Tokyo
51	外場中ナノ構造の励起電子状態とダイナミクスの第一原理計算	渡辺　一之	東京理科大学	理学部	First-principles study of excited electronic states and dynamics of nanostructures under external fields	Kazuyuki Watanabe	Tokyo University of Science
52	ワイドギャップ半導体のデバイス応用のための第一原理計算	斎藤　峯雄	金沢大学	理工研究域数物科学系	First-principles calculation for device application of wide gap semiconductors	Mineo Saito	Kanazawa University
53	次世代相変化メモリのデバイス特性に関する第一原理計算	洗平　昌晃	名古屋大学	未来材料・システム研究所	First-principles study on device properties of emerging phase-change memory devices	Masaaki Araidai	Nagoya University
54	第一原理計算によるグラフェン担持 Pt クラスターの触媒特性の研究	濱本　雄治	大阪大学	大学院工学研究科	First principles study of catalytic properties of Pt cluster supported on graphene	Yuji Hamamoto	Osaka University
55	原子膜積層系におけるモアレの第一原理計算	内田　和之	京都産業大学	理学部	First-principles study of moire patterns in atomic layers	Kazuyuki Uchida	Kyoto Sangyo University
56	第一原理分子動力学法に基づくネットワーク形成系ガラスの静的構造に関する研究	高良　明英	熊本大学	学生支援部	Ab initio molecular dynamics study for the static structure of the network forming glass	Akihide Koura	Kumamoto University
57	第一原理計算によるグラフェン担持 Pt クラスターの触媒特性の研究	濱本　雄治	大阪大学	大学院工学研究科	First principles study of catalytic properties of Pt cluster supported on graphene	Yuji Hamamoto	Osaka University
58	ワイドギャップ半導体のデバイス応用のための第一原理計算	斎藤　峯雄	金沢大学	理工研究域数物科学系	First-principles calculation for device application of wide gap semiconductors	Mineo Saito	Kanazawa University
59	電子デバイスのための自己組織化ナノインターフェイスの理論	レービガー　ハンネス	横浜国立大学	大学院工学研究院	Theory of self-organized nano-interfaces for electronic devices	Hannes Raebiger	Yokohama National University
60	有機・金属界面で誘起される磁気分極に関する理論的研究	柳澤　将	琉球大学	理学部	Theoretical investigation of spin polarization induced at the organic-metal interfaces	Susumu Yanagisawa	University of the Ryukyus
61	ハイブリッド abinitioQM/MM シミュレーションによる生体高分子の理論解析	舘野　賢	兵庫県立大学	大学院生命理学研究科	Hybrid ab initio QM/MM simulations of biological macromolecular systems	Masaru Tateno	University of Hyogo
62	界面の電子状態変調に伴う Pd(100) 超薄膜の磁性変化	佐藤　徹哉	慶應義塾大学	理工学部	Change in magnetism of Pd(100) ultrathin films due to the modulation in the interface electric states	Tetsuya Sato	Keio University
63	酸化物の機能性界面の第一原理計算	王　中長	東北大学	原子分子材料科学高等研究機構	First-principles investigation of functional interfaces in metallic oxides	Wang Zhongchang	Tohoku University
64	新規酸素吸蔵材料の開発と鉄鋼材料における水素脆化特性の解明	國貞　雄治	北海道大学	大学院工学研究院	Development of oxygen storage materials and analysis of hydrogen embrittlement properties of steel	Yuji Kunisada	Hokkaido University
65	AbinitioGW+ キュムラント展開法を用いた低次元系のスペクトル関数計算	中村　和磨	九州工業大学		Ab initio GW+cumulant study for spectral function of low-dimensional system	Kazuma Nakamura	Kyushu Institute of Technology
66	スピン軌道場と熱電能の第一原理計算	石井　史之	金沢大学	理工研究域数物科学系	First-principles calculation of spin-orbit field and thermopower	Fumiyuki Ishii	Kanazawa University

No.	課題名	氏名	所属		Title	Name	Organization
67	新規局所的光学特性測定法の検討と鉄鋼材料における水素脆化特性の解明	國貞　雄治	北海道大学	大学院工学研究院	Development of measurement technique of local optical property and analysis of hydrogen embrittlement properties of steel	Yuji Kunisada	Hokkaido University
68	不純物添加による光捕集性分子の光吸収特性への影響：第一原理分子動力学計算	大村　訓史	広島工業大学	工学部	Doping effects on light absorption of light-harvesting molecules: ab initio molecular-dynamics study	Satoshi Ohmura	Hiroshima Institute of Technology
69	金属／酸化物界面の誘電応答変調の第一原理解析	笠松　秀輔	東京大学	物性研究所	First-principles analysis of the dielectric response at metal/oxide interfaces	Shusuke Kasamatsu	The University of Tokyo
70	時間依存密度汎関数法に基づく第一原理電子輸送シミュレーターの開発と応用	江上　喜幸	北海道大学	大学院工学研究院	Development and application of first-principles electron-transport simulator based on time-dependent density functional theory	Yoshiyuki Egami	Hokkaido University
71	下部マントル鉱物の格子熱伝導率に対する鉄固溶効果の第一原理計算	出倉　春彦	愛媛大学	地球深部ダイナミクス研究センター	First-principles calculations of iron solid solution effects on the lattice thermal conductivity of lower mantle minerals	Haruhiko Dekura	Ehime University
72	燃料電池酸素還元反応の Pt ステップ構造依存性	木崎　栄年	大阪大学	大学院工学研究科	Pt stepped structure dependence for oxygen reduction reaction in fuel cell	Hidetoshi Kizaki	Osaka University
73	エネルギー変換過程における基礎過程の研究と高変換効率化に向けた大規模第一原理計算	山下　晃一	東京大学	大学院工学系研究科	Large scale ab initio calculations on the fundamental processes of energy convergence devices and on their optimization for high conversion efficiency	Koichi Yamashita	The University of Tokyo
74	第一原理 GW 計算による物質のプラズマロン状態の温度依存性解析	中村　和磨	九州工業大学		Temperature dependence of low-energy plasmaron states of materials: Ab initio GW analysis	Kazuma Nakamura	Kyushu Institute of Technology
75	固体酸化物燃料電池の電極材料における点欠陥の第一原理計算	桑原　彰秀	ファインセラミックスセンター		First principles calculation of point defects in electrodes of solid oxide fuel cells	Akihide Kuwabara	Japan Fine Ceramics Center
76	複雑なフェルミ面を持つ物質における超伝導ペアリング相互作用の第一原理計算	明石　遼介	東京大学	大学院理学系研究科	Ab initio calculation of superconducting pairing interactions in materials with complex Fermi surface	Ryosuke Akashi	The University of Tokyo
77	外場中ナノ構造の励起電子状態とダイナミクスの第一原理計算	渡辺　一之	東京理科大学	理学部	First-principles study of excited electronic states and dynamics of nanostructures under external fields	Kazuyuki Watanabe	Tokyo University of Science
78	ナノ構造のイオン輸送特性、電気特性および界面電子状態の理論解析	渡邉　聡	東京大学	大学院工学系研究科	Theoretical analyses on ionic transport properties, electrical properties and interfacial electronic states of nanostructures	Satoshi Watanabe	The University of Tokyo
79	遷移金属化合物に対する第一原理バンド計算による有効模型導出と多体効果の解析	榊原　寛史	鳥取大学	大学院工学研究科	Derivation of effective model in transition metal compounds by first-principles calculation and its analysis from the view point of many body effect	Hirofumi Sakakibara	Tottori University
80	ナノ材料熱電特性に及ぼすひずみの影響に関する第一原理解析	塩見　淳一郎	東京大学	大学院工学系研究科	First-principles analysis on the strain effect on the thermoelectric properties of nanomaterials	Junichiro Shiomi	The University of Tokyo
81	有機結晶の電子的性質に関する理論的研究	柳澤　将	琉球大学	理学部	Theoretical investigation on electronic properties of organic solids	Susumu Yanagisawa	University of Ryukyus
82	Si 表面上の原子吸着系のモデル計算	服部　賢	奈良先端科学技術大学院大学	物質創成科学研究科	Model calculations in Si surfaces with adsorbates	Ken Hattori	Nara Institute of Science and Technology
83	新規エネルギー貯蔵システムの触媒開発と表面反応解析	大友　順一郎	東京大学	大学院新領域創成科学研究科	Study on catalyst synthesis and surface reaction analysis for novel energy storage systems	Junichiro Otomo	The University of Tokyo

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84	コランダム型 Cr_2O_3 および Fe_2O_3 の磁気異方性エネルギーの解析	小田　洋平	福島工業高等専門学校		Analysis of magnetic anisotropy energy in corundum-type Cr_2O_3 and Fe_2O_3	Yohei Kota	Fukushima National College of Technology
85	定電位電極表面における電解質の拡散過程の第一原理シミュレーション	胡　春平	京都大学	学際融合教育研究推進センター	First-principles simulation of electrolyte diffusion process on constant-potential electrodes	Chunping Hu	Kyoto University
86	第一原理電子状態計算プログラム xTAPP の高度化	吉本　芳英	東京大学	情報理工学系研究科	Development of first-principles electronic structure calculation package xTAPP	Yoshihide Yoshimoto	The University of Tokyo
87	半導体表面界面欠陥の形成と物性の機構解明	影島　博之	島根大学	大学院総合理工学研究科	Study on formation and property mechanism of semiconductor surfaces/interfaces/defects	Hiroyuki Kageshima	Shimane University
88	磁石物質とスピン軌道相互作用系の第一原理的研究	三宅　隆	産業技術総合研究所	ナノシステム研究部門	First-principles study of magnet materials and spin-orbit systems	Takashi Miyake	AIST
89	半導体格子欠陥の第一原理計算	山内　淳	慶應義塾大学	理工学部	First-principles study on the defects in semiconductors	Jun Yamauchi	Keio University
90	第一原理計算による水分解用光触媒材料の解析	阪田　薫穂	東京大学	化学システム工学専攻	Ab-initio DFT calculations of photocatalyst material for water splitting	Kaoruho Sakata	The University of Tokyo
91	新たなナノスケール界面の電子物性の探索	小林　功佳	お茶の水女子大学	理学部	Search for electronic properties of new nanoscale interfaces	Katsuyoshi Kobayashi	Ochanomizu University
92	金属強磁性体 / スピネルバリア界面の結晶磁気異方性の第一原理計算	三浦　良雄	京都工芸繊維大学	工芸科学研究科	A first-principles study on magneto-crystalline anisotropy of ferromagnetic metal interfaces with spinel barrier	Yoshio Miura	Kyoto Institute of Technology
93	金属酸化物中の不純物のまわりの局所構造解析	赤木　和人	東北大学	原子分子材料科学高等研究機構	Local structure analysis around impurity atoms in a metal oxide	Kazuto Akagi	Tohoku University
94	希土類磁石材料の電子状態	赤井　久純	東京大学	物性研究所	Electronic structure of rare earth magnets	Hisazumi Akai	The University of Tokyo
95	炭化珪素ナノクラスターの高温酸化と水分解反応の第一原理計算	鶴田　健二	岡山大学	大学院自然科学研究科	Ab initio simulation of SiC nanocluster for high-temperature oxidation and water splitting	Kenji Tsuruta	Okayama University
96	鉄化合物の磁性計算	小畑　修二	東京電機大学	理工学部	Calculations of Fe compounds magnetism	Shuji Obata	Tokyo Denki University
97	原子膜物質の原子構造・安定性・電子構造の解明	藤本　義隆	東京工業大学	大学院理工学研究科	Stabilities, structures, and electronic properties of atomic-layered materials	Yoshitaka Fujimoto	Tokyo Institute of Technology
98	照射損傷と格子間原子との相互作用の研究	大澤　一人	九州大学	応用力学研究所	Study of interaction between radiation damage and interstitial atom	Kazuhito Ohsawa	Kyushu University
99	シリコンクラスター超格子に対する第一原理計算	織田　望	産業技術総合研究所		Ab initio calculations for the silicon cluster superlattice	Nozomi Orita	AIST
100	遷移金属薄膜・有機金属錯体の電子構造と磁性、電界効果に関する第一原理計算	中村　浩次	三重大学	大学院工学研究科	First principles calculations on electronic structures, magnetism, and electric field effects in transition-metal films and organometallic complexes	Kohji Nakamura	Mie University

