International Workshop on Joint-Use at IRCNMS

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International Research Center of Nuclear Materials Science (IRCNMS) hosted "International Workshop on Joint-Use at IRCNMS," co-organized with the other workshops "Workshop of Laboratory of Alpha-Ray Emitters" and "Workshop on Radiation Effects in Materials: towards Irradiation 3.0," in on-line style due to COVID-19 pandemic from September 30th to October 3rd in 2020. The workshop had fruitful discussions on (1) the results of joint use, (2) future plans and research proposals for joint use, and (3) the irradiation plan etc.

1. Introduction

IRCNMS hosts "Oarai workshop" every year as a meeting to report the results of joint use research and to present future research proposals on various research field including future nuclear materials development, safety issues of light water reactors, Actinide sciences, etc. The future neutron irradiations using foreign research reactors are also discussed.

In 2020, the workshop was held as an international workshop: "International Workshop on Joint-Use at ICRNMS." The reasons why it should be international in 2020 are as follows; (1) At present, all neutron irradiation is carried out using Belgium Reactor 2 (BR2), the research reactor owned by SCK/CEN, based on an academic agreement with SCK/CEN, called "MICADO" project since 2005. It is a good opportunity to summarize the results of research on BR2 irradiation and discuss future irradiation plans since the academic agreement is renewed in 2020. (2) IRCNMS has accepted 23 overseas research proposals in the first year of GIMRT. It is very meaningful to share the results with the research community and promote international joint research among users. (3) IRCNMS had the 50 years anniversary since founded in 2019. We had the ceremony but it was domestic because the president of the local government and MEXT etc. are the guests.

It should be mentioned that the workshop was co-organized with the other two workshops: "Workshop of Laboratory of Alpha-Ray Emitters" and "Workshop on Radiation Effects in Materials: towards Irradiation 3.0." These workshops is reported elsewhere.

2. Content of the Workshop

Due to the COVID-19 pandemic, the workshop was held as completely on-line conference using ZOOM system from September 30th to October 3rd in 2020. We had 4 invited speakers from USA and Europe, 36 oral and 30 poster presentations for irradiated and related material studies, 17 oral and 7 poster presentations for Actinide science studies, and 10 oral presentations from users of laboratory of alpha-ray emitters. Totally, 137 attendees join the on-line workshop.

In addition to these conventional presentations, we had discussion of irradiation plan which will be performed in BR2. Attendees from SCK/CEN introduced BR2 status, operation plan, possible irradiation conditions and irradiation schedule. Taking users irradiation request into account, the irradiation capsules (named as LIBERTY, HTHF, and BAMI) and conditions (fluences, fluxes and temperatures) are fixed.

The program is shown below.

3. Results and Conclusions

We discussed (1) the results of joint use, (2) future plans and research proposals for joint use, and (3) the irradiation plan, and discuss international joint use at IRCNMS. Through the discussion, the joint users in Japan and overseas shared the research and the domestic researches will be internationalized. In addition, SCK/CEN directly understand the Japanese irradiation needs, and understand the future direction of the irradiation researches. These could contribute further activation of international joint

research and joint use at IRCNMS.

Acknowledgement

We thank the international committee members (6 from overseas and 2 domestic) outside IMR, in addition to all the participants. We also thank IRCNMS members and GIMRT office staffs for great support on the remote conference organization.

