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ICC-IMR Director
**Hiroyuki
NOJIRI**

Top Message

Will 2022 be recorded as the year the coronavirus pandemic began to show signs of convergence and returning to normal? Or will it be remembered as the year of the war in Ukraine? This war is an event that will be engraved in history in the sense that it is severely impacting the academic exchange and academic research worldwide.

Eleven years ago, in March 2011, Tohoku was hit by the Great East Japan Earthquake. In the fall of 2011, ICC-IMR organized the International Week of Materials Science with the aim of showing the recovery from the disaster and the importance of international collaboration, during which International Declaration on Materials Science in Tohoku 2011 "Contributions in the field of Materials Science to build a better society" was announced with the endorsement of many overseas organizations and individuals. The declaration showed that the international academic community can unite together to confront the difficulties caused by disasters. The last part of the declaration is as follows:

"This year, 2011 when the tragedy will be recorded

in history, we would like to declare our deepened commitment to the following three endeavors. We will work tirelessly to address a variety of important challenges facing human beings, including energy related issues, environmental protection, safety, and improvements in information and communication systems, social infrastructure and in the medical field. We will strengthen our research focus by strengthening our global partnerships in the drive to find solutions to common issues, which feature challenges in materials science. We will improve the manner in which information is disclosed to the general public, in the knowledge that intellectual property with regard to findings in the field of materials belongs to the community. To deepen our relationship with the community, we will make efforts that the results are used with social support and understanding."

How such solidarity can be created and maintained in the face of new types of disasters, such as pandemics and wars, is a new challenge for ICC-IMR.

❖ Comments from a Visiting Professor

Research Activities under the COVID-19 pandemic.



Farhad REZAI-ARIA

Professor,
Telecom Institut Mines,
Ecole Mines Albi,
Institut Clément
Ader Laboratory, France

In 2009, I visited the IMR for the first time as part of the Frontiers scientific seminar. I found similarities with Professor A. Chiba's activities on hot work tools. Afterward, we discussed the thermo-mechanical fatigue of tools in Albi. Then, on our side, we focused our research on the disruptive and fast-growing technology of recent years, additive layer manufacturing (ALM). Before the Covid pandemic, we had intensive exchanges on ALM (SAKE seminar) in Albi in 2019. We therefore agreed to work more closely and launched a joint research programme on ALM, starting on titanium alloys with him and Professor K. Yamanaka and his colleagues. Very soon, Professor A. Chiba invited me to join his laboratory, but the Covid prevented me from joining the IMR. With our patience and willingness to collaborate on ALM, I was able to join the IMR on 4 June 2022 for 2 months.

This is a very short period of time for a scientific stay and to get acquainted with the legendary and ancient Japanese civilisation and culture known worldwide for the extraordinary human respect and great hospitality created over the centuries. I was privileged to see many aspects of these ancient cultures and customs that are miraculously preserved and harmonised with a modern, advanced and highly industrialised society. I was very impressed to observe the daily efforts of my colleagues and their students to advance and cultivate the scientific mind and work, to advance peace, industrial issues for the welfare of mankind, values, and civilisation across borders. I found the laboratory and the IMR to have an extraordinary working attitude and a very efficient organisation. I sincerely thank the IMR and its director for their hospitality. It was a real pleasure for me to work in such a stimulating environment. My thanks to K. Hoshino and A. Kawamura for their involvement and help. Although I could not experience the legendary Japanese spring, I enjoyed the famous Tanabata Festival in Sendai and the great Gion Festival. I found new colleagues and friends who deeply impressed me with their friendship, presence, and care in every respect. With deep gratitude to Professor A. Chiba, to all friends, colleagues and students.

❖ Comments from a Visiting Professor



Sanjit KONAR

Professor,
IISER Bhopal, India

It was indeed a great experience to visit the group of Prof. Hitoshi Miyasaka, at IMR for a month in summer 2022. It was really refreshing stay considering the fact we were very much restricted to travel since the beginning of the Covid-19 pandemic. The international character and the world class facilities of IMR were the inspiration for my visit to explore the possibility of opening future collaborations. My research group at the IISER Bhopal is working on the different aspects and molecular magnetism including spin state switching in transition metal complexes. We use light, pressure, and temperature as stimuli for switching the spin states in 3d transition-based materials. Miyasaka group has the expertise in studying gas responsive magnetic property changes in the

framework materials, designed using redox active ligands. They also have the facility and capability of determine the single crystal structure of porous frameworks. Some of the magnetic materials we design are porous, highly stable, and suitable for studying their gas responsive magnetic properties as well as the structural changes. We started an effective collaboration during my visit. The online meetings work well up to certain level, but are less fertile in initiating new collaboration, discussing new ideas, and not ideal in the apprenticeship of younger researchers. I thank Prof. Miyasaka and IMR, Tohoku university for providing me with the opportunity for the visit.



