

Summit of Materials Science SMS 2023 and Global Institute for Materials Research Tohoku (GIMRT) User Meeting 2023 , November 20-22, 2023

The 6th SMS was successfully held at IMR auditorium with 200(仮) of participants (including online listeners from a distance place) in 3 days. All speakers gathered in a hall after an interval of four years since the 4th SMS just before the pandemic.

The Conference started with the welcome greetings by Prof. Takahiko Sasaki, Director of IMR, Prof. Hideo Ohno, President of Tohoku University and Mr. Koji Yanagisawa, Director of Scientific Research Institutes Division, MEXT (Ministry of Education, Culture, Sports, Science and Technology), with the host of Prof. Rie Umetsu, Deputy Director of IMR. The auditorium was fulfilled with over a hundred of participants from all over the world.

The total number of speakers were 48 this time. 20 were invited, in which 11 were from overseas, and 28 were contributed or short speakers. Not only senior researchers, but also young and energetic speakers expressed lively their recent cutting-edge research topics.

The conference was divided in 9 fields, “Superconductivity”, “Quantum Materials”, “Exotic Spin Systems”, “Material Design and Informatics”, “Spintronics and Topological Phenomena”, “Functional Materials”, “Nuclear and Irradiation”, “Advanced Metallurgy – 3D Printing and Nanomaterials” and “Hydrogen Materials”. A hot discussion was exchanged at every field, and a discussion sometimes extended for a break.

In the evening of 2nd day, the poster session was held. Researchers and students presented their recent research topics. The discussion was overflowing with excitement and enthusiasm and continued until late at night.

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1_Opening 1_佐々木所長



1_Opening 2_大野総長



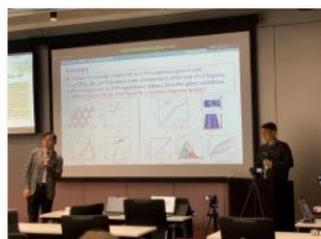
1_Opening 3_MEXT



1_Opening 4_講堂後方



1_Opening 5_講堂後方



1_講演C-1_Kwang-Yong Choi



2_講演F-1_Ratnamala Chatterjee



3_講演G-5_Steven Van Dyck



Summit of Materials Science 2023 and GIMRT User Meeting 2023

Date: November 20-22, 2023

Venue: IMR Auditorium, Tohoku University, Onsite, hybrid available

MAP: https://www.tohoku.ac.jp/en/about/images/map_katahira_2021.pdf

Day 1: Nov. 20

	10:00	10:20	Opening (Chair: Rie Y. Umetsu, IMR)		
			Opening Address	Takahiko Sasaki	Director of Institute for Materials Research, Tohoku University
			Welcome Greeting	Hideo Ohno	President of Tohoku University
			Greeting from MEXT	Koji Yanagisawa	Director of Scientific Research Institutes Division, Research Promotion Bureau, MEXT

