How to use the network joint research center

1 Access the researcher database.
http:/star-five.net/

Researcher database | search

You can search with the name, affiliation, and keywords of the host researchers

2 Consult with the researcher you would like to collaborate with or contact the Kyoten headquarter.

Email address of Kyoten headquarter:
five-star@grp.tohoku.ac.jp

3 Apply with the prescribed format.

Details of the open call for participants will be announced on the Kyoten website.
http://five-star.tagen.tohoku.ac.jp/

4 Acceptance

The applicant will be notified by email.

Always → Until around December → Around January → Around April

Contact information for each institute

Research Institute for Electronic Science,Hokkaido University

Kita 20 Nishi 10,Kita-ku,Sappro 001-0020

TEL 011-706-9202 FAX 011-706-9110
Email k-kenkyo@jimu.hokudai.ac.jp
http://www.es.hokudai.ac.jp/

Institute of Multidisciplinary Research for Advanced Materials,Tohoku University

Katahira 2-1-1, Aoba-ku, Sendai 980-8577

TEL 022-217-5203 FAX 022-217-5211
Email five-star@grp.tohoku.ac.jp
http://www2.tagen.tohoku.ac.jp/

Labiratory for Chemistry and Life Science, Tokyo Institute of Technology

4259 Nagatsuta, Midori-ku, Yokohama 226-8503

TEL 045-924-5961 FAX 045-924-5976
Email kasei.kyoten@jim.titech.ac.jp
http://www.res.titech.ac.jp/

The Institute of Scientific and Industrial Research, Osaka University

8-1, Mihogaoka, Ibaraki, Osaka 567-0047

TEL 06-6879-4300 FAX 06-6879-8509
Email NJRC@sanken.osaka-u.ac.jp
http://www.sanken.osaka-u.ac.jp/

Institute of Materials Chemistry and Engineering, Kyushu University

6-1 Kasuga-koen, Kasuga 816-8580

TEL 092-583-8898 FAX 092-583-8898
Email kyoten@cm.kyushu-u.ac.jp
http://www.cm.kyushu-u.ac.jp/

Check here for the latest information, events, and open call information

http://five-star.tagen.tohoku.ac.jp/

発行日：2020年3月

Five-Star

NJRC

Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials

Network Joint Research Center for Materials and Devices

Hokkaido University, Tohoku University, Tokyo Institute of Technology, Osaka University, Kyushu University

Create the future
Beyond the field
Network Joint Research Center

About The Network Joint Research Center for Materials and Device and The Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials

In FY2005, “Materials Science & Technology Research Center for Industrial Creation” was launched between The Institute of Scientific and Industrial Research at Osaka University (ISIR) and Institute of Multidisciplinary Research for Advanced Materials at Tohoku University (IMRAM), which has attracted great attention as a pioneering case of the so-called Collaboration project among Research Institutes beyond the boundaries of their affiliated universities.