❖ Comment from Young Researcher



Giovani Gonçalves RIBAMAR

PhD. Student,
Phase transformation
Laboratory,
University of São Paulo, Brazil

Furuhara laboratory is full of intelligent, hard worker and organized people that are always willing to help, not just with the research, but also with the Japanese language and culture. Even with the hard and difficult pandemic situation across the world, Furuhara laboratory staff managed to lead and provide safe work conditions and produce great results in my short stay. The excellent equipment, meetings with some of the best researchers in phase transformation field, and the availability of each member of Tadashi Furuhara Laboratory to teach, help and discuss my work increased my knowledge and expanded my views on my own research. In special, professor Dr. Goro Miyamoto and Dr. Youngje Zhang helped me with many explanations and discussions about HEXRD and TEM

experimental results.

During the visit, we studied, by mean of TEM and EBSD experiments, the formation of transition carbides and austenite decomposition. These are part of my thesis about the phenomena occurring during tempering and partitioning of high carbon high silicon bearing steels. Results showed that transition carbides form and remain even after long time tempering (2h) at low temperature, without significant austenite decomposition. Those results complement previously obtained synchrotron X-ray diffraction results, tracking and explaining austenite carbon enrichment phenomenon in high carbon steels, and consequently, its stabilization during the tempering heat treatment.

Outside the laboratory, I could experience the view and lifestyle of the beautiful city of Sendai. The culture is remarkable and will stay in my memory as one of the greatest experiences I have ever had. I wish to express my deep and sincere gratitude to the ICC-IMR and the entire Furuhara Laboratory group for their kind hospitality during my stay in Sendai. Hopefully, we can work together again, with new projects and knowledge exchange.

Summit of Materials Science 2022 and GIMRT User Meeting 2022

Affiliated with KINKEN WAKATE 2022 (March 2-3, 2022)



"Summit of Materials Science 2022 and GIMRT User Meeting 2022" was held in a hybrid style at the Sendai International Center, Sendai, Japan, two years after the previous meeting was held in November 2019. At the conference, 29 invited lectures (including 8 young invited speakers of jointly held KINKEN WAKATE 2022) in 5 fields

of "Quantum Beam", "Functional Material", "Nuclear Materials / 5f", "Computational Materials Science / Informatics", "High Magnetic Field and Magnetism", and "Structural Materials" were presented by researchers from 6 nations in a hybrid style. The participants enjoyed the rare on-site international conference under the pandemic situation. It became a memorable event as a precursor to the revival of international joint research together with the significant relaxation of border measures of Japan from March 2022. Following this success, ICC and GIMRT will continue to welcome onsite international meetings and visitors from abroad.



❖ Greeting from GIMRT Coordinator



Hiroko SHIMIZU
Specially Appointed
Associate Professor,
Senior URA
at ICC-IMR

It is a magnificent pleasure to start working as a research coordinator at ICC-IMR.

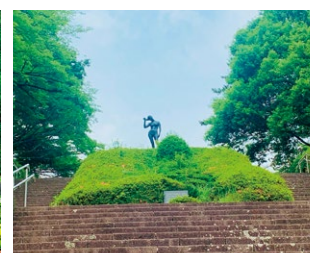
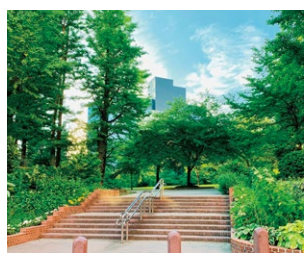
ICC-IMR has been working as a gateway of diverse collaborations between international researchers and IMR members. My aim is to encourage all the stakeholders of ICC-IMR and GIMRT for fruitful collaboration research, through the activities such as matching between researchers or promoting the programs etc. We ICC-IMR office will continue making a constant effort to offer all the ICC-IMR users an excellent



experience at IMR. We always welcome your suggestion or opinion for our better operation.