30th Sep.(JST)		Institute for Materials Research, Tohoku University, Sendai, Japan, ONLINE		
9:05 - 9:10		Tohoku Univ.	Tadashi Furuhara	Opening remarks
9:10 - 9:15		Tohoku Univ.	Yasuyoshi Nagai	Introduction of Oarai Workshop
9:15 - 9:20		Tohoku Univ.	Ryuta Kasada	Introduction of REMAS2020, Irradiation 3.0
9:20 - 9:30		Tohoku Univ.	Yusei Shimizu	Announcements from the web conference office
9:30 - 10:10	Chair: S. Kondo	ORNL	Takaaki Koyanagi	***Plenary Talk:*** Additive manufacturing of silicon carbide for nuclear applications
10:10 - 10:20				Coffee break
10:20 - 10:40	Chair: R. Kasada	Tohoku Univ.	Akira Hasegawa	Current research status of neutron irradiation effects on advanced Tungsten alloys
10:40 - 11:00		Toyama Univ.	Yuji Hatano	Deuterium Retention in Irradiated W and W-Re, Cr, Mo and Ta Binary Alloys
11:00 - 11:20		NIFS	Takuya Nagasaka	Re-optimaization of composition for vanadium alloys for fusion reactors based on low-activation characteristics and irradiation properties.
11:20 - 11:40		Tohoku Univ.	Shuhei Nogami	Neutron Irradiation Tolerance of Potassium-Doped Tungsten-Rhenium Alloys
11:40 - 12:00		JAEA	Eiichi Wakai	Recent research on the effects of displacement damage and helium atoms on creep properties of austenitic stainless steel using research and test reactors and accelerators for innovated reactor development
12:00 - 13:00				Lunch
13:00 - 13:20	Chair: T. Toyama	Tohoku Univ.	Ryuta Kasada	Ultra-Small Testing Technologies for Irradiated Materials: A key of "Micro-Hot-Laboratory"
13:20 - 13:40		Hokaido Univ.	Naoyuki Hashimoto	Development and study of radiation damage in high entropy alloys for nuclear application
13:40 - 14:00		Fukui Univ.	Kenichi Fukumoto	Irradiation behavior of vanadium alloy with/without temperature transient effect during neutron irradiation using MARICO-II capsule in Joyo
14:00 - 14:20		Chongqing Univ.	Akihiko Kimura	Radiation effects on the EB-weld bonding of ODS ferritic steel —Comparison between neutron and ion irradiation--
14:20 - 14:30				Coffee break
14:30 - 14:50	Chair: K. Yoshida	USTB	Xiaoou Yi	Effect of radiation damage on thermal diffusivity and gas emission property in neutron irradiated tungsten
14:50 - 15:10		Guilin Univ. Electr. Tech.	Miao Lei	Observation of structural imperfectness in thermoelectric materials by advanced analytical microscopy
15:10 - 15:30		York. Univ.	Atsufumi Hirohata	Cross-sectional TEM imaging of NiCrMnSi and CoFe:N alloys for magnetic tunnel junctions
15:30 - 15:50		Russian Academy of Science	Vladimir Alimov	Deuterium release from deuterium plasma-exposed neutron-irradiated and non-neutron-irradiated tungsten samples during annealing
15:50 - 16:00				Coffee break
16:00 - 18:00	Chair: T.Toyama	SCK/CEN	Steven Van Dyck, Patrice Jacquet Bert Rossaert Dmitry Terentyev Inge Uytdenhouwen	15 years of MICADO collaboration Status of the BR2 reactor Material irradiations – devices used for MICADO Material irradiations – other existing devices and devices in development Fuel irradiations – existing devices and devices in development Laboratories and PIE Fusion related research RPV related research
18:00 - 19:30				Poster