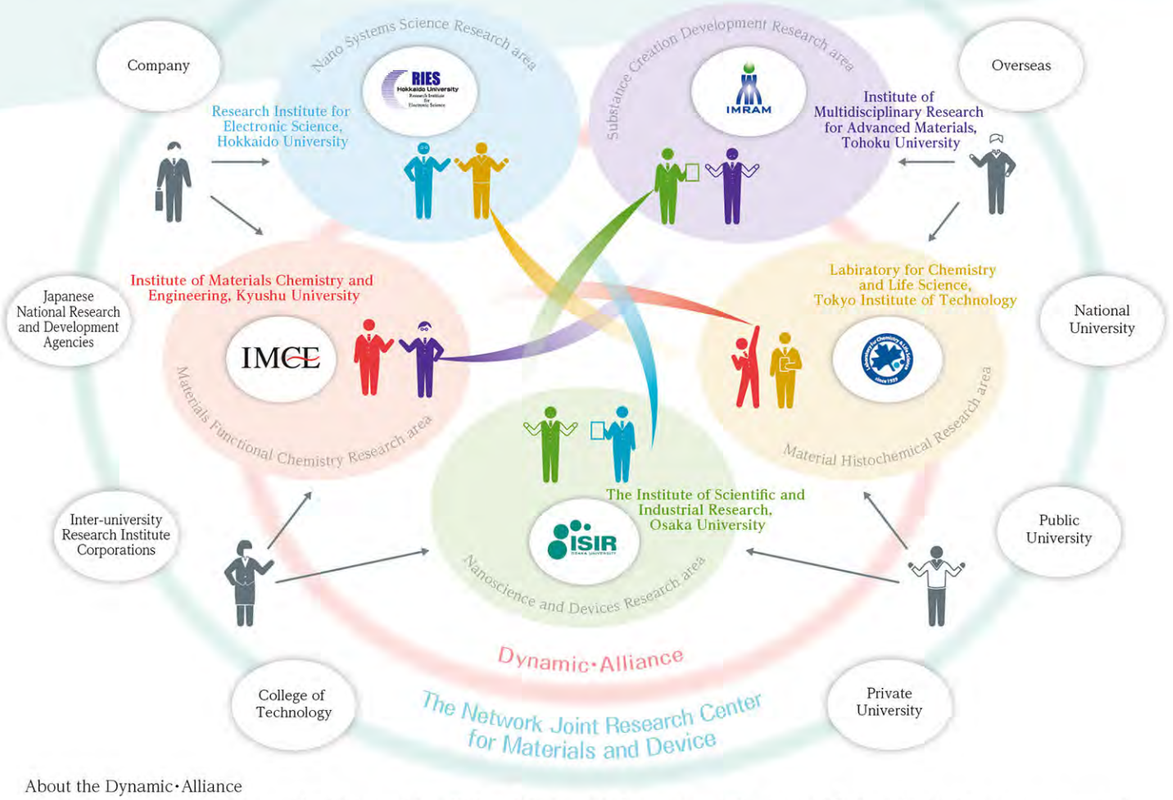
In FY2006, Research Institute for Electronic Science (RIES), Hokkaido University and Chemical Resources Laboratory (now Laboratory of Chemistry and Life Science (CRL)), Tokyo Institute of Technology newly joined as the constituents of the project to expand the Alliance framework, which started as “Post-Silicon Materials and Devices Research Alliance”. Furthermore, form FY2010, “The Strategic Project for the Creation of Materials, Devices and Systems Connecting Nano and Macro through the Inter-institute Alliance” was launched with the addition of Institute for Materials Chemistry and Engineering (IMCE), Kyushu University.

In line with the start of the alliance among the five universities and five research institutes, the first phase of the "Network-type" Joint Research Center for Materials and Devices was launched in FY2010 with the approval of the Ministry of Education, Culture, Sports, Science and Technology (MEXT), aiming to dramatically strengthen the domestic and international collaborative research network.

The Network Joint Research Center’s enterprise has been approved for continuation. In FY2016, when the second phase of the enterprise began, the "Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials" was newly started in parallel, and is unfolding its activities, which are complementary and linked to the Network Joint Research Center’s enterprise.

In this Network Joint Research Center for Materials and Devices, we aim to create innovative materials and devices by establishing a joint research system in the field of materials and devices, which spans the five research areas of Nano Systems Science, Development of New Materials, Histochemistry of Materials, Nanoscience and Devices, and Materials Functional Chemistry, and by forming a core to promote various Diverse cutting-edge interdisciplinary joint researches.

Based on the alliance-type joint research network formed among the five research institutes, we aim to develop research, nurture young human resources and create innovation by further collaboration with domestic and foreign researchers, students, and companies.



About the Dynamic・Alliance

We are conducting a new type of joint research called as “Horizontal skewer type joint research” characterized by cross-group and cross-disciplinary research, which dynamically incorporates and densely develops People and Different Fields by five Alliance Research Institutes. Also, we are nurturing young researchers and students with abundant creativity who will be responsible for the next-generation of science and technology, and promoting network activities of research support organizations, such as technical staffs.

Message from Center Headquarters Manager, Joint Research Center/Director and Project Manager, Dynamic Alliance Headquarters/Director

The Center for Materials Science and Device Research (hereinafter referred to as the "Center") was established in FY2010, and is a network of equally-connected institutes with outstanding research achievements in the field of materials and devices, including Hokkaido University, Tohoku University, Chemical Research Institute for Advanced Materials Science and Technology, Tokyo Institute of Technology, Osaka University, and Institute for Materials Chemistry and Engineering, Kyushu University.

We invited researchers from national, public and private universities, technical colleges and other institutions of technology across the country to join us, and over the past 10 years we have promoted more than 4,600 joint research projects through the first (2010-2015) and second (2016-2021) phases of the project.

A noteworthy ingenuity in the second year was the restructuring of the COE and the alliance among the five research institutes (the Dynamic Alliance for Innovation between People, Environment and Materials (hereinafter referred to as the "Dynamic Alliance"), headed by Dr. Toru Sekino, Director of the Institute of Industrial Science and Technology, Osaka University) so that they are mutually inseparable from each other, and the preparation of a variety of programs as follows

We have positioned "basic joint research" and "use of facilities and equipment" as center programs in the field of materials and devices in Japan.