Here, allow me to introduce myself. I was working at Head office of Enterprise Partnerships of Tohoku University for the last 3 years, making use of my experiences as a manager at Strategy Planning and New Business Development division of a manufacturing company in Kyoto. I hope my various experience will work in good way.

I personally love walking around the downtown of Sendai. Sendai is known as the capital of forest and its walkable size. It is fun to find beautiful works of art, such as sculptures, which are everywhere in downtown or in park. And it is also pleasure to discover small historical spots by accident while walking around. I hope ICC-IMR visitors will enjoy not only experiments at labs, but also staying in Sendai city.



ICC-IMR Activities in FY 2021

Visiting Professor



Timothy Ziman

Institut Laue Langevin, France
December 1, 2021- February 28, 2022
"Magnetic Fluctuations and the
Thermoelectric Effect"
(Host: H. Nojiri, IMR)

International Workshop

ICC-IMR Sponsor Session: 27th International
Conference on Magnet Technology, Fukuoka
Hybrid, 2021.11.15-19

Organizer: S. Awaji, IMR

GIMRT Workshop: The 5th Symposium for the Core
Research Clusters for Materials Science and
Spintronics, and the 4th Symposium on
International Joint Graduate Programs in Materials
Science and Spintronics, Sendai Online,
2021.10.25-28

Organizer: T. Sasaki, IMR

GIMRT Workshop: 16th International Workshop on
Biomaterials in Interface Science, Sendai Online,
2021.9.28

Organizer: H. Kato, IMR

Summit of Materials Science 2022 and GIMRT User
Meeting 2022, Affiliated with KINKEN WAKATE
2022, Sendai Hybrid, 2021.3.2-3

Organizer: T. Furuhashi, IMR



Research Project

Synthesis and Investigation of Biocompatible
and Biodegradable Materials (2019-2021)

PI: J. Eckert, Erich Schmid Institute of Materials Science of the Austrian Academy of
Sciences and H. Kato, IMR



Major Publications

D. Aoki, M. Kimata, Y. J. Sato, G. Knebel, F. Honda,
A. Nakamura, D. Li, Y. Homma, Y. Shimizu, W. Knafo,
D. Braithwaite, M. Valiska, A. Pourret, J. P. Brison,
J. Flouquet

"Field-Induced Superconductivity near the Superconducting Critical Pressure in UTe₂" J. Phys. Soc. Jpn.,
90(2021) 074705

L. Qin, H. L. Zhang, Y. Q. Zhai, H. Nojiri, C. Schroeder,
Y. Z. Zheng

"A Giant Spin Molecule with Ninety-Six Parallel Unpaired Electrons", iScience, 24(2021) 102350

D. Li, A. Nakamura, F. Honda, Y.J. Sato, Y. Homma,
Y. Shimizu, J. Ishizuka, Y. Yanase, G. Knebel, J. Flouquet,
D. Aoki

Magnetic Properties under Pressure in Novel Spin-Triplet Superconductor UTe₂, J. Phys. Soc.
Jpn., 90(2021) 073703

Y. H. Shin, H. Choi, C. Park, D. Park, M. S. Jeong,
H. Nojiri, Z. Yang, Y. Kohama, Y. Kim

"Combination of Optical Transitions of Polarons with Rashba Effect in Methylammonium Lead Trihalide
Perovskites under High Magnetic Fields", Phys. Rev. Lett. 104(2021) 035205