Number	Time	Category	Name	Affiliation	Title	Page	
Session A Superconductivity (Chair: Masaki Fujita, IMR)							
A-1	10:20	10:50	Invited	Youichi Yanase	Kyoto University	Diverse mechanism of spin-triplet superconductivity	7
A-2	10:50	11:20	Invited	Clifford W. Hicks	University of Birmingham	Stress-strain measurements of the unconventional superconductor Sr ₂ RuO ₄	8
A-3	11:20	11:40	Contributed	Dai Aoki	IMR	Multiple superconducting phases and Fermi surfaces in spin-triplet superconductor UTe ₂	9
A-4	11:40	12:00	Contributed	Tsutomu Nojima	IMR	Nonreciprocal Superconducting Transport with Ferroelectric Polarization in Ion-Gated SrTiO ₃	10
A-5	12:00	12:20	Contributed	Motoki Osada	IMR	Optimizing synthesis of superconducting infinite-layer nickelate thin films	11
	12:20	13:30	Lunch				
Session B Quantum Materials (Chair: Dai Aoki, IMR)							
B-1	13:30	14:00	Invited	Emilia Morosan	Rice University	Real- and reciprocal-space topology in the square net series Eu(Ga _{1-x} Al _x) ₄	13
B-2	14:00	14:30	Invited	Shintaro Ishiwata	Osaka University	Exploration of metastable perovskite oxides exhibiting exotic magnetism: Combination of high-pressure synthesis and structural prediction	14
B-3	14:30	15:00	Invited	Valentin Taufour	University of California, Davis	Combining Topology and Superconductivity: Can We Discover Unconventional Superconductors Methodically?	15
B-4	15:00	15:20	Contributed	Michi-To Suzuki	IMR	Exploring Functional Antiferromagnetic Materials with Magnetic Structure Screening and First-Principles Calculation	16
B-5	15:20	15:40	Contributed	Wataru Kosaka	IMR	Creation of Gas-Responsive Porous Magnet	17
	15:40	15:55	Break				
Session C Exotic Spin Systems (Chair: Hiroyuki Nojiri, IMR)							
C-1	15:55	16:25	Invited	Kwang-Yong Choi	Sungkyunkwan University	Ground state and spin dynamics of the Kagome antiferromagnet YCu ₃ (OD) _{6+x} Br _{3-x}	19
C-2	16:25	16:55	Invited	Bella Lake	Helmholtz-Zentrum Berlin	Quantum spin liquid behavior and ferroelectricity in PbCuTe ₂ O ₆	20
C-3	16:55	17:25	Invited	Masato Matsuura	CROSS*	Lattice dynamics coupled to the intra dimer degree of freedom in the organic charge transfer salts κ-(BEDT-TTF) ₂ X with X=Cu[N(CN) ₂]Cl and Cu ₂ CN ₃	21
C-4	17:25	17:45	Contributed	Satoshi Iguchi	IMR	Infrared Magneto-optical Kerr Effect in Anisotropic Materials	22
C-5	17:45	18:05	Contributed	Shojiro Kimura	IMR	Magnetic excitation in the S = 1/2 Ising-like antiferromagnetic chain in high magnetic fields	23
	18:05	18:20	Break				
	18:20	19:40	Mixer				

Day 2: Nov. 21

Number	Time		Category	Name	Affiliation	Title	Page	
Session D Material Design and Informatics (Chair: Momoji Kubo, IMR)								
D-1	9:30	10:00	Invited	Talat S. Rahman	University of Central Florida	Excited state charge dynamics and optical response of 2D materials: the role of phonons	25	
D-2	10:00	10:20	Contributed	Yu Kumagai	IMR	Alkali mono-pnictides: a new class of photovoltaic materials by element mutation	26	
D-3	10:20	10:40	Contributed	Goro Miyamoto	IMR	Nano-sized Precipitates for Strengthening of Steels	27	
D-4	10:40	11:00	Contributed	Yusuke Ootani	IMR	Frictional Property of Concentrated Polymer Brush Elucidated by Molecular Dynamics Simulation	28	
D-5	11:00	11:20	Contributed	Akarsh Verma	Osaka University	Stepped (coherent-incoherent) grain boundary in miscible random alloys: Elucidating the mechanical response effect	29	
D-6	11:20	11:30	Short	Shota Ono	IMR	Stable configuration of 2D $\text{Cu}_{16-x}\text{Au}_x$: First-principles calculations, Bayesian optimization, and Lennard-Jones model	30	
	11:30	12:45	Lunch					
	12:45	13:00	Photo Session @Front Lobby of IMR Building 1 (A06)					
Session E Spintronics and Topological Phenomena (Chair: Atsushi Tsukazaki, IMR)								
E-1	13:00	13:30	Invited	Takahiro Moriyama	Nagoya University	Electrical detection of antiferromagnetic dynamics: toward THz spectroscopy for nano-scale antiferromagnets	32	
E-2	13:30	14:00	Invited	Ryusuke Matsunaga	The University of Tokyo	Dynamical aspect of Hall conductivity in topological antiferromagnet Mn_3Sn studied by terahertz spectroscopy	33	
E-3	14:00	14:20	Contributed	Takeshi Seki	IMR	Magneto-thermoelectric conversion in metallic superlattices	34	
E-4	14:20	14:40	Contributed	Motoi Kimata	IMR	Enhancement of anomalous Hall effect at the vicinity of field-reentrant superconducting phase in the spin-triplet superconductor UTe_2	35	
E-5	14:40	15:00	Contributed	Hidetoshi Masuda	IMR	Helimagnet-based Spintronics: Control and Detection of Magnetic Chirality	36	
E-6	15:00	15:20	Contributed	Michael Zhitomirsky	CEA* & ICC-IMR*	Magnetic frustration in octahedral networks: from antiperovskites to fcc antiferromagnets	37	
E-7	15:20	15:30	Short	Yusuke Kousaka	Osaka Metropolitan University	Chiral Helimagnetism and Chiral Soliton Lattice in a Transition-Metal Dichalcogenide MnTa_3S_6	38	
	15:30	15:50	Break					
Session F Functional Materials (Chair: Rie Y. Umetsu, IMR)								
F-1	15:50	16:20	Invited	Ratnamala Chatterjee	IIT Delhi*	Evidence for $2k_F$ and $4k_F$ incommensurate charge density wave in Ta_2NiSe_7 single crystal through electrical and thermal transport	40	
F-2	16:20	16:50	Invited	Hidenori Fujiwara	Osaka University	Resonant inelastic soft x-ray scattering on spintronic materials	41	
F-3	16:50	17:20	Invited	Carmine Senatore	University of Geneva	Current Trends and Future Prospects for the High-Field Applications of Nb_3Sn and REBCO Superconductors	42	
F-4	17:20	17:40	Contributed	Tatsunori Okada	IMR	Critical current characterization using high-field cryogen-free superconducting magnets at HFLSM	43	
F-5	17:40	18:00	Contributed	Hanae Kijima-Aoki	Tohoku University	Multifunctionality via spin-dependent tunneling in magneto-dielectric nanocomposite thin films	44	
F-6	18:00	18:20	Contributed	Kazuki Ohishi	CROSS*	Ion Dynamics in Na-Ion Battery Materials Studied by SANS and μSR	45	
	18:20	19:40	Poster Session @Front Lobby and Lounge of IMR Building 2 (A07)					