The Dynamic Alliance Program includes the "Developmental Joint Research" to develop outstanding research results, the "Next Generation Collaborative Research" where graduate students, undergraduates and technical college students plan and carry out their own research, and the "CORE Lab Collaborative Research" where outstanding young researchers promote creative interdisciplinary research.

All of these programs are vigorously supported by both the centers and the Dynamic Alliance business as a whole.

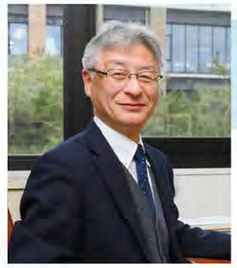
This center was highly evaluated for its continuity and developmental potential, and was the only network-type cooperative research center to receive an "S" rating, the highest possible, at the 2015 year-end evaluation and the 2018 interim evaluation.

Through the development of the center's activities, the network formed among the center's users has expanded, and in some cases it has developed into the development of new research fields, and in other cases, the center's users have developed joint research projects across multiple research institutes, making it possible to feel that new research is being carried out across the country.

Our goal is not only to strengthen the research capabilities of the institute's member institutes, but also to revitalize the research community at home and abroad and to support future-oriented and challenging research.

We also respect the diversity of research and support research that is full of potential.

We hope that many researchers will take advantage of this program and expand the network of research activities.



Center Headquarters Manager, Joint Research Center/Director
Institute of Multidisciplinary Research for Advanced Materials,
Tohoku University

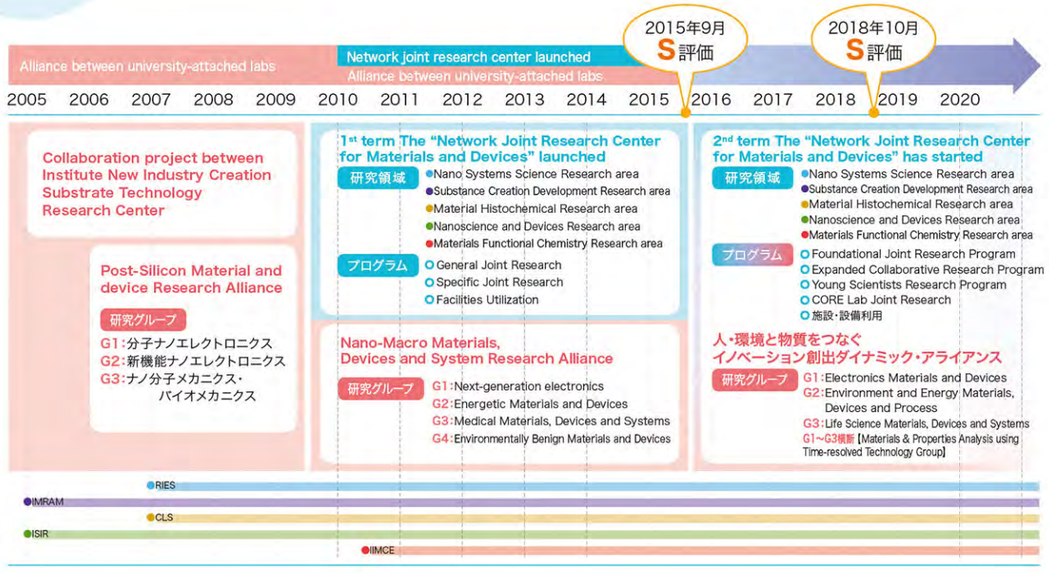
Prof. Masami Terauchi

Project Manager, Dynamic Alliance Headquarters/Director
Institute of Scientific and Industrial Research,
Osaka University

Prof. Tohru Sekino

History

It was the only networked location to receive an S rating in the 2015 year-end evaluation and the 2018 interim evaluation.In the second phase, which began in fiscal 2016, we added new programs, including a program for the development of young human resources, as well as joint research with young people that leverages our networking skills.



Features of The Kyoten

Diversity-filled interdisciplinary research that could not be achieved through joint research with a single research institute, "Sharing knowledge and research environment" utilizing domestic & overseas networks, and fostering motivated young research personnel are being promoted together with "Dynamic Alliance for Open Innovation Bridging Human, Environment and Materials".
From basic research to applied research, we are contributing to the development of humanistic science and technology that brightens and enriches future society.

POINT 1 Further expanding network

We accept joint research with researchers from a wide range of research institutes such as national, public and private universities, technical colleges, and overseas universities, etc. and promote challenging academic research created by interdisciplinary fusion.