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101	ナノスケール炭素物質の物質設計と物性解明	岡田　晋	筑波大学	大学院数理物質科学研究科	Electronic structures of carbon nanomaterials	Susumu Okada	University of Tsukuba
102	原子膜物質の原子構造・安定性・電子構造の解明	藤本　義隆	東京工業大学	大学院理工学研究科	Stabilities, structures, and electronic properties of atomic-layered materials	Yoshitaka Fujimoto	Tokyo Institute of Technology
103	有機結晶の電子的性質に関する理論的研究	柳澤　将	琉球大学	理学部	Theoretical investigation on electronic properties of organic solids	Susumu Yanagisawa	University of Ryukyus
104	アンモニア合成の新触媒設計のための N_2 および H_2 の解離現象の理論的評価	神原　陽一	慶應義塾大学	理工学部	Theoretical research on dissociation of N_2 and H_2 for designing new ammonia synthesis catalysts	Yoichi Kamihara	Keio University
105	希土類磁石材料の電子状態	赤井　久純	東京大学	物性研究所	Electronic structure of rare earth magnets	Hisazumi Akai	The University of Tokyo
106	熱電材料の電子状態に関する第一原理計算	佐藤　幸生	九州大学	大学院工学研究院	First-principles calculation on electronic structure of thermoelectric material	Yukio Sato	Kyushu University
107	第１原理運動量依存変分理論の構築と鉄化合物への応用	梯　祥郎	琉球大学	理学部	First-principles momentum dependent local ansatz theory and its application to Fe compounds	Yoshiro Kakehashi	University of Ryukyus
108	層状人工格子界面の電子状態と近接効果	平井　國友	奈良県立医科大学	医学部	Electronic state and proximity effects around interface in layered superlattices	Kunitomo Hirai	Nara Medical University
109	正八面体型フラストレーションを持つ磁性合金の理論	内田　尚志	北海道科学大学		Theory of magnetic alloys with octahedral frustration	Takashi Uchida	Hokkaido University of Science
110	超精密ダイヤモンド工具の損耗機構	宇田　豊	大阪電気通信大学	工学部	Wear mechanism of diamond tool	Yutaka Uda	Osaka University
111	重い元素からなる低次元ハニカム格子物質の開拓	高木　紀明	東京大学	大学院新領域創成科学研究科	Exploring of low-dimensional honeycomb materials consisting of heavy elements	Noriaki Takagi	The University of Tokyo
112	固体表面における磁性分子の構造と電子状態	高木　紀明	東京大学	大学院新領域創成科学研究科	Geometric and electronic structures of magnetic molecules at solid surfaces	Noriaki Takagi	The University of Tokyo
113	超精密ダイヤモンド工具の損耗機構	宇田　豊	大阪電気通信大学	工学部	Wear mechanism of diamond tool	Yutaka Uda	Osaka Electro-Communication University
114	重い元素からなるハニカム格子の電子状態と構造	高木　紀明	東京大学	大学院新領域創成科学研究科	Geometric and electronic structures of honeycomb materials of heavy atoms	Noriaki Takagi	The University of Tokyo
115	固体表面の分子磁性に関する研究	高木　紀明	東京大学	大学院新領域創成科学研究科	Investigation on molecular magnetism at solid surfaces	Noriaki Takagi	The University of Tokyo
2. 強相関 / Strongly Correlated Quantum Systems							
116	強相関超伝導体における光誘起相転移ダイナミクス	青木　秀夫	東京大学	大学院理学系研究科	Photoinduced phase transitions in strongly correlated superconductors	Hideo Aoki	The University of Tokyo

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117	高精度変分波動関数を用いた銅酸化物薄膜の第一原理有効模型の数値的研究	今田　正俊	東京大学	大学院工学系研究科	Numerical studies on ab initio low-energy effective models for thin films of cuprates by high-precision variational wave functions	Masatoshi Imada	The University of Tokyo
118	多変数変分モンテカルロ法の高精度化と鉄系超伝導体への応用	三澤　貴宏	東京大学	大学院工学系研究科	Improvement of many-variable variational Monte Carlo method and its application to iron-based superconductors	Takahiro Misawa	The University of Tokyo
119	電子相関とスピン軌道相互作用の協奏が織りなす新物性の解明	求　幸年	東京大学	大学院工学系研究科	Theoretical study of novel physics by synergy between electron correlation and spin-orbit coupling	Yukitoshi Motome	The University of Tokyo
120	強相関デイラック電子系における臨界現象の解明	大塚　雄一	理化学研究所	計算科学研究機構	Numerical study of critical phenomena in strongly correlated dirac electrons	Yuichi Otsuka	RIKEN
121	軌道縮退を有する強相関電子系におけるスピン軌道相互作用の効果	古賀　昌久	東京工業大学		Spin-orbit coupling in strongly correlated electron systems with orbital degeneracy	Akihisa Koga	Tokyo Institute of Technology
122	量子不純物模型に対する密度行列繰り込み群法	白川　知功	理化学研究所	創発物性科学研究センター	Density-matrix renormalization group method for quantum impurity models	Tomonori Shirakawa	RIKEN
123	相関の強い超格子・準周期系で実現されるトポロジカル相と非平衡現象	川上　則雄	京都大学	大学院理学研究科	Topologically nontrivial phases and nonequilibrium phenomena in strongly correlated superlattice and quasiperiodic systems	Norio Kawakami	Kyoto University
124	多軌道強相関物質の第一原理的研究	有田　亮太郎	理化学研究所	創発物性科学研究センター	First-principles study of multi-orbital correlated materials	Ryotaro Arita	RIKEN
125	強相関電子系における電荷・スピン・軌道結合がもたらす新しい物理	求　幸年	東京大学	大学院工学系研究科	New physics opened by charge-spin-orbital coupling in strongly correlated electron systems	Yukitoshi Motome	The University of Tokyo
126	トポロジカル相における強相関効果の解明	吉田　恒也	京都大学	大学院理学研究科	Study of correlation effects on topological phases	Tsuneya Yoshida	Kyoto University
127	電子格子相互作用を考慮した鉄系超伝導体の第一原理有効模型の数値解析	大越　孝洋	東京大学	大学院工学系研究科	Numerical study of an ab-initio effective model for an iron-based superconductor with electron-phonon interactions	Takahiro Ohgoe	The University of Tokyo
128	基板吸着 ^{4}He の数値解析	本山　裕一	東京大学	物性研究所	Numerical simulation of ^{4}He adsorbed on substrates	Yuichi Motoyama	The University of Tokyo
129	内部自由度を有する相関フェルミ粒子系における超伝導と秩序相	古賀　昌久	東京工業大学		Superconductivity and ordered phases in correlated fermion systems with internal degree of freedom	Akihisa Koga	Tokyo Institute of Technology
130	トポロジカル相における強相関効果の解明	吉田　恒也	京都大学	大学院理学研究科	Study of correlation effects on topological phases	Tsuneya Yoshida	Kyoto University
131	多変数変分モンテカルロ法を用いた電子格子相互作用を含むハバードモデルの研究	大越　孝洋	東京大学	大学院工学系研究科	Multi-variable variational Monte Carlo study of the Hubbard model with electron-phonon interactions	Takahiro Ohgoe	The University of Tokyo
132	並列 MPS 法の開発とフラストレーション系への応用	五十嵐　亮	東京大学	情報基盤センター	Development of parallelized MPS algorithm and its application to various frustrated systems	Ryo Igarashi	The University of Tokyo
133	冷却原子系において実現される非平衡系・非一様系における相関効果	川上　則雄	京都大学	大学院理学研究科	Correlation effects in nonequilibrium/inhomogeneous cold atom systems	Norio Kawakami	Kyoto University

No.	課題名	氏名	所属		Title	Name	Organization
134	遍歴・局在カイラルらせん磁性体のモンテカルロ法による研究	星野　晋太郎	東京大学	総合文化研究科	Monte carlo study of itinerant and localized chiral helimagnets	Shintaro Hoshino	The University of Tokyo
135	鉄系超伝導体における特異な実空間ホッピングによる超伝導増強に関する研究	黒木　和彦	大阪大学		Study on the enhanced pairing due to peculiar hoppings in the iron-based superconductors	Kazuhiko Kuroki	Osaka University
136	強相関電子系における磁性状態及びスピン液体相の研究	山田　篤志	千葉大学	理学研究科	Magnetic properties and spin liquids in the strongly correlated electron systems	Atsushi Yamada	Chiba University
137	正方格子ハバード模型における磁気転移近傍の光学伝導度の解析	佐藤　年裕	理化学研究所		Optical conductivity near the magnetic transition in a square-lattice Hubbard model	Toshihiro Sato	RIKEN
138	量子モンテカルロ法による強相関電子系の研究	柳沢　孝	産業技術総合研究所		Quantum Monte Carlo study of strongly correlated electron systems	Takashi Yanagisawa	AIST
139	相関電子格子系における非平衡ダイナミクスの数値計算	石原　純夫	東北大学	大学院理学研究科	Numerical analyses of nonequilibrium state in electron-lattice correlated systems	Sumio Ishihara	Tohoku University
140	量子モンテカルロ法および第一原理計算による強相関電子系の研究	柳沢　孝	産業技術総合研究所		Numerical study of correlated electron systems by quantum Monte Carlo and first-principles calculations	Takashi Yanagisawa	AIST
141	相関電子系の新規量子相と実時間ダイナミクス	石原　純夫	東北大学	大学院理学研究科	Novel quantum phase and real time dynamics in correlated electron systems	Sumio Ishihara	Tohoku University
142	スピン軌道相互作用のある７軌道ハバードモデルに基づく多極子秩序と多極子揺らぎ超伝導の研究	堀田　貴嗣	首都大学東京	理工学研究科	Research for multipole ordering and superconductivity induced by multipole fluctuations in seven-orbital Hubbard model with spin-orbit coupling	Takashi Hotta	Tokyo Metropolitan University
143	多軌道系のスピン輸送における多体効果の理論的研究	荒川　直也	理化学研究所	創発物性科学研究センター	Theoretical study of many-body effects on spin transports in a multiorbital system	Naoya Arakawa	RIKEN
144	クーロン相互作用と電子格子相互作用の協力・競合によるエキシトン凝縮・CDW・超伝導	渡部　洋	理化学研究所	創発物性科学研究センター	Exciton condensation, CDW, and superconductivity induced by cooperation and competition between Coulomb interaction and electron-lattice interaction	Hiroshi Watanabe	RIKEN
145	基板吸着 ^{4}He の数値解析	本山　裕一	東京大学	物性研究所	Numerical simulation of ^{4}He adsorbed on substrates	Yuichi Motoyama	The University of Tokyo
146	物質中のカイラル磁気効果の理論的研究	押川　正毅	東京大学	物性研究所	Theoretical study of chiral magnetic effect in materials	Masaki Oshikawa	The University of Tokyo
3. 巨視系の協同現象 / Cooperative Phenomena in Complex, Macroscopic Systems							
147	グラファイト上に吸着されたヘリウム４における超固体の可能性	川島　直輝	東京大学	物性研究所	Possibility of supersolid in helium 4 adsorbed on graphite surface	Naoki Kawashima	The University of Tokyo
148	量子モンテカルロ法の開発とランダムボーズ原子系の臨界現象	正木　晶子	理化学研究所		Development and application of the quantum Monte Carlo method for critical phenomena of random bosonic systems	Akiko Masaki-Kato	RIKEN
149	生体膜の構造形成	野口　博司	東京大学	物性研究所	Structure formation of biomembranes	Hiroshi Noguchi	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
150	フラストレート磁性体における新奇秩序の探索	大久保　毅	東京大学	物性研究所	Novel phases in frustrated magnets	Tsuyoshi Okubo	The University of Tokyo
151	蜂の巣格子磁性体 Na_2IrO_3 の動的性質	鈴木　隆史	兵庫県立大学	大学院工学研究科	Dynamical properties of honeybomb lattice magnets	Takafumi Suzuki	University of Hyogo
152	蛋白質物性に強く関与するソフトモードの効率的サンプリングシミュレーション	北尾　彰朗	東京大学	分子細胞生物学研究所	Efficient sampling simulation of the soft modes significantly contribute to protein properties	Akio Kitao	The University of Tokyo
153	フラストレート磁性体における新奇秩序の探索	大久保　毅	東京大学	物性研究所	Novel phases in frustrated magnets	Tsuyoshi Okubo	The University of Tokyo
154	不純物ドープと磁気冷凍性能の関係の探求	田村　亮	物質・材料研究機構		Study on relation between impurity doping and magnetic refrigeration efficiency	Ryo Tamura	NIMS
155	高精度変分波動関数を用いたドープされた二次元ハバード模型における光誘起超伝導転移の数値的研究	今田　正俊	東京大学	工学系研究科	Numerical studies on photoinduced superconductivity in two dimensional doped Hubbard model by high-precision variational wave functions	Masatoshi Imada	The University of Tokyo
156	膜タンパク質の結合、化学反応による脂質膜の形態変化	野口　博司	東京大学	物性研究所	Shape transformation of lipid membranes induced by protein adsorption and chemical reaction	Hiroshi Noguchi	The University of Tokyo
157	グラファイト上に吸着されたヘリウム４における超固体の可能性	川島　直輝	東京大学	物性研究所	Possibility of supersolid in helium 4 adsorbed on graphite surface	Naoki Kawashima	The University of Tokyo
158	量子スピン系の低エネルギー状態に関する数値的研究	中野　博生	兵庫県立	大学大学院物質理学研究科	Numerical study on low-energy states of quantum spin systems	Hiroki Nakano	University of Hyogo
159	ガラス系の平衡統計力学と動的性質	福島　孝治	東京大学	大学院総合文化研究科	Equilibrium and dynamical properties in glassy systems	Koji Hukushima	The University of Tokyo
160	三角格子 Kitaev-Heisenberg 模型の量子相の研究	遠山　貴己	東京理科大学	理学部応用物理学科	Study of quantum phases in triangular Kitaev-Heisenberg model	Takami Tohyama	Tokyo University of Science
161	蜂の巣格子 Heisenberg-Kitaev 模型の磁気励起	鈴木　隆史	兵庫県立大学	大学院工学研究科	Mangetic excitations of the Heisenberg-Kitaev model on a honeycomb lattice	Takafumi Suzuki	University of Hyogo
162	ソフトマター系（高分子、液晶、ミセル）の粘弾性解析とマルチスケールシミュレーション	村島　隆浩	東北大学	大学院理学研究科	Viscoelastic analysis on soft matter systems (polymer, liquid crystal, micelle) and multiscale simulation	Takahiro Murashima	Tohoku University
163	量子スピン系におけるエンタングルメントと量子相転移の研究	藤堂　眞治	東京大学	大学院理学系研究科	Entanglement and quantum phase transition in quantum spin systems	Synge Todo	The University of Tokyo
164	イジングモデル型量子情報処理の展開	田中　宗	早稲田大学	高等研究所	Quantum information processing based on the ising models	Shu Tanaka	Waseda University
165	高分子溶液における摩擦抵抗低減効果の分子動力学計算	渡辺　宙志	東京大学	物性研究所	Molecular dynamics study on polymer drag reduction effect	Hiroshi Watanabe	The University of Tokyo
166	量子スピン系におけるエンタングルメントと量子相転移の研究	藤堂　眞治	東京大学	大学院理学系研究科	Entanglement and quantum phase transition in quantum spin systems	Synge Todo	The University of Tokyo