1st Oct.(JST)		Institute for Materials Research, Tohoku University, Sendai, Japan, ONLINE		
9:00 - 9:35	Chair: R. Kasada	KLA Corporation	W.C. Oliver	***Plenary Talk:*** The use of nanindentation as a strength microprobe to investigate properties alterations associated with radiation damage
9:35 - 10:10	Chair: Y. Nagai	UCSB	Odette G Robert	***Plenary Talk:*** Measuring, Modeling and Managing RPV Embrittlement: Low Flux-High Fluence Shift Predictions
10:10 - 10:15				Coffee break
10:15 - 10:35	Chair: K. Yoshida	USTB	Somei Ohnuki	Anomalous phase separation in Fe-Cr alloys under three types of irradiation
10:35 - 10:55		Hokkaido Univ.	Naoko Oono	Radiation-induced microstructure and mechanical property modification in FeCrAl-ODS Alloy after Neutron Irradiation at an Operating Temperature
10:55 - 11:15		Tohoku Univ.	Takeshi Toyama	Microstructural analysis of RPV steels in joint research between SCK.CEN and IMR
11:15 - 11:35		Kyushu Univ.	Hideo Watanabe	Study of radiation induced microstructure of Fe-(Mn,Ni) model alloys under neutron irradiaton
11:35 - 11:55		Tohoku Univ.	Sosuke Kondo	Role of SiC dangling bonds in the irradiation assisted corrosion
11:55 - 12:15		NIFS	Arata Nishimura	Neutron Irradiation Effect on Critical Current of Nb_3Sn Wire for ITER TF Coil.
12:15 - 13:15				Lunch
13:15 - 13:35	Chair: K. Inoue	Muroran Inst. Tech.	Hirotatsu Kishimoto	Investigation of environmental durability of NITE-SiC/SiC Composites under neutron irradiation environments
13:35 - 13:55		JAEA	Tomoaki Suzudo	Cleavage and dislocation emissions in BCC iron: A molecular dynamics study
13:55 - 14:15		Tokyo Univ.	Sho Kano	Radiation-Induced Amorphization of $M_{23}C_6$ in Reduced Activation Ferritic/Martensitic Steels: An atomic-Scale Observation
14:15 - 14:35		Kyoto Univ.	Toshimasa Yoshiie	The formation of iron nitride, α"-$Fe_{16}N_2$, around <100> interstitial type dislocation loops in neutron-irradiated iron
14:35 - 14:55		JAEA	Takashi Tannno	Development of miniature fracture toughness test technique for thin martensitic steel wrapper tube of fast reactor
14:55 - 15:05				Coffee break
15:05 - 15:25	Chair: Y. Shimada	KEK	Tatsushi Nakamoto	Development of radiation resistant materials for superconducting magnet system for high intensity proton beam line
15:25 - 15:45		NIMS	Yasuo Shimizu	Atom probe analysis of dopant distributionin commercial solar cells
15:45 - 16:05		INSS	Katsuhiko Fujii	Effects of cold work on solute atom clustering during thermal aging in RPV model alloy
16:05 - 16:25		Tohoku Univ.	Kenta Yoshida	In-situ weak-beam STEM for quantitative dislocation analysis in nuclear materials during post-irradiation annealing
16:25 - 16:35				Coffee break
16:35 - 17:30				Discussion for future irradiation plan using BR2
17:30 - 19:00				Poster

2nd Oct.(JST)		Institute for Materials Research, Tohoku University, Sendai, Japan, ONLINE		
9:00 - 9:10		Tohoku Univ.	Dai Aoki	Introduction of Oarai Workshop on Actinoid Science
9:10 - 9:40	Chair: D. Aoki	UC-Davis	Valentin Taufour	New compounds with novel type of ferromagnetic quantum criticality
9:40 - 10:00		Kobe Univ.	Hitoshi Sugawara	Study of Electronic States in Multipolar Conductors and Related Materials
10:00 - 10:20		Kobe Univ.	Hisashi Kotegawa	Single crystal growth and NMR studies of Uranium based superconductors and related materials
10:20 - 10:40		Kinki Univ.	Masanobu Nogami	Development of novel cyclic monoamide extractants for selective separation of uranium(VI)
10:40 - 10:50				Coffee break
10:50 - 11:10	Chair: F. Honda	Hokkaido Univ.	Hiroshi Amitsuka	Search for Uranium Compounds with Odd-Parity Cluster Multipole Ordering
11:10 - 11:30		RIKEN, CEMS	Yoshichika Onuki	Single Crystal Growth and Unique Electronic States of Cubic Chiral EuPtSi and Related Compounds
11:30 - 11:50		Ibaraki Univ.	Makoto Yokoyama	Relationship between quantum critical fluctuations and anomalous superconductivity in $CeCoIn_5$ and its ionic substitutions
11:50 - 12:10		Kyoto Univ.	Shunsaku Kitagawa	New avenue of outreach activities - how to become a YouTuber -