POINT 2 The power to connect and cooperate with each other

We comprehensively support researchers nationwide by building on a powerful collaborative research platform cultivated through the existing dynamic alliance.Utilizing the network, we support research activities in emergencies such as disasters.

POINT 3 Formation of international network

We create an environment where Japanese researchers can cooperate while studying diligently with researchers from all over the world, support to participate in international joint research activities, and to demonstrate leadership.

POINT 4 Fostering young researchers

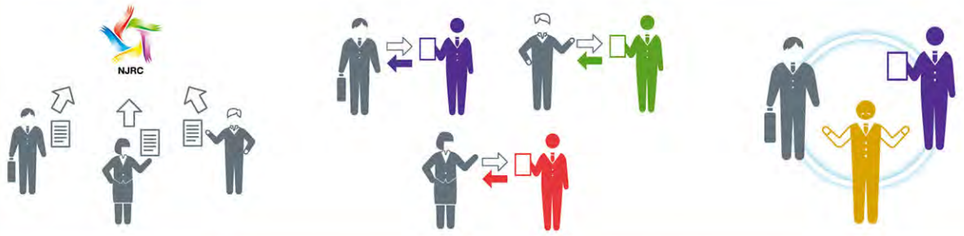
We provide young researchers and students with opportunities to actively present their research at workshops and symposia.
We improve research ability by sharing results and improve our motivation through human exchange.

STEP 1

Foundational Joint Research Program

Since the purpose of this program is for "Grow the buds of research on Materials and Devices", this is a joint research program in which the Kyoten and the Five-star alliance support bottom-up proposals based on the applicant's free ideas.

We ensure diversity by inviting a wide range of applicants and adopting as many joint research issues as possible.



STEP 2

Expanded Collaborative Research Program

Among the " Foundational Joint Research ", particularly excellent research are designated as " Expanded Collaborative Research " and are given priority support.
"Expanded Collaborative Research Program" is a program unique to the Network-type Joint Research Center/Dynamic Alliance, which aims to "participate the applicant researchers in the framework of the Alliance between multiple research institutes".
It has the property of easily creating ingenious research results through synergistic effects.

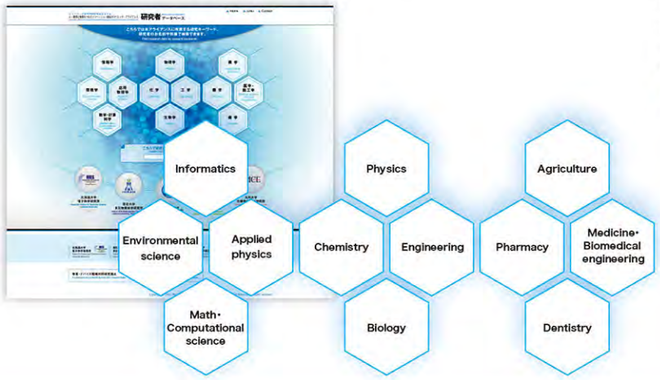
RIES Hokkaido University · IMRAM · ISIR · IMCE

The “Joint Research Center for Materials Science and Devices” and the “Five-star Alliance” promote the dissemination of information on active young researchers.
We introduce the research of particularly excellent students as a role model for the further development of young researchers of the future and for those who will follow in their footsteps.

A network of technical staff and a researcher database have been established to further develop network-type joint research beyond the boundaries of universities.
In addition, information to encourage the use of the cutting-edge facilities and equipment of each institute is available to the public.

【 Researcher database 】

Approximately 370 researchers belonging to 5 research institutes are registered in the database.
You can search for your perfect collaborators by keyword.
http://star-five.net/



【 Equipment introduction 】

Please visit on the following URL to see the research facilities of each research center.
http://five-star.tagen.tohoku.ac.jp/equipment/

CORE*Lab Joint Research

The CORE Lab is a place for practical research and education for human resource development and talent growth. Young researchers become Principal Investigators, forming teams with outstanding researchers from five research institutes, and conducting medium-to long-term research activities. Principal Investigator, etc. will stay in the CORE lab set up at the host research institute to carry out joint research.

*Collaboration Research

Young Scientists Research Program

In this program, creative undergraduate and graduate students and technical college students, who will be responsible for the future of science and technology in the next generation, become Principal Investigator (PI) and proactively engage in joint research in close collaboration with host researchers.
Principal investigators will be awarded the title of "NJRC Excellent Student Researcher".