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167	分子動力学シミュレーションによる生体分子の動的秩序の形成	奥村　久士	分子科学研究所	計算科学研究センター	Dynamical ordering of biomolecular systems by molecular dynamics simulations	Hisashi Okumura	Institute for Molecular Science
168	低次元フラストレート磁性体における低エネルギー励起状態の数値的研究	下川　統久朗	大阪大学	大学院理学研究科	Numerical study of the low-lying excited state in low-dimensional frustrated magnetism	Tokuro Shimokawa	Osaka University
169	ガラス状物質のレオロジー	古川　亮	東京大学	生産技術研究所	Rheology of glassy materials	Akira Furukawa	The University of Tokyo
170	ガラス系の平衡統計力学と動的性質	福島　孝治	東京大学	大学院総合文化研究科	Equilibrium and dynamical properties in glassy systems	Koji Hukushima	The University of Tokyo
171	カゴメ格子反強磁性体の磁場誘起量子相転移	坂井　徹	兵庫県立大学	大学院物質理学研究科	Field-induced quantum phase transition in the kagome lattice antiferromagnet	Toru Sakai	University of Hyogo
172	時間変動する外場のもとでの動的相転移	宮下　精二	東京大学	理学系研究科	Dynamical phase transitions under time dependent external fields	Seiji Miyashita	The University of Tokyo
173	乱れたトポロジカル絶縁体のスケーリング理論	大槻　東巳	上智大学	理工学部	Scaling theory of disordered topological insulators	Tomi Ohtsuki	Sophia University
174	フラストレート磁性体における新奇秩序	川村　光	大阪大学	大学院理学研究科	Novel order in frustrated magnets	Hikaru Kawamura	Osaka University
175	可解量子系に潜むエンタングルメント特性の探求	田中　宗	早稲田大学	高等研究所	Study on entanglement properties in exactly solvable models	Shu Tanaka	Waseda University
176	スピンナノチューブの量子相転移	坂井　徹	兵庫県立大学	大学院物質理学研究科	Quantum phase transition of the spin nanotubes	Toru Sakai	University of Hyogo
177	２次元量子スピン系のテンソルネットワーク計算	原田　健自	京都大学	大学院情報学研究科	Tensor network calculation on two-dimensional quantum spin models	Kenji Harada	Kyoto University
178	O(N) モンテカルロ法によるスピングラス模型の動力学の研究	富田　裕介	芝浦工業大学		Numerical study of dynamics in spin glass models with long-range interactions	Yusuke Tomita	Shibaura Institute of Technology
179	フラストレート磁性体における新奇秩序	川村　光	大阪大学	大学院理学研究科	Novel order in frustrated magnets	Hikaru Kawamura	Osaka University
180	バルクエッジ対応の多様性の数値的研究	初貝　安弘	筑波大学	大学院数理物質科学研究科	Variety of bulk-edge correspondence by numerical methods	Yasuhiro Hatsugai	University of Tsukuba
181	並列化マルチワームアルゴリズムを用いたカゴメ格子上のボーズ原子系の研究	正木　晶子	理化学研究所		Quantum Monte Carlo simulations of interacting bosons on kagome lattices with the parallelized multi-worm algorithm	Akiko Masaki-Kato	RIKEN
182	電位センサータンパク質群の動作機構の解明に向けた計算科学アプローチ	鷹野　優	広島市立大学	大学院情報科学研究科	Computational study of the mechanism of voltage sensing proteins	Yu Takano	Hiroshima City University
183	観測データからモデルハミルトニアンを推定する手法開発	田村　亮	物質・材料研究機構		Development of a method to estimate a model Hamiltonian from observed data	Ryo Tamura	NIMS

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184	不凍タンパク質による氷ベーサル面成長促進機構の分子動力学シミュレーション研究	灘　浩樹	産業技術総合研究所		Molecular dynamics simulation study of growth promotion mechanism of ice basal plane by antifreeze protein	Hiroki Nada	AIST
185	２次元量子スピン系のテンソルネットワーク計算	原田　健自	京都大学	大学院情報学研究科	Tensor network calculation on two-dimensional quantum spin models	Kenji Harada	Kyoto University
186	動的スケーリングの改良と非平衡緩和データの高精度解析	尾関　之康	電気通信大学	情報理工学研究科	Improvement of dynamical scaling and accurate analysis of nonequilibrium relaxation data	Yukiyasu Ozeki	he University of Electro-Communications
187	格子自由度と相互作用する一次元スピン系の量子相転移	諏訪　秀麿	東京大学	大学院理学系研究科	Quantum phase transitions of one-dimensional spin systems coupling with lattice degrees of freedom	Hidemaro Suwa	The University of Tokyo
188	ナノ構造界面での熱輸送特性の評価	塩見　淳一郎	東京大学	大学院工学系研究科	Characterization of thermal transport at nanostructure interface	Junichiro Shiomi	The University of Tokyo
189	摩擦の物理	松川　宏	青山学院大学理工学部		Physics of friction	Hiroshi Matsukawa	Aoyama Gakuin University
190	磁気秩序相と格子秩序相の競合する量子相転移に対するスペクトル解析	諏訪　秀麿	東京大学	大学院理学系研究科	Spectral analysis of quantum phase transition between competitive magnetic order and lattice order phases	Hidemaro Suwa	The University of Tokyo
191	微細横溝加工を施した鉛直平板を流れる凝縮液膜流の熱輸送特性	足立　高弘	秋田大学	工学資源学部機械工学科	Heat transfer characteristics of condensate film flow along vertical plates with microscopic grooves	Takahiro Adachi	Akita University
192	並列 MPS 法の GPU 高速化とそのフラストレーション系への応用	五十嵐　亮	東京大学	情報基盤センター	GPU parallelization of MPS algorithm and its application to various frustrated systems	Ryo Igarashi	The University of Tokyo
193	シェル・モデルを用いた強誘電体の分子動力学シミュレーション	橋本　保	産業技術総合研究所		Molecular dynamics simulation of ferroelectrics using a shell model	tamotsu hashimoto	AIST
194	動的スケーリングの改良と非平衡緩和データの高精度解析	尾関　之康	電気通信大学	情報理工学研究科	Improvement of dynamical scaling and accurate analysis of nonequilibrium relaxation data	Yukiyasu Ozeki	The University of Electro-Communications
195	細胞間接着による細胞集団運動制御のシミュレーション	松下　勝義	大阪大学	大学院理学研究科	Simulation of cell-cell adhesion control of collective cell motion	Katsuyoshi Matsushita	Osaka University
196	*N* 波高木方程式の数値解法の研究	沖津　康平	東京大学	大学院工学系研究科	Study on numerical mathod to solve *n*-beam Takagi equation	Kouhei Okitsu	The University of Tokyo
197	空間構造をもつ一次元量子スピン系の数値的研究	利根川　孝	大阪大学	大学院理学研究科	Numerical study of the one-dimensional quantum spin systems with spatial structures	Takashi Tonegawa	Kobe University
198	グラフェン量子素子デバイスの応答評価計算	草部　浩一	大阪大学	大学院基礎工学研究科	Simulation of quantum response of graphene quantum devices	Koichi Kusakabe	Osaka University
199	フラストレート量子スピン鎖の磁場中スピンダイナミクス	大西　弘明	日本原子力研究開発機構	先端基礎研究センター	Spin dynamics of frustrated quantum spin chain in magnetic field	Hiroaki Onishi	JAEA
200	融解現象とポリアモルフィズム	渕崎　員弘	愛媛大学	理工学研究科	Melting phenomena and polyamorphism	Kazuhiro Fuchizaki	Ehime University