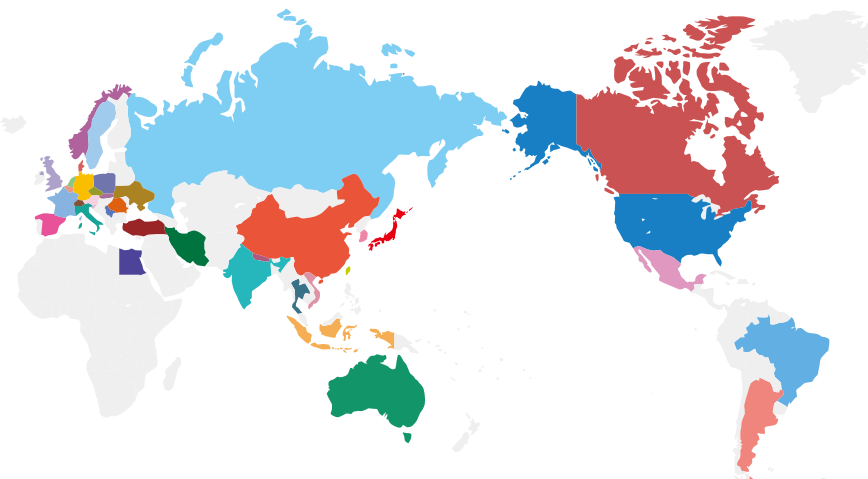
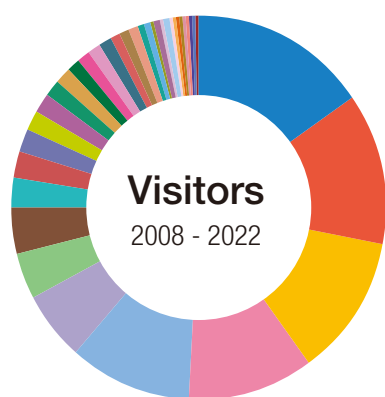
M. Y. Maeda, M. Koyama, H. Nishimura, O. M. Cintho,
E. Akiyama

"Pre-straining Alters Hydrogen-Assisted Cracking Site and Local Hydrogen Diffusivity in a
Nitrogen-Doped Duplex Steel", Scr. Mater., 207(2022) 114272

V. Zadorozhnyy, I. Tomilin, E. Berdonosova, C. Gammer,
M. Zadorozhnyy, I. Savvotin, I. Shchetinin,
M. Zheleznyi, A. Novikov, A. Bazlov, M. Serov,
G. Milovzorov, A. Korol, H. Kato, J. Eckert, S. Kaloshkin,
S. Klyamkin

"Composition Design, Synthesis and Hydrogen Storage Ability of Multi-Principal-Component Alloy
TiVZrNbTa", J. Alloys. Compd, 901(2022) 163638

❖ Visitors supported by ICC-Programs



USA	113	Switzerland	18	Iran	8	Brazil	3	Ukraine	2
China	93	India	17	Spain	8	Czech Republic	3	Vietnam	2
Germany	89	Canada	13	Mexico	7	Slovakia	3	Argentina	1
Korea	79	Poland	13	Thailand	7	Slovenia	3	Egypt	1
France	78	Taiwan	13	Denmark	6	Sweden	3	Nepal	1
UK	42	Norway	10	Hong-Kong	6	Austria	2	Serbia	1
Russia	29	Australia	9	Belgium	4	Indonesia	2	Turkey	1
Netherlands	29	Singapore	9	Italy	4	Rumania	2		

❖ ICC-IMR Programs

ICC-IMR was founded in April 2008 as the center for international collaboration of the Institute for Materials Research (IMR). As one of the centers of excellence in materials science, IMR holds 27 research groups and five research centers. ICC-IMR works as a gateway of diverse collaborations between international researchers and IMR members. ICC-IMR has invited 67 visiting professors and conducted 23 international research projects since the start-up. The applications are open for foreign researchers and the projects are evaluated by a peer-review process involving international reviewers. Currently, ICC-IMR coordinates five different programs:

- 1 International Integrated Project Research**
- 2 Visiting Professors**
- 3 International Workshops**
- 4 Fellowships for Young Researchers and PhD Students**
- 5 Material Transfer Program**

We welcome applicants from around the globe to participate in these international programs.

❖ Featuring Program “Covis”, Co-research visit

GIMRT(Global Institute Materials Research Tohoku) provides a program Covis for team visit. It is to combine guest professorship (Type G) of ICC-IMR and short-term research visit (Type S) of GIMRT. For example, a senior researcher stays longer as guest professor and his/her team members (available also student) join for a few weeks. It can be a great opportunity for a team to do experiments and discussion altogether directly in the same time. Please visit GIMRT website for more information;
<http://gimrt.www.imr.tohoku.ac.jp/en/guide/program.html>



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On the Cover

25 T Cryogen-Free Superconducting Magnet
Photo Credit: High Field Laboratory for Superconducting Materials