Examples of outstanding achievements at the 2nd term

The number of papers published in high-quality journals (IF > 3): The number of such papers in the second term (2016 to 2019) has already achieved 1098, comparable to the total number of the first term (1133 papers for 6 years).
Also, there are many valuable papers even if the published journal has low IF (< 3).
The above achievements are released as “Research Highlights” at our web page. The following shows representative examples.

■RIES ■IMRAM ■CLS ■ISIR ■IMCE ●Overseas joint research* ○Kyoten user

*Overseas joint research is the proof of the fact that our joint research project involves not only domestic researchers but also international researchers.

Co-authored papers by multiple research institutes and overseas collaborators

■■■

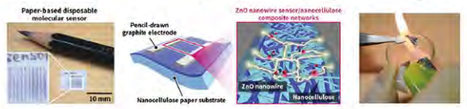
ACS Applied Materials & Interfaces

ナノセルロースペーパーのディスポーサブル分子センサ

（阪大産研）古賀大尚・Yintong Huang・上谷幸治郎・能木雅也、（九大先導研）長島一樹・Guozhu Zhang・Chen Wang・高橋綱己・井上陽英・Hong Yan・金井貴樹・柳田剛、（Chongqing University）Yong He

Paper-Based Disposable Molecular Sensor Constructed from Oxide Nanowires, Cellulose Nanofibers, and Pencil-Drawn Electrodes

Hirotaka Koga, Kazuki Nagashima, Yintong Huang, Guozhu Zhang, Chen Wang, Tsunaki Takahashi, Akihide Inoue, Hong Yan, Masaki Kanai, Yong He, Kojiro Uetani, Masaya Nogi, and Takeshi Yanagida



本研究では、生分解性のナノセルロースペーパー基材、ユビキタスな単結晶ZnOナノワイヤセンサ、大気安定で安価なグラファイト電極を用いて、貴金属フリーで使い捨て仕様のペーパー分子センサを開発した。紙抄き技術を応用することで、ZnOナノワイヤセンサをナノセルロースペーパー基材表面に露出・固定化することに成功し、高感度な分子センシング性能や切り貼りして使用できるフレキシブル性も実現した。
Paper-based molecular sensor consisting of nanocellulose substrate, ZnO nanowire sensor, and graphite electrode was developed. The paper sensor provided high sensitivity, easy disposability, and cut-and-paste usability, suggesting potential as disposable and ubiquitous molecular sensor elements.

Co-authored papers by multiple research institutes and Kyoten users

■■

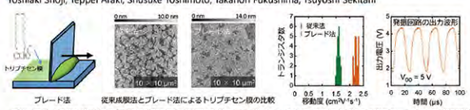
Scientific Reports Vol. 9, No. 9203, Published online 24 June 2019, DOI:10.1038/s41598-019-45509-4

ブレードコート法によるトリプチセン誘導体の高配向化

（阪大産研・阪大院工）近藤 瀧哉（拠点卓越学生研究員）、（阪大産研）植村 隆文・野田 祐樹・荒木 徹平・吉本 秀輔・関谷 毅、（東工大化生研）梶谷 孝・石蔵 史宗・庄子 良晃・福島 孝典

Highly-ordered Triptycene Modifer Layer Based on Blade Coating for Ultrafexible Organic Transistors

Masaya Kondo（NJRC Excellent Student Researcher）, Takashi Kajitani, Takafumi Uemura, Yuki Noda, Fumitaka Ishiwari, Yoshiaki Shoji, Teppei Araki, Shusuke Yoshimoto, Takanori Fukushima, Tsuyoshi Sekitani



プロペラ上の骨格を持つトリプチセン分子にアルキル長鎖を付与した誘導体は、入れ子状に自己集合した2次元シートとそれを規則的に積層した3次元構造をポリマーや金属などの材料表面に関わらず形成する。しかし、従来のトリプチセン成膜プロセスでは多くのテラス境界を持った膜が形成されるためその性能を完全に引き出せてはいなかった。本研究では、トリプチセン分子の溶媒した溶液をブレードに担持させながら分子結晶を析出させることで、1枚のテラス状のトリプチセン分子膜を得ることに成功した。この手法でポリマー絶縁膜表面を改質した有機薄膜トランジスタでは電流特性が大幅に向上し、作製した発振回路はポリマー単層膜型として世界最速を達成した。
Triptycene derivatives with alkyl long chains form nested self-assembled two-dimensional sheets and the three-dimensional stacked structure, regardless of the modified surface such as polymer or metal. However, triptycene film possesses many terrace boundaries in the conventional triptycene deposition process. Hence, its performance has not been completely extracted. In this work, we succeeded in obtaining a single terrace-like triptycene molecular film based on blade coating process. We applied the triptycene film to polymer gate dielectrics of organic thin film transistors. As the results, the performance was greatly improved, and the oscillator achieved the world's fastest as those with polymer gate dielectrics.