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201	相転移における流体力学的効果３	田中　肇	東京大学	生産技術研究所	Hydrodynamic effects on phase ordering 3	Hajime Tanaka	The University of Tokyo
202	固体表面の低次元電子系及びナノ粒子の有限電子系の新規物性	稲岡　毅	琉球大学	理学部	Novel properties of low-dimensional electron systems at solid surfaces and finite electron systems in nanoparticles	Takeshi Inaoka	University of Ryukyus
203	ハニカム格子磁性体を用いた非自明な磁気現象に関する数値的研究	下川　統久朗	大阪大学	大学院理学研究科	Numerical study of the novel magnetic phenomenon on the honeycomb magnetism	Tokuro Shimokawa	Osaka University
204	半導体ナノ結晶に関する数値的研究	寺尾　貴道	岐阜大学	工学部	Numerical study of semiconductor nanocrystals	Takamichi Terao	Gifu University
205	細胞間接着と細胞極性が生み出す集団運動のシミュレーション	松下　勝義	大阪大学	大学院理学研究科	Simulation of collective migrations induced by the cell-cell adhesion and the cell polarity	Katsuyoshi Matsushita	Osaka University
206	融解現象とポリアモルフィズム	渕崎　員弘	愛媛大学	理工学研究科	Melting phenomena and polyamorphism	Kazuhiro Fuchizaki	Ehime University
207	半導体ナノ結晶に関する数値的研究	寺尾　貴道	岐阜大学	工学部	Numerical study of semiconductor nanocrystals	Takamichi Terao	Gifu University
208	地震の統計モデルの数値シミュレーション	川村　光	大阪大学	大学院理学研究科	Numerical simulations on statistical models of earthquakes	Hikaru Kawamura	Osaka University
209	テンソルネットワーク法の並列プログラム開発	森田　悟史	東京大学	物性研究所	Parallelization of tensor network method	Satoshi Morita	The University of Tokyo
210	地震の統計モデルの数値シミュレーション	川村　光	大阪大学	大学院理学研究科	Numerical simulations on statistical models of earthquakes	Hikaru Kawamura	Osaka University
211	量子モンテカルロ法を用いたフォノン輸送における多体効果の数値研究	加藤　岳生	東京大学	物性研究所	Numerical research of many-body effects on phonon transport by a quantum Monte Carlo method	Takeo Kato	The University of Tokyo
212	周期的に相分離する流体混合系中のヤヌス粒子の自発的運動	荒木　武昭	京都大学	大学院理学研究科	Self-propelled motion of a Janus particle in periodically phase separating mixtures	Takeaki Araki	Kyoto University
213	多成分剛体球の稠密充填状態の並列 Wang-Lanadu 法による探索	能川　知昭	東邦大学	医学部	Search of close packing states of multicomponent hard-sphere systems by the parallelized Wang-Landau sampling	Tomoaki Nogawa	Toho University
214	ブリージングパイロクロア反強磁性体における格子歪みの効果	青山　和司	大阪大学	大学院理学研究科	Spin-lattice coupling effects in Heisenberg antiferromagnets on breathing pyrochlore lattices	Kazushi Aoyama	Osaka University
215	厳密対角化パッケージ Rokko による Heisenberg-Kitaev 模型の研究	坂下　達哉	東京大学	物性研究所	Study of Heisenberg-Kitaev model by exact diagonalization package Rokko	Tatsuya Sakashita	The University of Tokyo
216	両親媒性溶液中におけるミセル形状転移の分子シミュレーション研究	藤原　進	京都工芸繊維大学	大学院工芸科学研究科	Molecular simulation study of micellar shape transition in amphiphilic solution	Susumu Fujiwara	Kyoto Instituteof Technology
217	低レイノルズ数非ブラウン粒子懸濁液の吸収状態転移と粘弾性の関係	佐野　雅己	東京大学	大学院理学系研究科	Absorbing phase transition and viscoleasticity of Non-Brownian suspension in low Reynolds number fluid	Masaki Sano	The University of Tokyo

No.	課題名	氏名	所属		Title	Name	Organization
218	空間構造をもつ一次元量子スピン系の数値的研究	利根川　孝	神戸大学	大学院理学研究科	Numerical study of the one-dimensional quantum spin systems with spatial structures	Takashi Tonegawa	Kobe University
219	決定論的モンテカルロ計算アルゴリズムの解析	鈴木　秀幸	東京大学	大学院情報理工学系研究科	Analysis of deterministic Monte Carlo algorithms	Hideyuki Suzuki	The University of Tokyo
220	微細横溝加工を施した鉛直平板を流れる凝縮液膜流の熱輸送特性	足立　高弘	秋田大学	工学資源学部機械工学科	Heat transfer characteristics of condensate film flow along vertical plates with microscopic grooves	Takahiro Adachi	Akita University
221	X 線 n 波動力学理論によるタンパク質結晶構造解析法の研究	沖津　康平	東京大学	大学院工学系研究科	Study on protein crystal structure analysis using X-ray n-beam dynamical diffraction theory	Kouhei Okitsu	The University of Tokyo
222	格子の自由度と結合した量子スピン系の相転移	安田　千寿	琉球大学	理学部	Phase transition in quantum spin systems coupled to lattice degrees of freedom	Chitoshi Yasuda	University of Ryukyus
223	1 次元フラストレート量子スピン系の数値的研究	飛田　和男	埼玉大学	大学院理工学研究科	Numerical study of one dimensional frustrated quantum spin systems	Kazuo Hida	Saitama University
224	高密剛体球系の非平衡相転移と大規模分子動力学シミュレーション	礒部　雅晴	名古屋工業大学		Nonequilibirum phase transition in the large scale dense hard sphere molecular dynamics simulation	Masaharu Isobe	Nagoya Institute of Technology
225	スケールフリーネットワークにおける相転移	城　真範	産業技術総合研究所		Phase transition on scale-free networks 2	Masanori Shiro	AIST
226	スケールフリーネットワークにおける相転移	城　真範	産業技術総合研究所		Phase transition on scale-free networks	Masanori Shiro	AIST

平成 27 年度　スーパーコンピュータ CMSI 戦略課題一覧 / CMSI Project List of Supercomputer system 2015

No.	課題名	氏名	所属		Title	Name	Organization
前期 / First Term							
1	分子における電子の動的過程と多体量子動力学	高塚　和夫	東京大学	大学院総合文化研究科	Nonadiabatic electron dynamics and many-body nuclear dynamics in molecules	Kazuo Takatsuka	The University of Tokyo
2	電子格子相互作用と電子間相互作用の絡み合いによって駆動される強相関電子系の超伝導	今田　正俊	東京大学	大学院工学系研究科	Superconducting mechanism driven by both electron-phonon and strong electron correlations	Masatoshi Imada	The University of Tokyo
3	強相関電子系の励起ダイナミクスの研究	遠山　貴巳	東京理科大学	理学部	Study of excitation dynamics in strongly correlated electron systems	Takami Tohyama	Tokyo University of Science
4	量子モンテカルロ法・テンソルネットワーク法による新しい量子相・量子臨界現象に関する研究	川島　直輝	東京大学	物性研究所	Study of novel quantum phases and critical phenomena by monte carlo method and tensor network	Naoki Kawashima	The University of Tokyo
5	ナノ構造の電子状態から機械的性質までのマルチスケールシミュレーション	尾形　修司	名古屋工業大学	工学部	Multi-scale simulation of nano-structured materials from electronic to mechanical properties	Shuji Ogata	Nagoya Institute of Technology
6	密度汎関数法によるナノ構造時空場での電子機能予測とその実現	押山　淳	東京大学	大学院工学系研究科	Density-functional study on prediction of electronic properties of spatiotemporal fields in nanostructures	Atsushi Oshiyama	The University of Tokyo
7	新物質探索のための第一原理計算手法開発とその応用	常行　真司	東京大学	大学院理学系研究科	Development and application of first-principles simulations for new materials exploration	Shinji Tsuneyuki	The University of Tokyo
8	スピントロニクス / マルチフェロイックスの応用へ指向した材料探索	斎藤　峯雄	金沢大学	理工研究域	Materials design for spintronics/multiferroics applications	Mineo Saito	Kanazawa University
9	密度汎関数法によるナノ構造時空場での電子機能予測とその実現	信定　克幸	分子科学研究所	理論・計算分子科学研究領域	Prediction of electronic properties in spatiotemporal nano-field based on the density functional theory	Katsuyuki Nobusada	Institute for Molecular Science
10	全原子シミュレーションによるウィルスの分子科学の展開	岡崎　進	名古屋大学	大学院工学研究科	Molecular science of virus by all-atom simulation	Susumu Okazaki	Nagoya University
11	太陽電池における光電変換の基礎過程の研究と変換効率最適化にむけた大規模数値計算	山下　晃一	東京大学	大学院工学系研究科	Large scale calculations on the fundamental processes of solar cells and their optimization in conversion efficiency	Koichi Yamashita	The University of Tokyo
12	エネルギー変換の界面科学	杉野　修	東京大学	物性研究所	Interface science on energy conversion	Osamu Sugino	The University of Tokyo
13	バイオマス利用のための酵素反応解析	吉田　紀生	九州大学	大学院理学研究科	Analysis of enzymatic reaction for biomass energy creation	Norio Yoshida	Kyushu University
14	電位制御可能な第一原理分子動力学計算に基づく蓄電デバイス系界面のシミュレーション	大谷　実	産業技術総合研究所	ナノシステム研究部門	First-principles simulations of electrode-electrolyte interfaces in secondary batteries with a bias-control technique	Minoru Otani	AIST
15	ナノクラスターから結晶までの機能性材料の全電子スペクトルとダイナミクス	大野　かおる	横浜国立大学	大学院工学研究院	All electron spectra and dynamics of functional materials from nanoclusters to crystals	Kaoru Ohno	Yokohama National University

No.	課題名	氏名	所属		Title	Name	Organization
16	フラストレート磁性体の計算科学的研究	中野　博生	兵庫県立大学	大学院物質理学研究科	Computational-science study of frustrated magnets	Hiroki Nakano	University of Hyogo
17	フラストレート磁性体におけるトポロジカル励起の秩序化	大久保　毅	東京大学	物性研究所	Ordering of topological excitations of the frustrated magnets	Tsuyoshi Okubo	The University of Tokyo
後期 / Latter Term							
18	高温超伝導機構の第一原理計算　—銅酸化物と鉄系超伝導体の比較	今田　正俊	東京大学	大学院工学系研究科	Ab initio calculation of high-temperature superconducting mechanism - Comparison of cuprates and iron-based superconductors	Masatoshi Imada	The University of Tokyo
19	強相関電子系の励起ダイナミクスの研究	遠山　貴巳	東京理科大学	理学部	Study of excitation dynamics in strongly correlated electron systems	Takami Tohyama	Tokyo University of Science
20	量子モンテカルロ法による新しい量子相・量子臨界現象に関する研究	川島　直輝	東京大学	物性研究所	Monte carlo study of novel quantum phases and critical phenomena	Naoki Kawashima	The University of Tokyo
21	ナノ構造の電子状態から機械的性質までのマルチスケールシミュレーション	尾形　修司	名古屋工業大学	工学部	Multi-scale simulation of nano-structured materials from electronic to mechanical properties	Shuji Ogata	Nagoya Institute of Technology
22	密度汎関数法によるナノ構造時空場での電子機能予測とその実現	押山　淳	東京大学	大学院工学系研究科	Density-functional study on prediction of electronic properties of spatiotemporal fields in nanostructures	Atsushi Oshiyama	The University of Tokyo
23	酸化物中の不純物水素の高精度計算	常行 真司	東京大学	大学院理学系研究科	Highly accurate calculation of impurity hydrogen in oxides	Shinji Tsuneyuki	The University of Tokyo
24	スピントロニクス / マルチフェロイックスの応用へ指向した材料探索	斎藤　峯雄	金沢大学	理工研究域	Materials design for spintronics/multiferroics applications	Mineo Saito	Kanazawa University
25	密度汎関数法によるナノ構造時空場での電子機能予測とその実現	信定　克幸	分子科学研究所	理論・計算分子科学研究領域	Prediction of electronic properties in spatiotemporal nano-field	Katsuyuki Nobusada	Institute for Molecular Science
26	全原子シミュレーションによるウィルスの分子科学の展開	岡崎　進	名古屋大学	大学院工学研究科	based on the density functional theory	Susumu Okazaki	Nagoya University
27	非平衡輸送現象の大規模計算シミュレーション	浅井　美博	産業技術総合研究所	ナノ材料研究部門	Large scale computational simulations of non-equilibrium transport phenomena	Yoshihiro Asai	AIST
28	蓄電池電極—電解質界面現象の原子スケール描像の確立	杉野　修	東京大学	物性研究所	Structure and functionality of electrode-electrolyte interface in battery	Osamu Sugino	The University of Tokyo
29	バイオマス利用のための酵素反応解析	吉田　紀生	九州大学	大学院理学研究科	Analysis of enzymatic reaction for biomass energy creation	Norio Yoshida	Kyushu University
30	高性能リチウムイオン電池開発に向けた基礎的研究	大谷　実	産業技術総合研究所	ナノシステム研究部門	First-principlemolecular dynamics study toward a high performance Li-ion battery	Minoru Otani	AIST
31	ナノクラスターから結晶までの機能性材料の全電子スペクトルとダイナミクス	大野　かおる	横浜国立大学	大学院工学研究院	All electron spectra and dynamics of functional materials from nanoclusters to crystals	Kaoru Ohno	Yokohama National University

No.	課題名	氏名	所属		Title	Name	Organization
32	フラストレート磁性体の計算科学的研究	中野　博生	兵庫県立大学	大学院物質理学研究科	Computational-science study of frustrated magnets	Hiroki Nakano	University of Hyogo
33	フラストレート磁性体におけるトポロジカル励起の秩序化	大久保　毅	東京大学	物性研究所	Ordering of topological excitations of the frustrated magnets	Tsuyoshi Okubo	The University of Tokyo

Publications

Division of New Materials Science

Takigawa group

We have been performing nuclear magnetic resonance experiments on various quantum spin systems and strongly correlated electron systems to explore novel quantum phases with exotic ordering and fluctuation phenomena. The major achievements in the year 2015 include: (1) Investigation by ^{31}P-NMR of the quasi two dimensional antiferromagnet $RbMoOPO_4Cl$ with the frustrating nearest neighbor and the next nearest neighbor interactions that lead to the identification of a stripe type antiferromagnetic order. (2) Combined studies of ^{7}Li-NMR and neutron scattering experiments on the breathing pyrochlore antiferromagnet $Li(Ga,In)Cr_4O_8$, in particular the observation of a second order phase transition in the In 5% doped sample. (3) Investigation of spin dynamics in the quantum spin ice compound $Pr_2Zr_2O_7$ by ^{91}Zr-NQR/NMR that revealed contrasting behavior when a magnetic field is applied along <001> and <111>.