Day 3: Nov. 22

Number	Time	Category	Name	Affiliation	Title	Page	
Session G Nuclear and Irradiation (Chair: Yasuyoshi Nagai, IMR)							
G-1	9:30	10:00	Invited	Somei Ohnuki	University of Science and Technology Beijing	Phase separation and damage structure in Fe-Cr alloys under neutron-irradiation	47
G-2	10:00	10:30	Invited	Takuji Oda	Seoul National University	Atomistic simulation of hydrogen isotope diffusion in metals using machine-learning interatomic potentials	48
G-3	10:30	10:50	Contributed	Sosuke Kondo	IMR	Process Informatics for CVD Coating on SiC/SiC for Nuclear Applications	49
G-4	10:50	11:10	Contributed	Koji Inoue	IMR	Evolution of Ni-Mn-Si clusters in a low copper reactor pressure vessel steel analyzed by atom probe tomography	50
G-5	11:10	11:30	Contributed	Steven Van Dyck	SCK-CEN*	Study of neutron irradiation effects in materials using the BR2 material test reactor	51
	11:30	11:40	Break				
Session H Advanced Metallurgy-3D Printing and Nanomaterials (Chair: Sosuke Kondo)							
H-1	11:40	12:10	Invited	Christopher Hutchinson	Monash University	Nucleation in solid state phase transformations requiring a change in chemistry	53
H-2	12:10	12:40	Invited	Mari Onodera	Panasonic Industry Co., Ltd.	Development of Multi-Layered Cosmetic Sheet Applied by Printed Electronics Technology	54
	12:40	13:40	Lunch				
H-3	13:40	14:10	Invited	Naoki Tarutani	Hiroshima University	Thermal conversion of metal hydroxide salt nanoparticles towards nanoparticulate and porous structured alloy materials	55
H-4	14:10	14:30	Contributed	Kenta Aoyagi	IMR	In-process monitoring for electron beam powder bed fusion by using electron beam imaging technology	56
H-5	14:30	14:40	Short	Zhenxing Zhou	Tohoku University	Fabrication of refractory alloy by freeze-dry pulsated orifice ejection method and laser powder bed fusion	57
	14:40	15:00	Break				
Session I Hydrogen Materials (Chair: Eiji Akiyama, IMR)							
I-1	15:00	15:30	Invited	Kohta Asano	AIST*	Nano-structural configuration of destabilized Mg hydride for hydrogen storage materials	59
I-2	15:30	15:50	Contributed	Shigeyuki Takagi	IMR	Creation and functionalization of hydride complexes with high hydrogen coordination	60
I-3	15:50	16:10	Contributed	Hiroshi Kakinuma	IMR	Filming microstructure-dependent hydrogen diffusion in polycrystalline metals using a hydrogen video imaging system	61
I-4	16:10	16:20	Short	Ruirui Song	IMR	Ultrafine Nanoporous Intermetallic Catalysts by High-Temperature Liquid Metal Dealloying for Electrochemical Hydrogen Production	62
	16:20	16:50	Closing				