■■○

Angew. Chem. Int. Ed. 58 (2019) 4369 –4372, Published online: 23 January 2019, DOI: 10.1002/anie.201813709

結晶状態における超分子イオンチャネルへの選択的なイオン交換

（広島大学）市橋亮哉、金野大介、マルニーナ クセーヤ、井上克也、西原康文、（東京農工大）川口睿昂、久保田芳樹、笹刀雅子、（北大電子研）中村貴義、（東北大多元研）芥川智行

Selective Ion Exchange in Supramolecular Channels in the Crystalline State

Katsuya Ichihashi, Daisuke Konno, Kseniya Yu. Maryunina, Katsuya Inoue, Kazuhiro Toyoda, Shogo Kawaguchi, Yoshiki Kubota, Yoko Tatewaki, Tomoyuki Akutagawa, Takayoshi Nakamura, and Sadafumi Nishihara

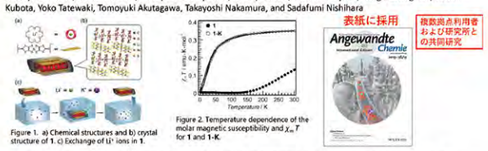


Figure 1. a) Chemical structures and b) crystal structure of 1. c) Exchange of Li^+ ions in 1.

Figure 2. Temperature dependence of the molar magnetic susceptibility and $\chi_m T$ for 1 and 1-K.

By soaking single crystals of Li_2{[18]crown-6}$_2$[Ni(dmit)$_2$]$_2$(H_2O)$_n$ (1) in an aqueous solution containing K^+, we succeeded in complete ion exchange of the Li^+ ions in 1 with K^+ ions in the solution. This ion exchange with K^+ was selectively conducted even in mixed solutions containing K^+ as well as Na^+/Li^+. Furthermore, remarkable changes in the physical properties of 1 resulted from the ion exchange. Our finding enables not only the realization of selective ion permeability but also the development of highly sensitive biosensors and futuristic ion exchange agents.
水溶液中のLi$_2${[18]crown-6}$_2$[Ni(dmit)$_2$]$_2$(H_2O)$_n$ (1)単結晶を用いて、イオンチャネル中のLi$^+$イオンをK$^+$イオンに交換することに成功した。K$^+$へのイオン交換は、K$^+$を含む溶液中で選択的に生じ、Na$^+$/Li$^+$の様な共存イオンでは観測されなかった。イオン交換は、結晶1の物性を劇的に変化させた。今回の成果は、次世代バイオセンサなどの開発に重要な概念を提唱する。

Co-authored papers by a research institute and Kyoten users

■○○

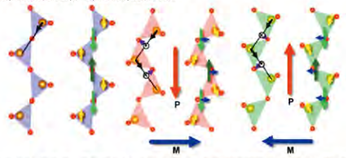
Advanced Materials Vol.31, 1808354 (2019), Published online: 28 April 2019, DOI: 10.1002/adma.201808354

1次元四面体鎖における室温強誘電・強磁性

（SKKU）K.T. Kang, (GIST) C. J. Roh, J. Lim, (PNU) T. Min, (UNIST) J.H. Lee, (SNU) K. Lee, T.Y. Lee, (SKKU) S. Kang, D. Seol, (PNU) J. Kim, (北大電子研) 太田裕道, (SKKU) A. Khare, (PNU) S. Park, (SKKU) Y. Kim, (SNU) S.C. Chae, (UNIST) Y.S. Oh, (PNU) J. Lee, (SNU) J. Yu, (GIST) J.S. Lee, (SKKU) W.S. Choi*

A Room-Temperature Ferroelectric Ferromagnet in a 1D Tetrahedral Chain Network

K.T. Kang, C.J. Roh, J. Lim, T. Min, J.H. Lee, K. Lee, T.Y. Lee, S. Kang, D. Seol, J. Kim, H. Ohta, A. Khare, S. Park, Y. Kim, S.C. Chae, Y.S. Oh, J. Lee, J. Yu, J.S. Lee, W.S. Choi*



ブラウンミラライト型$SrFeO_{2.5}$エピタキシャル薄膜の1次元FeO_4四面体鎖における室温強誘電・強磁性を見出した。Ferroelectricity and coupled ferromagnetism in a 1D FeO_4 tetrahedral chain network of a brownmillerite $SrFeO_{2.5}$ epitaxial thin film are presented. The result provides a new paradigm for designing low-dimensional MO_x networks, which is expected to benefit the realization of macroscopic ferro-ordering materials including ferroelectric ferromagnets.