1. †Structural anomalies and short-range magnetic correlations in the orbitally degenerate system Sr_2VO_4: I. Yamauchi, K. Nawa, M. Hiraishi, M. Miyazaki, A. Koda, K. M. Kojima, R. Kadono, H. Nakao, R. Kumai, Y. Murakami, H. Ueda, K. Yoshimura and M. Takigawa, Phys. Rev. B **92** (2015) 064408(1-7).

2. *One-Third Magnetization Plateau with a Preceding Novel Phase in Volborthite: H. Ishikawa, M. Yoshida, K. Nawa, M. Jeong, S. Kramer, M. Horvatic, C. Berthier, M. Takigawa, M. Akaki, A. Miyake, M. Tokunaga, K. Kindo, J. Yamaura, Y. Okamoto and Z. Hiroi, Phys. Rev. Lett. **114** (2015) 227202(1-5).

3. †Real Space Imaging of Spin Polarons in Zn-Doped $SrCu_2(BO_3)_2$: M. Yoshida, H. Kobayashi, I. Yamauchi, M. Takigawa, S. Capponi, D. Poilblanc, F. Mila, K. Kudo, Y. Koike and N. Kobayashi, Phys. Rev. Lett. **114** (2015) 056402 (1-5).

4. *Single crystal ^{27}Al-NMR study of the cubic Γ_3 ground doublet system $PrTi_2Al_{20}$: T. Taniguchi, M. Yoshida, H. Takeda, M. Takigawa, M. Tsujimoto, A. Sakai, Y. Matsumoto and S. Nakatsuji, J. Phys.: Conf. Ser. **683** (2016) 012016(1-9).

5. *Site-selective ^{11}B NMR studies on $YbAlB_4$: S. Takano, M. S. Grbic, K. Kimura, M. Yoshida, M. Takigawa, E. C. T. O. Farrell, K. Kuga, S. Nakatsuji and H. Harima, J. Phys.: Conf. Ser. **683** (2016) 012008(1-6).

Sakakibara group

We study magnetism and superconductivity of materials having low characteristic temperatures. These include heavy-electron systems, quantum spin systems and frustrated spin systems. The followings are some selected achievements in the fiscal year 2015. (1) Field and temperature variations of the specific heat $C(H,T)$ of the heavy fermion superconductor URu_2Si_2 (T_c= 1.4 K) were examined at temperatures down to 200 mK. The occurrence of quasiparticle excitations due to the Doppler-shift effect was detected regardless of the field direction in $C(H)$, implying the presence of a line node. Furthermore, the polar-angle-dependence of the specific heat $C(\theta)$ under a rotating magnetic field within the *ac* plane exhibits a shoulder-like anomaly at $\theta \sim 45°$ and a sharp dip at $\theta = 90°$ (H // a) in the moderate-field region. These features are supported by theoretical analyses based on microscopic calculations assuming the gap symmetry of $k_z(k_x+ik_y)$, whose gap structure is characterized by a combination of a horizontal line node at the equator and point nodes at the poles. The present results have settled the previous controversy over the gap structure of URu_2Si_2 and have authenticated its chiral *d*-wave superconductivity. (2) We examined low-temperature magnetic properties of a new verdazyl radical crystal α-2-Cl-4-F-V. Molecular orbital calculations predict that this material is a spin-1/2 quasi-one-dimensional antiferromagnet. The magnetization curve at 0.1 K shows gapless behavior like conventional one-dimensional quantum spin systems and saturates at about 5 T. A peak is observed in the temperature dependence of the heat capacity at 0 T, indicating that a three-dimensional ordering occurs at about 0.2 K. On the other hand, the temperature dependence of the magnetization at various magnetic fields shows an anomaly similar to that observed in many of gapped spin systems. This behavior is attributed to the highly frustrated nature of the interchain interactions.

1. *Field Evolution of Quantum Critical and Heavy Fermi-Liquid Components in the Magnetization of the Mixed Valence Compound β-$YbAlB_4$: Y. Matsumoto, K. Kuga, Y. Karaki, Y. Shimura, T. Sakakibara, M. Tokunaga, K. Kindo and S. Nakatsuji, J. Phys. Soc. Jpn. **84** (2015) 024710(1-7).

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* Joint research among groups within ISSP.

2. †Observation of a New Ordered Phase in the Kondo Semiconductor $CeOs_4Sb_{12}$: T. Tayama, W. Ohmachi, M. Wansawa, D. Yutani, T. Sakakibara, H. Sugawara and H. Sato, J. Phys. Soc. Jpn. **84** (2015) 104701(1-6).

3. †*Pauli-limited superconductivity and antiferromagnetism in the heavy-fermion compound $CeCo(In_{1-x}Zn_x)_5$: M. Yokoyama, H. Mashiko, R. Otaka, Y. Sakon, K. Fujimura, K. Tenya, A. Kondo, K. Kindo, Y. Ikeda, H. Yoshizawa, Y. Shimizu, Y. Kono and T. Sakakibara, Phys. Rev. B **92** (2015) 184509(9).

4. †Quantum phase near the saturation field in the S = 1/2 frustrated spin ladder: H. Yamaguchi, H. Miyagai, Y. Kono, S. Kittaka, T. Sakakibara, K. Iwase, T. Ono, T. Shimokawa and Y. Hosokoshi, Phys. Rev. B **91** (2015) 125104(1-5).

5. †S = 1/2 ferromagnetic-antiferromagnetic alternating Heisenberg chain in a zinc-verdazyl complex: H. Yamaguchi, Y. Shinpuku, T. Shimokawa, K. Iwase, T. Ono, Y. Kono, S. Kittaka, T. Sakakibara and Y. Hosokoshi, Phys. Rev. B **91** (2015) 085117(1-6).

6. *Unstable spin-ice order in the stuffed metallic pyrochlore $Pr_{2+x}Ir_{2-x}O_{7-\delta}$: D. E. MacLaughlin, O. O. Bernal, L. Shu, J. Ishikawa, Y. Matsumoto, J. -J. Wen, M. Mourigal, C. Stock, G. Ehlers, C. L. Broholm, Y. Machida, K. Kimura, S. Nakatsuji, Y. Shimura and T. Sakakibara, Phys. Rev. B **92** (2015) 054432(1-12).

7. Field-Induced Quantum Criticality and Universal Temperature Dependence of the Magnetization of a Spin-1/2 Heisenberg Chain: Y. Kono, T. Sakakibara, C. P. Aoyama, C. Hotta, M. M. Turnbull, C. P. Landee and Y. Takano, Phys. Rev. Lett. **114** (2015) 037202(1-5).

8. Field-Orientation Dependence of Low-Energy Quasiparticle Excitations in the Heavy-Electron Superconductor UBe_{13}: Y. Shimizu, S. Kittaka, T. Sakakibara, Y. Haga, E. Yamamoto, H. Amitsuka, Y. Tsutsumi and K. Machida, Phys. Rev. Lett. **114** (2015) 147002(1-5).

9. †*Antiferromagnetic Transition in a Novel Star-Shaped High-Spin Fe(III) Tetranuclear Cluster from a Mononuclear Coordination Anion Featuring π-Extended Schiff Base Ligands: K. Takahashi, K. Kawamukai, T. Mochida, T. Sakurai, H. Ohta, T. Yamamoto, Y. Einaga, H. Mori, Y. Shimura, T. Sakakibara, T. Fujisawa, A. Yamaguchi and A. Sumiyama, Chem. Lett. **44** (2015) 840-842.

10. *Antiferromagnetic transition of the caged compound $TmTi_2Al_{20}$: N. Kase, Y. Shimura, S. Kittaka, T. Sakakibara, S. Nakatsuji, T. Nakano, N. Takeda and J. Akimitsu, J. Phys.: Conf. Ser. **592** (2015) 012052(1-5).

11. †Experimental Realization of a Quantum Pentagonal Lattice: H. Yamaguchi, T. Okubo, S. Kittaka, T. Sakakibara, K. Araki, K. Iwase, N. Amaya, T. Ono and Y. Hosokoshi, Sci. Rep. **5** (2015) 15327(1-6).

12. †First-order ferromagnetic transition of quantum spin ice system $Yb_2Ti_2O_7$: Y. Yasui, N. Hamachi, Y. Kono, S. Kittaka and T. Sakakibara, SPIN **5** (2015) 154002(1-6).

13. Low temperature magnetic properties of a new quasi-one-dimensional organic magnet α-2-Cl-4-F-V: Y. Kono, S. Kittaka, T. Sakakibara, H. Yamaguchi and Y. Hosokoshi, Phys. Procedia **75** (2015) 679-686.

14. Evidence for chiral d-wave superconductivity in URu_2Si_2 from the field-angle variation of its specific heat: S. Kittaka, Y. Shimizu, T. Sakakibara, Y. Haga, E. Yamamoto, Y. Onuki, Y. Tsutsumi, T. Nomoto, H. Ikeda and K. Machida, J. Phys. Soc. Jpn. **85** (2016) 033704(1-4).

15. Field-induced phase transitions and magnetoferroelectricity in the perfect triangular lattice antiferromagnet $RbFe(MoO_4)_2$ in a vertical magnetic field: H. Mitamura, R. Watanuki, N. Onozaki, Y. Amou, Y. Kono, S. Kittaka, Y. Shimura, I. Yamamoto, K. Suzuki and T. Sakakibara, J. Magn. Magn. Mater. **400** (2016) 70-72.

16. First-order superconducting transition of Sr_2RuO_4 investigated by magnetization and magnetic torque: S. Kittaka, A. Kasahara, T. Sakakibara, D. Shibata, S. Yonezawa, Y. Maeno, K. Tenya and K. Machida, J. Magn. Magn. Mater. **400** (2016) 81-83.

17. Heat capacity measurements on UBe_{13} in rotated magnetic fields: anisotropic response in the normal state and the absence of nodal quasiparticles: Y. Shimizu, S. Kittaka, T. Sakakibara, Y. Haga, E. Yamamoto, H. Amitsuka, Y. Tsutsumi and K. Machida, J. Magn. Magn. Mater. **400** (2016) 52-55.

18. †Unconventional S = 2 alternating chain realized by a metal-radical hybrid-spin approach: H. Yamaguchi, Y. Shinpuku, Y. Kono, S. Kittaka, T. Sakakibara, M. Hagiwara, T. Kawakami, K. Iwase, T. Ono and Y. Hosokoshi, Phys. Rev. B **93** (2016) 115145(1-7).

19. †Quadrupole Order in the Frustrated Pyrochlore $Tb_{2+x}Ti_{2-x}O_{7+y}$: H. Takatsu, S. Onoda, S. Kittaka, A. Kasahara, Y. Kono, T. Sakakibara, Y. Kato, B. Fâk, J. Ollivier, J. W. Lynn, T. Taniguchi, M. Wakita and H. Kadowaki, Phys. Rev. Lett. **116** (2016) 217201(1-6).

† Joint research with outside partners.