Poster Session

Number	Name	Affiliation	Title	Page
PS1	Xiaoyang Zheng	NIMS*	Deep Learning in Mechanical Metamaterials	64
PS2	Shigeru Suzuki	Tohoku University	Vibration Energy Harvesting using Electromagnetic Induction Assisted by Inverse Magnetostriction of Iron-based Alloys	65
PS3	Kohei Fujiwara	IMR	Reducing the conducting channel thickness of ferromagnetic $\text{Co}_3\text{Sn}_2\text{S}_2$ films by bias-induced dealloying	66
PS4	Rayko Simura	Tohoku University	In-house single crystal X-ray diffraction measurement system with anomalous X-ray scattering for site-selective structure analysis	67
PS5	Dayal Chandra Roy	Iwate University	Investigation and characterization of rare-earth free double-perovskite oxides $\text{Ba}_2\text{Bi}^{3+}(\text{Bi}_{1-2x}^{5+}\text{Sb}_{2x}^{5+})\text{O}_6$: A comparative study of photocatalytic performance	68
PS6	Takeshi Hagiwara	Kanagawa University	Syntheses and some properties of AlLB_{14} ($L = \text{Li}, \text{Na}$) crystals by Al self-flux	69
PS7	Teruhito Nakashita	The University of Tokyo	Search for fundamental symmetry by trapping francium atoms	70
PS8	Kenji Ishii	QST*	Post-growth annealing effects on charge and spin excitations in $\text{Nd}_{2-x}\text{Ce}_x\text{CuO}_4$ studied by resonant inelastic x-ray scattering	71
PS9	Vu Thi Ngoc Huyen	IMR	Piezomagnetic effect in Mn_3AN and Mn_3X from symmetry analysis and first-principles calculations	72
PS10	Kyosuke Sakurai	IMR	Metal-insulator transition behavior of RECoO_3 for high field superconducting magnets	73
PS11	Shogo Yoshida	Kogakuin University	Growth of Cu_3N Films by Mist CVD with Ethylenediamine	74
PS12	Kaoru Kouzu	Kokushikan University	Syntheses and some properties of $R(\text{Al},\text{W})\text{B}_4$ ($R = \text{rear earth}$) compounds	75
PS13	Kushwaha Varun Kumar	IMR	Selective magnetization switching conditions for hard magnetic FePt with spin-wave dynamics	76
PS14	Keita Ito	IMR	Correlation between magnetostriction and magnetic damping in $\text{Fe}_{4-x}\text{Mn}_x\text{N}$ and $\text{Fe}_{4-y}\text{Co}_y\text{N}$ films	77
PS15	Yoshihiko Umemoto	IMR	Local Structure Analysis of Iron-Manganese-Based Elinvar Alloys via Neutron Total Scattering	78
PS16	Ta-Te Chen	Nagoya University	Estimation of plastic properties of alloys using instrumented indentation test	79

AIST: National Institute of Advanced Industrial Science and Technology
 CEA: Commissariat à l'énergie atomique et aux énergies alternatives
 CROSS: Comprehensive Research Organization for Science and Society
 ICC-IMR: International Collaboration Center, Institute for Materials Research, Tohoku University
 IIT Delhi: Indian Institute of Technology Delhi
 NIMS: National Institute for Materials Science
 QST: National Institutes for Quantum Science and Technology
 SCK-CEN: Belgian Nuclear Research Centre