■○○

Nature Communications Vol. 10, 2186, Published online: 15 May 2019, DOI: 10.1038/s41467-019-10065-z

X線で誘起した気相超高速反応を観測

（東北大多元研）福澤宏宣・上田潔、（東北大理学研究科）河野裕彦、（広島大）和田真一、（京都大）永谷清信・西山俊幸（拠点卓越学生研究員）、（トルクワ大）Kukk Edwin、（パリ・サクレ大）Miron Catalin、（ハイデルベルク大）Kuleff Alexander・Cederbaum Lorenz、他

Real-time observation of X-ray-induced intramolecular and interatomic electronic decay in CH_2I_2

H. Fukuzawa, T. Takanashi, E. Kukk, K. Motomura, S.-i. Wada, K. Nagaya, Y. Ito, T. Nishiyama, C. Nicolas, Y. Kumagai, D. Iablonskyi, S. Mondal, T. Tachibana, D. You, S. Yamada, Y. Sato, T. Sakai, K. Matsunami, T. Umemoto, K. Kariyazono, S. Kajimoto, H. Sotome, P. Johnsson, M. S. Schöffler, G. Kastirke, K. Kooser, X.-J. Liu, T. Asavei, L. Neagu, S. Molodtsov, K. Ochiai, M. Kanno, K. Yamazaki, S. Owada, K. Ogawa, T. Katayama, T. Togashi, K. Tono, M. Yabashi, A. Ghosh, K. Gokhberg, L. S. Cederbaum, A. I. Kuleff, H. Fukumura, N. Kishimoto, A. Rudenko, C. Miron, H. Kono, K. Ueda

ジヨードメタン（CH_2I_2）分子にX線を照射することで誘起される、数10 fsで起こる超高速反応を、X線自由電子レーザーと近赤外レーザーを用いた時間分解測定で捉えました。
We have observed X-ray induced ultrafast processes in diiodomethane (CH_2I_2) molecules using X-ray free-electron laser and near-infrared laser.

Papers published as a result of joint research by Kyoten users

■●○

Chem. Commun Vol. 54, No. 66, p. 8995, Published online: 27 June 2018, DOI: 10.1039/C8CC04424D

FeN_4ユニットを有する炭素質2次元格子

（大阪技術研）丸山 純、（兵庫県立大）天野泰至, 井上 聡, 村松康司, （産総研）吉澤徳子, (LBNL) Eric M. Gullikson

A carbonaceous two-dimensional lattice with FeN_4 units

Jun Maruyama, Taiji Amano, Satoshi Inoue, Yasuji Muramatsu, Noriko Yoshizawa, Eric M. Gullikson

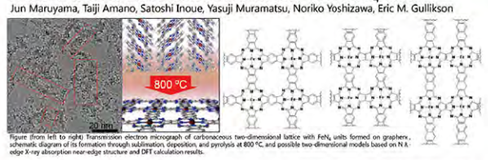
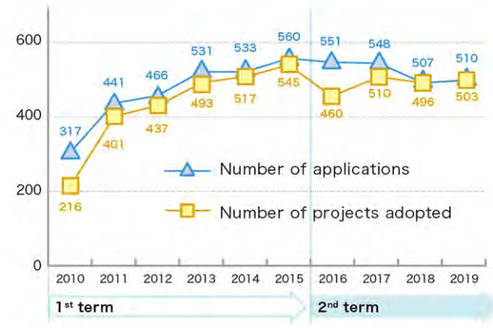


Figure (from left to right) Transmission electron micrograph of carbonaceous two-dimensional lattice with FeN_4 units formed on graphene, schematic diagram of its formation through sublimation, deposition, and pyrolysis at 800 °C, and possible two-dimensional models based on N k edge X-ray absorption near-edge structure and DFT calculation results.

鉄フタロシアニンの昇華、グラフェン面上への析出、その場での熱分解により、金属を含有する2次元格子状炭素化物を作製しました。鉄フタロシアニン由来のπ共役系の生成と成長は、グラフェン面に対して垂直に配向した状態から水平配向への転換と、窒素K殻のX線吸収端近傍構造に反映されていました。
A metal-containing carbonaceous two-dimensional lattice was formed on a graphene plane by sublimation, deposition, and pyrolysis of Fe phthalocyanine (Fc). The formation and growth of the FeN$_4$-derived π-conjugated planar system were reflected by its orientation conversion from the perpendicular to horizontal mode and by the N K-edge X-ray absorption near-edge structure.