20. †Possible observation of highly itinerant quantum magnetic monopoles in the frustrated pyrochlore $Yb_2Ti_2O_7$: Y. Tokiwa, T. Yamashita, M. Udagawa, S. Kittaka, T. Sakakibara, D. Terazawa, Y. Shimoyama, T. Terashima, Y. Yasui, T. Shibauchi and Y. Matsuda, Nat. Commun. **7** (2016) 10807(1-6).

21. †Quadrupole order in the frustrated pyrochlore magnet $Tb_2Ti_2O_7$: H. Takatsu, T. Taniguchi, S. Kittaka, T. Sakakibara and H. Kadowaki, J. Phys.: Conf. Series **683** (2016) 012022(1-6).

22. *Low-Energy Excitations and Ground State Selection in Quantum Breathing Pyrochlore Antiferromagnet $Ba_3Yb_2Zn_5O_{11}$: T. Haku, K. Kimura, Y. Matsumoto, M. Soda, M. Sera, D. Yu, R. A. Mole, T. Takeuchi, S. Nakatsuji, Y. Kono, T. Sakakibara, L. -J. Chang and T. Masuda, Phys. Rev. B (2016), in print.

Mori group

We have successfully developed and unvailed unprecedented functional properties for the molecular materials. The major achievements in 2015 are (1) to discover the peculiar hydrogen-bond-dynamics-based switching of conductivity and magnetism triggered by deuterium and charge transfers in the hydrogen-bond-unit for the purely organic conductor κ-D_3(Cat-EDT-ST)$_2$, (2) to develop the novel donor-acceptor-type molecular dyad with small HOMO-LUMO gap, and (3) to develop the chiral molecular conductors composed of chiral BEDT-TTF derivatives with hydrogen bonds, α'-[(*R,R*)-BEDT-TTF(CH_2OH)$_2$]$_2$$ClO_4$($H_2O$). The introduction of a large variety of molecule degree of freedom to solid promises the development of new trends in functional molecular materials.

1. Dynamics of Charge Ordering in the Nonlinear Regime of θ-(BEDT-TTF)$_2$CsZn(SCN)$_4$: M. Abdel-Jawad, I. Terasaki, T. Mori and H. Mori, J. Phys. Soc. Jpn. **84** (2015) 033707(1-4).

2. †Phase-change memory function of correlated electrons in organic conductors: H. Oike, F. Kagawa, N. Ogawa, A. Ueda, H. Mori, M. Kawasaki and Y. Tokura, Phys. Rev. B **91** (2015) 041101(R)(1-4).

3. †*Antiferromagnetic Transition in a Novel Star-Shaped High-Spin Fe(III) Tetranuclear Cluster from a Mononuclear Coordination Anion Featuring π-Extended Schiff Base Ligands: K. Takahashi, K. Kawamukai, T. Mochida, T. Sakurai, H. Ohta, T. Yamamoto, Y. Einaga, H. Mori, Y. Shimura, T. Sakakibara, T. Fujisawa, A. Yamaguchi and A. Sumiyama, Chem. Lett. **44** (2015) 840-842.

4. Unexpected Formation of *ortho*-Benzoquinone-fused Tetraselenafulvalene (TSF): Synthesis, Structures, and Properties of a Novel TSF-based Donor–Acceptor Dyad: A. Ueda, H. Kamo and H. Mori, Chem. Lett. **44** (2015) 1538-1540.

5. Modulation of a Molecular π-Electron System in a Purely Organic Conductor that Shows Hydrogen-Bond-Dynamics-Based Switching of Conductivity and Magnetism: A. Ueda, A. Hatakeyama, M. Enomoto, R. Kumai, Y. Murakami and H. Mori, Chem. - Eur. J. **21** (2015) 15020-15028.

6. Synthesis of racemic and chiral BEDT-TTF derivatives possessing hydroxy groups and their achiral and chiral charge transfer complexes: S. J. Krivickas, C. Hashimoto, J. Yoshida, A. Ueda, K. Takahashi, J. D. Wallis and H. Mori, Beilstein J. Org. Chem. **11** (2015) 1561-1569.

7. Novel electronic ferroelectricity in an organic charge-order insulator investigated with terahertz-pump optical-probe spectroscopy: H. Yamakawa, T. Miyamoto, T. Morimoto, H. Yada, Y. Kinoshita, M. Sotome, N. Kida, K. Yamamoto, K. Iwano, Y. Matsumoto, S. Watanabe, Y. Shimoi, M. Suda, H. M. Yamamoto, H. Mori and H. Okamoto, Sci. Rep. **6** (2016) 20571(1-10).

8. 有機結晶における新機能物性開拓 —π 電子と水素の協奏—: 森 初果 , Mol. Sci. **9** (2015) A0081.

Nakatsuji group

Our group explores novel quantum phases and phase transitions in rare-earth and transition metal based compounds. The followings are some relevant results obtained in 2015. (1) We discovered the first example of an antiferromagnet that exhibits the anomalous Hall effect at room temperature, the chiral antiferromagnet Mn_3Sn (2) The quantum criticality at ambient pressure in β-$YbAlB_4$ is found robust against pressure, and possibly forms a strange metal phase. In addition, this phase is separated from a magnetic criticality by a Fermi liquid phase stabilized under pressure (3) A field induced quantum metal-insulator transition was found in the pyrochlore iridate $Nd_2Ir_2O_7$, when the field is applied only along the narrow angle range close to [100]. (4) A Fermi node at the quadratic band touching in $Pr_2Ir_2O_7$ was found and indicates that $Pr_2Ir_2O_7$ should be viewed as a mother compound for various topological phases in the correlated electron system, such as Weyl semimetals, and topological insulators.

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Division of Condensed Matter Theory

Takada group

Employing several standard techniques including the Green's-function method, quantum Monte Carlo simulations, band-structure calculations, and various types of variational approaches, we are studying several aspects of quantum many-body problems in condensed matter physics, based primarily on the first-principles Hamiltonian. This year we have studied the following issues: (1) The failure of the conventional self-consistent GW approximation in the calculation of both normal and superconducting properties is made clear by comparing the results among the G_0W_0 (one-shot GW), GW, and GWΓ approximations. (2) Diffusion Monte Carlo (DMC) simulations are performed on the system of an atom embedded in an electron gas with a view of investigating Kondo physics from first principles. A detailed analysis of the Friedel oscillations around the impurity atom

* Joint research among groups within ISSP.

reveals that a proton-embedded electron gas can exhibit the Kondo temperature well beyond 1000 K. The obtained accurate electron-density profile is used to improve on the GGA-PBE version of the exchange-correlation energy functional in the density functional theory. In making this improvement, we have paid special attention to fulfilling the cusp theorem at the atom site. The improved functional will be applied to a wide range of topics in the future, including the phase diagram of the solid hydrogen under high pressures. (3) With proposing a better functional form for the vertex function Γ, always satisfying both the Ward identity and the momentum conservation law, we study the low-density electron gas in the GWΓ scheme to find an anomalous mass reduction as a result of avoiding the collapse of the normal state into a spontaneously excited electron-hole pair condensed state. Concomitantly with this mass reduction, an anomalous behavior of the momentum distribution function is found for the density parameter r_s around 20.

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Oshikawa group

We studied a wide range of fundamental problems in condensed matter theory and statistical mechanics. In particular, we discovered that even trivial phases, which are adiabatically connected to a product state without any entanglement, are not unique in the presence of an appropriate symmetry. We discussed a simple example of S = 1 quantum spin chain with a symmetry under a combined operation of the site-centered lattice inversion and the global π-rotation about z axis. In this model, there are two trivial phases, adiabatically connected to the Néel state and the large-D state (product of S^z=0 states), which are always separated by a quantum phase transition in the presence of the above symmetry. We demonstrated this using field theory, numerical calculation, and a general proof based on Matrix Product State representation. The present result brings about a new perspective in classification of quantum phases, a central issue in current condensed matter physics.

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Tsunetsugu group

We have studied optical conductivity near an antiferromagnetic phase transition in the square-lattice Hubbard model at half filling using the cluster dynamical-mean field approach. We investigated the effects of vertex corrections on optical conductivity and found that they have large contributions and change some important features of optical conductivity. The vertex corrections enhance frequency dependence of conductivity in both metallic and insulating phaes. Another important discovery is the presence of a temperature region above the transition temperature where dc conductivity shows non-increasing behavior with lowering temperature. This is not due to a pseudogap behavior, but the electron spectral function does not show a dip at Fermi energy. (Reference: arXiv:1605.00387) We have continued the study of quadrupole order in Pr 1-2-20 system. We used a classical Monte Carlo calculation to investigate the effects of thermal fluctuations in temperature-magnetic field phase diagram. We found that the same number of ordered phases appear as predicted by our previous mean-field analysis, but the phase boundaries are strongly modified by thermal fluctuations and have a different topology. A new tetracritical point appears when magnetic field is applied along (001) direction. Criticality of parasitic ferro quadrupole order is also investigated, and we have found an unusual critical behavior in their temperature dependence. (Reference arXiv:1605.05175) We have also studied an antiferromagnetic Heisenberg model on breathing pyrochlore lattice, and found that the ground state in the S = 3/2 case has an interesting "dimerized" pattern that differs from the previously studied S = 1/2 case.

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Sugino group

We have done first-principles study of the excited-states, ferroelectric interfaces, electrochemical interfaces, and the ground-state wavefunctions. We have improved our GW+ BSE program of excited-state calculation so as to manipulate large number of atoms (~200 atoms), which has significantly activated collaboration with experiments. We also advanced density functional methods to compute the electrically biased interface, which are used to investigate the system of negative capacitance as well as the electrochemical reactions. We further developed a variational approach to strongly correlated electron systems to investigate the structure of the many-body wavefunction.

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Kato group

The main research subject of our laboratory is theory of non-equilibrium properties in nanoscale devices. We have studied (1) photon-assisted current noises under strong AC fields in quantum dot systems, (2) a multi-orbital Anderson impurity at high bias voltages, and (3) non-equilibrium current noises of quantum dots in the Kondo regime. We have also studied form factors of the Kondo model by the Bethe ansatz method.

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Division of Nanoscale Science

Iye group

Electronic transport in monolayer graphene grown on vicinal surface of 6H-SiC(0001) with a quasi-regular step-and-terrace structure is studied. Conductivity under a magnetic field normal to the plane showed a high degree of anisotropy. The quantum Hall effect (QHE) with zero resistance manifests itself for the current along the steps, whereas the QHE is obscured by pronounced positive magnetoresistance with quadratic magnetic-field dependence for the current across the steps.

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2. [†*]Highly Anisotropic Parallel Conduction in the Stepped Substrate of Epitaxial Graphene Grown on Vicinal SiC: A. Endo, F. Komori, K. Morita, T. Kajiwara and S. Tanaka, J. Low Temp. Phys. **179** (2015) 237-250.

Katsumoto group

Conductance fluctuation in InAs two-dimensional electrons versus in-plane magnetic field was found and attributed to the sign of so called "Zitterbewegung" (trembling motion) due to spin-orbit coupling. We have succeeded in making low resistance semiconductor-superconductor junctions not only for InAs two-dimensional electrons but also for a diluted magnetic semiconductor (In,Fe)As. Anomalous response in the latter will be our next subject.

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Otani group

We have studied on three topics including spin Hall effect, spin diffusion length, and magnonic crystals.

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Komori group

Reproducible dependence of the STM images on the distance between the surface and the STM tip apex for a monatomic layer of iron nitride (Fe_2N) formed on a Cu(001) surface was found in the bias-voltage range corresponding to the Fe 3*d* states. The results are attributed to a shift in surface orbitals detected by the tip from the *d* states to the *sp* states. Electronic structures of the Pt-adsorbed Ge(001) surface with a one-dimensional atomic structure were studied by high-resolution ARPES and SARPES. One-dimensional Fermi surfaces of four surface states were confirmed by ARPES. One of them is spin-split due to the Rashba effect.

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Yoshinobu group

We conducted several research projects in the fiscal year 2015. (1) The activation and hydrogenation of CO_2 on clean and Zn-deposited Cu(111) and Cu(997) surfaces studied by AP-XPS. (2) The surface chemistry of formic acid on Zn-Cu(111) studied by SR-PES. (3) Spectroscopic characterization of H-Cu(111), Zn-Cu(111) and Pd-Cu surfaces by XPS. (4) Spectroscopic characterization of Au on $SrTiO_3$ under O_2 exposure using SR-XPS (5) LT-STM study of CO_2 on Cu(997) (6) Independently driven four-probe conductivity measurement of organic thin films.