12:10 - 13:30					Lunch
13:30 - 13:50	Chair: H. Amitsuka	Tohoku Univ.	Dai Aoki	Field-reentrant and multiple superconductivity in UTe_2	
13:50 - 14:10		Osaka.Univ.	Koichi Izawa	Nodal structure of UTe_2 studied by thermal conductivity	
14:10 - 14:30		JAEA	Yo Tokunaga	NMR Study of Magnetic Fluctuations in Heavy Fermion Superconductor UTe_2	
14:30 - 14:50		Kyoto Univ.	Kenji Ishida	NMR Study on the Superconducting State of UTe_2	
14:50 - 15:00					Coffee break
15:00 - 15:30	Chair: F. Honda	Tata Inst. of Fundamental Research	Arumugam Thamizhavel	Extremely large magnetoresistance and Fermi surface properties of $MoSi_2$ and WSi_2 Single crystals	
15:30 - 16:00		Charles Univ.	Ladislav Havela	Tuning of the 5f magnetism in U intermetallics by polar bonds	
16:00 - 16:15					Coffee break
16:15 - 16:45	Chair: Y. Shimizu	CEA	Georg Knebel	Field Enhancement of Superconductivity in UTe_2	
16:45 - 17:15		CEA	Daniel Braithwaite	The nearly ferromagnetic superconductor UTe_2 under pressure	
17:15 - 17:45		CNRS	Ilya Sheikin	The mystery of $CeRhIn_5$ in high magnetic fields	

3rd Oct.(JST)		Institute for Materials Research, Tohoku University, Sendai, Japan, ONLINE		
8:55 - 9:00		Tohoku Univ.	Kenji Shirasaki	Introduction of Workshop of Laboratory of Alpha-Ray Emitters
9:00 - 9:20	Chair: K. Tsukada	Nat. Cancer Centr.	Mitsuyoshi Yoshimoto	Targeted alpha therapy using 225Ac-RGD peptide for pancreatic cancer
9:20 - 9:40		Osaka Univ.	Yoshifumi Shirakami	Development of targeted alpha therapy using Actinium-225
9:40 - 10:00		JAEA	Toru Kitagaki	Analysis of the alteration behavior of zircon mineral in the three different pH solutions
10:00 - 10:10				Coffee break
10:10 - 10:30	Chair : T. Yamamura	Shimane Univ.	Gaku Motoyama	Study of Magnetoelectric Effect on Antiferromagnetic Compounds of Ce_3TiSb_5 and Ce_3TiBi_5 with Ce Zig-Zag Chain
10:30 - 10:50		Okayama Univ.	Koji Yoshimura	Novel Production Method of the Lowest-Energy Nuclear State - Thorium-229 Isomer
10:50 - 11:10		RIKEN	Atsushi Yamaguchi	Energy of the Th-+G10:I10229 nuclear clock isomer determined by absolute γ-ray energy difference
11:10 - 11:20				Coffee break
11:20 - 11:40	Chair: K. Shirasaki	Kyushu Univ.	Kazuya Idemitsu	Diffusion behavior of Pu and Np in bentonite
11:40 - 12:00		Nagaoka Univ. of Tech.	Tatsuya Suzuki	Fundamental Study for Precise Analysis of Actinides in Hardly Soluble Substances Containing Uranium Oxides
12:00 - 12:20		Kyoto Univ.	Chihiro Tabata	Crystal structure and magnetism of uranium phthalocyanine complex
12:20 - 12:40		Tokyo Inst. Tech.	Masahiko Nakase	Relation between ion recognition of f-block elements and polymeric characteristics by extractant-immobilized hydrogel adsorbents
12:40 - 12:50		Tohoku Univ.	Yasuyoshi Nagai	Closing Remarks