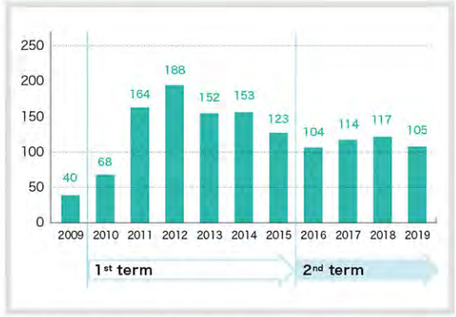
Achievement data of the second term

■Changes in the number of projects adopted and the number of applications



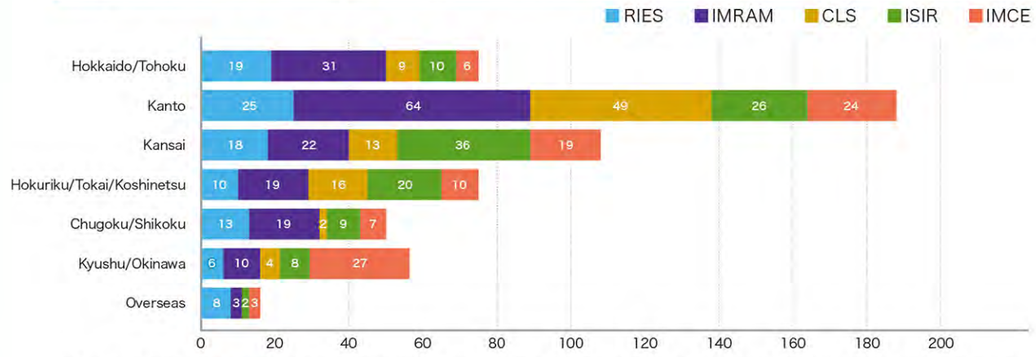
Since the establishment of this Kyoten project in FY2010, both the number of applications and the number of projects adopted have increased and kept high level around 500.

■Changes in the Number of adopted joint research projects with private universities



One of the features of this Kyoten project is a large number of participants from private universities: over 100 projects have been performed every year after 2011.

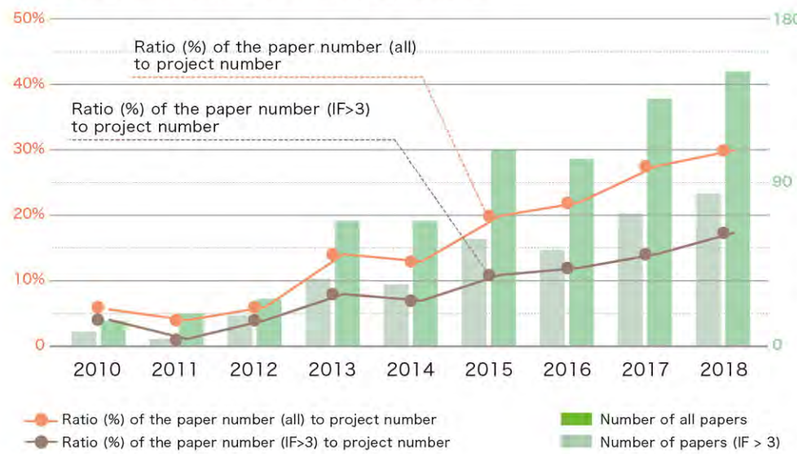
■Regional distribution of Kyotan-user institutions and the individual ratio of host institutions.



The five host institutions located at Hokkaido, Tohoku, Kanto, Kansai, and Kyusyu, can cover widespread Kyoten users not only in the individual areas but also in a whole Japan based on the advantage of the network-type joint research center.

■Changes in the number of papers/books written by Kyoten users who do not belong to the 5 research institutes

Changes in the number of papers/books by Kyoten users



The number of all papers/books by Kyoten users who do not belong to the 5 research institutes has been increased to 151 in 2018. It is 12 times of the number (12) at the beginning of the Kyoten project.
The Kyoten users have published papers in internationally distinct journals: 2 in Nature Physics, 4 in Advanced Materials, 6 in ACS Nano, 1 in Nature Immunology, 15 in JACS, 13 in Nature Communications, during 3 years in the 2nd term. Thus, the Kyoten project contributes to the development of the Kyoten users.