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Hasegawa group

We have developed spin-polarized scanning tunneling microscopy (SP-STM), which enables us to detect the orientation of spins / magnetic moments on surfaces in atomic-scale spatial resolutions. Using the method, we investigated the formation mechanism of spin spiral structures of Mn ultrathin films formed on a W(110) substrate. Because of the absence of inversion symmetry due to the thin film structure and the spin-orbit interaction in the heavy-elemental substrate, the Dzyaloshinskii-Moriya interaction (DMI) is exerted among the spins in the thin films, which induces chirality in the spin structures. In order to investigate the details of DMI, we directly measured the rotational sense of the spin spiral structures by SP-STM, and revealed that both 1st and 2nd Mn layers exhibit chirality and the same polarization of DMI despite their different types of spin structures and propagation directions. These results, combined with previous reports on the chirality of domain walls observed in magnetic thin films on the same substrate, lead us to conclude that the DMI polarization is dominantly determined by the substrate. Aiming for a bottom-up approach of fabricating quantum spin systems and their microscopic investigations, we studied the adsorption of oxygen molecules, which have a spin triplet state (S = 1) as a ground state, on a Ag(111) substrate. It was found that by low temperature exposure the molecules adsorb on the substrate in a physisorbed manner lying down to form a triangular

† Joint research with outside partners.

lattice. Different from an isosceles triangular lattice expected from the ellipsoidal shape of the molecule, the lattice is deformed to scalene. Based on a Monte Carlo calculation using parameters that account for the solid oxygen phases, we found that the introduction of antiferromagnetic interaction among the adsorbed molecules explain the deformation quantitatively. The antiferromagnetic order indicates the preservation of the spin of the adsorbed molecules, opening up the possibility that the system can be utilized for fabrication / construction of one- or two- dimensional spin structures using an atom / molecular manipulation method of STM.

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Lippmaa group

We work on various aspects of oxide thin films and interfaces. One of our aims is to explore novels polar oxide phases that may exhibit new type of magnetoelectric coupling. In particular, we have looked at double perovskites that can sustain both ferromagnetism and ferroelectricity in a strained lattice. We have continued working on magnetic interfaces, mostly looking at band alignment and magnetic coupling in manganite-titanate heterostructures. The third topic is the development of photocatalytic materials. Our recent work has involved the analysis of carrier dynamics in optically excited crystals, surface chemical reactions, and the development of nanoscale composite materials for efficient collection of photogenerated charge in a photocatalyst.

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Division of Physics in Extreme Conditions

Uwatoko group

We report electrical resistivity, ac magnetic susceptibility and X-ray absorption spectroscopy measurements of intermediate valence $YbNi_3Ga_9$ under pressure and magnetic field. We have revealed a characteristic pressure-induced Yb valence crossover within the temperature-pressure phase diagram, and a first-order metamagnetic transition is found below P_c ~9 GPa where the system undergoes a pressure-induced antiferromagnetic transition. Zirconium-based bulk metallic glass (Zr-based BMG) has outstanding properties as a cylinder material for piston-cylinder high pressure apparatuses and is especially useful for neutron scattering. The piston cylinder consisting of a Zr-based BMG cylinder with outer/inner diameters of 8.8/2.5 mm sustains pressures up to 1.81 GPa and ruptured at 2.0 GPa, with pressure values determined by the superconducting temperature of lead. We report the discovery of pressure-induced superconductivity below T_c = 14 K in the iron-based spin-ladder material $BaFe_2S_3$, a Mott insulator with striped-type magnetic ordering below ~120 K. Our findings indicate that iron-based ladder compounds represent promising material platforms, in particular for studying the fundamentals of iron-based superconductivity. The perovskite $PbCrO_3$ is an antiferromagnetic insulator. However, the fundamental interactions leading to the insulating state in this single valent perovskite are unclear. We report a variety of insitu pressure measurements including electron transport properties, X-ray absorption spectrum, and crystal structure study by X-ray and neutron diffraction. These studies reveal key information leading to the elucidation of the physics behind the insulating state and the pressure-induced transition.

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* Joint research among groups within ISSP.

Osada group

We have systematically studied quantum Hall transport in monolayer-bilayer graphene heterojunctions on hexagonal boron nitride substrate. It has been found that the observed asymmetric transverse and Hall resistances across the junction are well understood by the Landauer-Büttiker edge transport picture assuming the pair annihilation of edge channels with opposite chirality at the junction. We show that the above picture works well even in the system where the monolayer and bilayer regions have different carrier density, which corresponds to the preceding work. This result demonstrates the bulk-edge correspondence at the boundary of two quantum Hall states on different crystal and band structures. In addition, we found that fine structures around charge neutrality points, which are considered to originate from the degeneracy breaking of zero-energy Landau levels of monolayer and bilayer graphene.

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Yamashita group

As a joint project with Dr. Shishido at Osaka Prefecture University, we've performed dHvA measurements of the heavy-fermion superconductor $CeCoIn_5$. We succeeded to measure clear quantum oscillation measurements of the alpha bands of $CeCoIn_5$ down to 5 mK and up to 10 T. Unexpectedly, we found that the amplitude of the quantum oscillation is suppressed below 20 mK at 8 T (above H_{c2} of $CeCoIn_5$). At the same time, the frequency of the quantum oscillation shows a drop. These changes can be attributed to an emergence of a new ordered phase neighboring the superconducting phase. To clarify the property of the new phase, we started NMR measurements of $CeCoIn_5$ at ultra-low temperatures with Takigawa group, which is still a project under way in 2016. We've also measured longitudinal and transverse thermal transport measurements of a candidate material of quantum spin liquid, $Ba_3CuSb_2O_9$. We found that the longitudinal thermal conductivity is strongly suppressed in wide temperature range, showing that there are strong scatters of phonons. Further, a clear thermal Hall effect has been observed. Given that there are no mobile spin excitations in $Ba_3CuSb_2O_9$ from our measurements and NMR measurements, this thermal Hall effect is a phonon Hall effect. We believe that this work is the first systematic study of a thermal Hall effect of phonons including the temperature dependence of the thermal Hall conductivity. We've performed thermal Hall measurements of Mn_3Sn where the first observation of the anomalous Hall effect in antiferromagnetic system has been reported. A clear anomalous thermal Hall effect has been observed. We found that the temperature dependence of the Lorentz number implies that intrinsic scatterings play an important role for the anomalous Hall effect.

Materials Design and Characterization Laboratory

Hiroi group

One-Third Magnetization Plateau with a Preceding Novel Phase is discovered in Volborthite. We have synthesized high-quality single crystals of volborthite, and carried out high-field magnetization measurements up to 74 T and ^{51}V NMR measurements up to 30 T. An extremely wide 1/3 magnetization plateau appears above 28 T and continues over 74 T at 1.4 K, which has not been observed in previous studies using polycrystalline samples. NMR spectra reveal an incommensurate order (most likely a spin-density wave order) below 22 T and a simple spin structure in the plateau phase. Moreover, a novel intermediate phase is found between 23 and 26 T, where the magnetization varies linearly with magnetic field and the NMR spectra indicate an inhomogeneous distribution of the internal magnetic field. This sequence of phases in volborthite bears a striking similarity to those of frustrated spin chains with a ferromagnetic nearest-neighbor coupling J_1 competing with an antiferromagnetic next-nearest-neighbor coupling J_2. In addition, the metal-insulator transition (MIT) of VO_2 is discussed with particular emphasis on the structural instability of the rutile compounds toward dimerization. Ti substitution experiments reveal that the MIT is robust up to 20% Ti substitutions and occurs even in extremely thin V-rich lamellas in spinodally decomposed TiO_2-VO_2 composites, indicating that the MIT is insensitive to hole doping and essentially takes on a local character. These observations suggest that either electron correlation in the Mott-Hubbard sense or Peierls (Fermi-surface) instability plays a minor role on the MIT. Through a broad perspective of crystal chemistry on the rutile-related compounds, it is noted that VO_2 and another MIT compound NbO_2 in the family eventually lie just near the borderline between the two structural groups with the regular rutile structure and the distorted structures characterized by the formation of dimers with direct metal-metal bonding. It is also shown that the two compounds of the rutile form do not follow the general trends in structure observed for the other rutile compounds, giving clear evidence of an inherent structural instability present in the two compounds. The MITs of VO_2 and NbO_2 are natural consequences of structural transitions between the two groups, as all the d electrons are trapped in the bonding molecular

† Joint research with outside partners.

orbitals of dimers at low temperatures. Such dimer crystals are ubiquitously found in early transition metal compounds having chain-like structures, such as $MoBr_3$, $NbCl_4$, Ti_4O_7, and V_4O_7, the latter two of which also exhibit MITs probably of the same origin. In a broader sense, the dimer crystal is a kind of "molecular orbital crystals" in which virtual molecules made of transition metal atoms with partially-filled t_{2g} shells, such as dimers, trimers or larger ones, are generated by metal-metal bonding and are embedded into edge- or face-sharing octahedron networks of various kinds. The molecular orbital crystallization opens a natural route to stabilization of unpaired t_{2g} electrons in crystals.

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Kawashima group

We have been investigating quantum spin/boson systems and frustrated systems by means of large-scale numerical simulation. We also develop new numerical techniques. Our group's activities of 2015 include: (1) new interpretations and findings of computational results for the SU(N) Heisenberg models with and without higher order interactions, (2) development of quantum Monte Carlo code for Bose systems in continuous media, (3) correlation between computational hardness of the spin glass instances and the thermodynamic properties and (3) large-scale non-equilibrium molecular dynamics simulation of bubble growth in under-pressured near-transition liquid.

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Noguchi group

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† Joint research with outside partners.

Neutron Science Laboratory

Shibayama group

Shibayama group has been exploring the structure and dynamics of soft matter, especially polymer gels, micelles, and phenolic resin, utilizing a combination of small-angle neutron scattering (SANS), small-angle X-ray scattering (SAXS), and dynamic light scattering (DLS). The objectives are to elucidate the relationship between the structure and variety of novel properties/functions of polymer gels/resins. The highlights of 2015 include (1) development of high-toughness Ion gel for CO_2 separation, (2) gelation and cross-link inhomogeneity of phenolic resins, (3) structure evolution of catalyst ink for fuel cell in drying process, (4) rubber elasticity for percolation network consisting of Gaussian chains, (5) gelation mechanism of Tetra-Armed Poly(ethylene glycol) in aprotic ionic liquid, (6) structural analysis of lipophilic polyelectrolyte solutions and gels in low-polar solvents and so on.

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Yoshizawa group

A systematic study on spin dynamics in a two-dimensional transition-metal Ni oxide has been carried out with use of the high resolution chopper spectrometer installed at BL12 in the Material and Life Science Facility, J-PARC. The checkerboard-type spin-charge ordering in the highly hole-doped region of the layered nickelate was studied in detail. The nature of the excitation spectra and the thermodynamic properties in the checkerboard phase was found to show qualitative differences from those in the stripe phase. Magnetic properties of a family of Ce-based non-centrosymmetric heavy fermion compounds $CeTSi_3$ (T=transition metal ions) were also studied.

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Yamamuro group

Our laboratory is studying chemical physics of complex condensed matters by using neutron scattering, X-ray diffraction, calorimetric, dielectric, and viscoelastic techniques. Our target materials are glasses, liquids, and various disordered systems. This year, we have succeeded to observe the inelastic neutron scattering spectra of palladium hydride nanoparticles. The peaks characteristic to the nanoparticles are attributed to the vibration of the H atoms located at the tetrahedral sites of the Pd lattice, which were predicted by our neutron powder diffraction work. Another topic is on the dynamics of a reverse osmotic membrane consisting of aromatic polyamide and water. This system is remarked for seawater desalination and waste-water reclamation. Several quasielastic neutron scattering experiments in a wide time range (0.5 ps to 5 ns) revealed that the polyamide network is drastically plasticized by water and moving with water even at 240 K. This information will give a new insight into the mechanism of water purification. Other than above topics, we have made some progresses in the studies on vapor-deposited molecular glasses and ionic liquids with plastically crystalline phases.

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Masuda group

The goal of our research is to discover a new quantum phenomenon and to reveal the mechanism of it. In this fiscal year we studied the following topics; complex magnetostructural order in the frustrated spinel $LiInCr_4O_8$, magnetic model in multiferroic $NdFe_3(BO_3)_4$, specific heats of triangular spin tube in magnetic fields, and magnetic anti-cancer compound for magnet-guided delivery and magnetic resonance imaging.

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[*] Joint research among groups within ISSP.

International MegaGauss Science Laboratory

Takeyama group

Single-walled carbon nanotubes (SWNT) with a typical tube diameter an order of 1 nm are characterized by the quasi-one dimensional system. Optical properties are enriched by the enhancement of the excitonic band-edge structure. When a magnetic flux penetrates through the tube, the electronic band structure is subjected to substantial modulation via the mechanism of Aharonov-Bohm (A-B) effect. This effect lifts the quantum degeneracy of the band-edge states, induces splittings of the exciton optical absorption peak in megagauss magnetic field. The magneto-optical A-B splitting was investigated in magnetic fields of up to 300 – 400 T by observing band-edge exciton absorption spectra. The spectra evolved as a simple bright and dark exciton splitting with a linear magnetic field dependence as has been predicted by T. Ando. The ratio of the splitting is governed by a microscopic information of the environment dielectric substances surrounding the SWNTs.

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Kindo group

Long pulsed magnetic field has been improved. The maximum field of long pulse magnet was limited to 36 T due to the control system. We have improved the control system and succeeded in generating 42.5 T. The other improvement is development of almost perfect flat-top field. We have added a small coil into the bore of the large long pulse magnet and controlled the small coil to obtain the flat-top magnetic field. We have succeeded in generating 40 ± 0.005 T for 0.2 sec. These improvements will expand the possibility of the high field study on the condensed matter physics.

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Tokunaga group

We are focusing on physics in the quantum limit state, in which all the carriers are accommodated in the lowest Landau level. Since the carriers are confined in the smallest cyclotron orbit, kinetic degree of freedom normal to the field is suppressed. Thereby, the ratio between Coulomb interaction and bandwidth becomes large. Such strong correlation in the quantum limit state can realize anomalous quantum state. We can realize the quantum limit state in some kinds of semimetals with using non-destructive pulse magnets installed at ISSP. We studied magnetization and transport properties on various types of graphite in pulsed magnetic fields up to 74 T. The results suggest that the quantum limit state is realized in magnetic fields greater than 53 T applied along the *c*-axis. From systematic experimental studies, we proposed emergence of excitonic BCS-like state in

* Joint research among groups within ISSP.

the quantum limit state of graphite. We also studied transport properties of the semimetallic black phosphorus under pressure. We found anomalously large positive magnetoresistance and quantum oscillations in this material. The observed small Fermi surfaces, high mobilities, and light effective masses of carriers in semimetallic black phosphorus are comparable to those in the representative elemental semimetals of bismuth and graphite.

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Y. Matsuda group

The valence state and magnetization of the heavy fermion compound α-$YbAlB_4$ have been investigated. This compound shows the strong valence fluctuation and its Yb valence is around 2.8 which is distinctly smaller than the expected valence state 3.0 for local magnetic Yb ions. Although the fluctuated valence is expected to be influenced by magnetic field due to the suppression of the Kondo effect, the valence state has been found to be almost independent of magnetic field even at rather high magnetic field of up to 40 T. This experimental fact contrasts to that obtained in a related antiferomagnetic compound α-$YbAl_{1-x}Fe_xB_4$ (x = 0.115); the small valence increase is observed when magnetic field exceeds 20 T. The quantum criticality might be

† Joint research with outside partners.

enhanced in $YbAlB_4$ at low temperatures and the criticality is not significant in Fe-doped substance, which may explain the different magnetic field dependence of the Yb valence. In addition to the study of $YbAlB_4$, the B-T phase diagram of solid oxygen has been clarified and the high-field θ-phase has found to have low entropy and be clearly different from the high-tempereture γ-phase. We also studied issulator-metal transtion of Co-oxides, Fe-based superconductors and magneto-optics of the multiferroic CuB_2O_4.

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Center of Computational Materials Science

Akai group

(1) It is crucial to treat f-states properly to describe the magnetic properties of rear-earth permanent magnet materials. However, the local or semi-local approximations to the density functional method, which is the common basis of first-principles electronic structure calculations, are unable to treat the f-states in a reasonable way. To overcome this situation we have developed several methods that go beyond the local density approximation. One of them are the optimized effective potential method combined with the exact-excahnge and random-phaseapproximation. Another is the self-interaction corrected LDA/GGA applied to f-states. Using these methods, the magnetic crystalline anisotropy of $Sm_2Fe_{17}N_x$ ($0<x<3$) is calculated. The results obtained by two different methods show considerable differences and the origin of these discrepancies are discussed. (2) A scheme that combines the non-equilibrium Green's function method with the Korringa-Kohn-Rostoker (KKR) Green's function method is proposed. The scheme applied to Schottky contact composed of Al/GaN/Al trilayer. The transport property of this system under various finite bias voltages is calculated. It is shown that the asymmetric behavior of electron transport against the direction of bias voltage occurs in this system, confirming the feature of rectification.

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Ozaki Taisuke group

First-principles calculations based on density functional theories (DFT) have been playing an invaluable role as a cornerstone in computational materials science. For a wide variety of materials ranging from metals, insulators, semiconductors, and molecules the DFT calculations enable us to quantitatively predict the chemical and physical properties within a reasonable computational cost. With a recent advance of massively parallel computers, even realistic materials discussed in industrial fields have been becoming the potential targets. However, it is a challenging problem to develop algorithms and software being suitable for massively parallel computers typified by the K-computer, which results in a fact that users and developers are distinguished from each other in recent years, and that most of users use specific software. We have been developing OpenMX (Open source package for Material eXplore) towards a de fact standard DFT code, and in 2015 released the Ver. 3.8 to the public under GNU-GPL. To improve numerical accuracy, optimized pseudopotentials and pseudo-atomic basis functions have been developed based on a norm-conserving pseudopotential method with multiple reference energies and a variational optimization method for radial basis functions. The optimization over 80 elements in the periodic table results in the reliable database storing optimized pseudopotentials and pseudo-atomic basis functions, where the accuracy of the database was validated by the delta gauge method. In addition, new functionalities including stress tensor calculation, band unfolding method, and eigenchannel/real space current analysis have been developed, which makes OpenMX a versatile tool for many applications.

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Laser and Synchrotron Research Center

Suemoto group

(1) We tried to control the orientation of macroscopic magnetization in an orthoferrite $ErFeO_3$ by using terahertz magnetic field enhanced by a split ring resonator. The magnetization orientation was successfully controlled by changing the time delay between the terahertz pulse and the heating pulse. In addition, it was found that two kinds of mechanisms, i.e., spin precession motion and oscillating external magnetic field, are relevant on the symmetry breaking at the beginning of spin reorientation phase transition induced by the heating pulse. This is probably the first demonstration of coherent control of the macroscopic magnetization using direct magnetic dipole interaction with radiation. (2) Femtosecond infrared luminescence was observed in a topological insulator (TlBiSe2) and the luminescence component below the band gap energy (0.35 eV) was ascribed to the carrier recombination in the metal-like two-dimensional Dirac bands at the surface, while that above 0.35eV was assigned to the transitions in the semiconductor-like bulk bands. These results show that the luminescence method is usable under ambient condition for investigation of carrier dynamics, while photoemission method requires ultrahigh vacuum, which is different from

† Joint research with outside partners.

the operand condition of realistic devices.

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Shin group

We studied high Tc Fe-pnictide superconductors using 7-eV laser. High resolution photoemission study with polarization dependence is very powerful for the study of the superconducting mechanism. Orbital fluctuation mechanism is also important in addition to the spin fluctuation mechanism.

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Akiyama group

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I. Matsuda group

Developments and experiments of the advanced spectroscopies have been carried out by using vacuum ultraviolet (VUV) and soft X-rays (SX). At SPring-8 BL07LSU, we have succeeded in realizing fast-switching (10 Hz) of the light polarizations for the segmented cross-type undulator. Moreover, we could measure a spectrum of X-ray magnetic circular dichroism for a magnetic sample using the fast-switching of left and right circular polarized light. At the end-station, we routinely supported picosecond-time-resolved SX photoemission spectroscopy experiments of joint-researches. Studies of photovoltaics and photocatalysis have been carried out mainly. In the laboratory, we studied electronic structure of novel two-dimensional materials that could show intriguing dynamical properties.

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Kobayashi group

We have demonstrated the highest repetition rate in a Kerr-lens mode-locked oscillator in the world. 15-GHz mode space of the optical frequency comb can be resolved by using commercially available spectrum analyzer. We started to develop a new HHG beam line for industrial applications. We have demonstrated 300-mW, 193-nm light source with single longitudinal mode at 6 kHz repetition rate for next generation lithography technology.

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* Joint research among groups within ISSP.

Itatani group

We carried out several application experiments using the optical parametric chirped pulse amplification (OPCPA) system that can produce carrier-envelope phase (CEP)-stable, 1.5-mJ, 10-fs infrared pulses at a repetition rate of 1 kHz. First, we produced soft-X-ray continuum extending to the photon energy of 320 eV, and measured the static absorption spectrum of a thin film containing carbon atoms. We successfully resolved the peaks arising from the C=C and C-C bonding with an accumulation time of approximately 100 seconds. This result shows the capability of laser-based time-resolved soft-X-ray absorption spectroscopy. Second, we measured the photoelectron spectra of ionizing atoms, and observed the CEP-dependent high-energy structures. By mapping the CEP-dependent cutoffs of photoelectron spectra, we successfully reproduced the differential cross sections of rare gas atoms with a high degree of agreement with the most advanced scattering theory. Third, under the collaboration with Prof. Tanaka at Kyoto University, we produced broadband THz pulses using organic crystals. New directions of the BIBO-based ultrabroadband optical parametric amplifiers are pursuit as well. First, we developed a high-repetition-rate optical parametric amplifier using newly developed dispersion compensation mirrors. We have successfully produced CEP-stable 10 uJ, 9-fs infrared pulses at 20 kHz, which were applied to high-throughput electron scattering experiments. Second, we modified a high-energy OPCPA system to amplify two spectral components in infrared followed by differential frequency generation, resulting in the generation of intense mid-infrared pulses. A strong optical field up to 50 MV/cm was achieved with a capability of sub-cycle EO sampling using 6.5-fs visible pulses. We also kept collaboration with Shin, Komori, and Matsuda groups at LASOR-ISSP on time-resolved ARPES using a femtosecond EUV source. Photo-induced electronic dynamics of $CuM_{0.17}Bi_2Se_3$ and graphene are successfully measured.

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Harada group

After three years development of differential pumping system we have for the first time succeeded in the near ambient pressure soft X-ray RIXS experiments at SPring-8 BL07LSU. The best demonstration was done for O 1*s* RIXS of SiO_2 under around 360 Torr (0.5 bar) air pressure. We also have implemented rotation of the RIXS spectrometer to enable momentum dependent RIXS experiments urgently requested for the study of strongly correlated systems. This year we have accepted 8 collaborative works at BL07LSU HORNET endstation, which include oxygen site analysis of high Tc cuprates, operando analysis of Li ion battery electrodes, RIXS study of multiferroic materials applying magnetic field, spin transition of $LaCoO_3$, monitoring vibrational excitations at Ti site in ferroelectric $BaTiO_3$, and electronic structure analysis of high concentration electrolyte for Li ion batteries.

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Wadati group

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Kondo group

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Okazaki group

We have developed and improved a time- and angle-resolved photoemission (TrARPES) apparatus using EUV and SX lasers by high harmonics generation (HHG). In the fiscal year 2015, we have installed a new Ti:Sapphire regenerative amplifier system and fairly improved a performance and stability of this apparatus. We have studied nonequilibrium electronic states of semiconductor surfaces, graphene, high-Tc cuprates, iron-based superconductors, and strongly correlated electron systems. Particularly, we have observed coherent phonon excitations both in the hole and electron Fermi surfaces of a parent compound of iron-based superconductors $BaFe_2As_2$. In addition, we have also investigated superconducting-gap structures of iron-based superconductors and BiS2-based superconductors by a low-temperature and high-resolution laser ARPES apparatus.

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