The 5th International Symposium on Hybrid Materials and Processing
(HyMaP 2021)

Web site:
https://etigo.nagaokaut.ac.jp/hymap2021.html

Conference Date:
Aug. 4-6, 2021

Venue:
Online (a presentation room in Nagaoka University of Technology is also available)

Organizers:
Extreme Energy-Density Research Institutute, Nagaoka University of Technology
Education Center for Global High-Tech Materials and Parts (BK21 FOUR)

Co-organizers:
National Core Research Center for Hybrid Materials Solution, Pusan National University
Global Frontier Center for Hybrid Interface Materials, Pusan National University

Committees:
[General Chairs]
Hisayuki Suematsu (Nagaoka Univ. Tech., Japan)
Koichi Niihara (Past President of International Ceramic Federation)
Takashi Goto (President of International Ceramic Federation)
Kwang Ho Kim (Pusan National Univ., Korea)

[Secretariats]
Tadachika Nakayama (Nagaoka Univ. Tech., Japan)
Kayoko Watanabe (Nagaoka Univ. Tech., Japan)

[Members]
Yoshikazu Suzuki (Tsukuba Univ., Japan)
Satoshi Seino (Osaka Univ., Japan)
Nguyen Thanh Son (National Inst. Tech. Kushiro College, Japan)
Yamato Hayashi (Tohoku Univ., Japan)
Thi Mai Dung Do (Nagaoka Univ. Tech., Japan)
Hyongwon Son (Nagaoka Univ. Tech., Japan)
Se-Hun Kwon (Pusan National Univ., Korea)
Oi Lun (Helena) Li (Pusan National Univ., Korea)

[Session organizers]
Maarit Karppinen (Aalto Univ., Finland)
Lingfeng He (Idaho National Laboratory, U.S.A.)
Gordon Thorogood (ANSTO, Australia)
Yoshio Matsui (NIMS, Japan)
Tohru Sekino (Osaka Univ., Japan)
Minoru Osada (Nagoya Univ., Japan)
Akira Fujimoto (Nara Gakuen, Japan)
Toshio Nishimura (NIMS, Japan)
Toshihiro Ishikawa (Tokyo University of Science, Yamaguchi (Sanyo-Onoda City University), Japan)
Nguyen Thanh Son (National Inst. Tech. Kushiro College, Japan)
Hideaki Araki (National Inst. Tech. Nagaoka College, Japan)
Makoto Nanko (Nagaoka Univ. Tech., Japan)
Toru Sasaki (Nagaoka Univ. Tech., Japan)

Presentations:
All presentations are given online through one of the Zoom sessions.

The following room is also available for the presentation.
Room #103, Nucl. Bldg., Nagaoka University of Technology
PC is available for the presentation.

Networking sessions:
The following Zoom sessions can be freely used by presenters for discussion. No reservations are required.

Room C (networking 1)
Room D (networking 2)
Notice to presenters:

Video taping and audio recording of the presentations are not allowed.
## Technical Program:

### Aug. 4, 2021

### Opening

**Room A**

8:50  Niihara, Nagaoka

### Plenary session, 1, Chair: T. Nakayama, Nagaoka Univ. Tech.

**Room A**

9:00  "RADIATION DAMAGE IN CERAMIC NUCLEAR FUELS"

Lingfeng He*a

*Idaho National Laboratory, (Plenary)

9:30  "EFFECT OF Al CONTAINED IN POLYMER DERIVED SiC CRYSTALS ON CREATING STABLE CRYSTAL GRAIN BOUNDARIES"

Toshihiro Ishikawa, Katsuya Niidome

Tokyo University of Science, Yamaguchi, (Sanyo-Onoda City University), (Plenary)

10:00 "2D Nanosheet Architectonics for Hybrid Manufacturing"

Minoru Osada*a

*a Institute of Materials and Systems for Sustainability (IMaSS), Nagoya University, (Plenary)

10:30  Break

### Processing, Chair: H. Son, Nagaoka Univ. Tech.

**Room A**

10:40  "High temperature characteristics of SiC/SiC composites"

Kazuya Shimoda

National Institute for Materials Science, (Invited)

11:00  "OPTIMIZATION OF RARE-EARTH DOPED UPCONVERSION PHOSPHORS BY SOLUTION PARALLEL SYNTHESIS USING CITRIC ACID"

Koji Tomita*a, Sayaka Tamura*b, and Masato Kakihana*c

*aTokai University,  bMeiji University,  cOsaka University (Invited)

11:20  "Thermodynamic and Kinetic Origin of Ferroelectricity in Fluorite-Structured Oxides"

Min Hyuk Park

School of Materials Science and Engineering, Pusan National University, (Invited)
11:40 "Design of Alumina(Core)-hexagonal BN(shell)-based Polymer nanocomposites with Enhanced Thermal Conductivity”
Minseob Lim,* Hyeongjin Moon, Jaehyun Park, Hong-Baek Cho,†, Yong-Ho Cho*
Department of Materials Science and Chemical Engineering, Hanyang University, (Invited)
12:00 Break

Plenary session, 2, Chair: Suematsu, Nagaoka
Room A

13:00 "Materials Characterization by Advanced TEM/STEM”
Yoshio Matsuia*
National Institute for Materials Science, (Plenary)
13:30 "NEUTRON DIFFRACTION AND HOW IT CAN BE USED TO SOLVE DIFFICULT PROBLEMS”
Gordon J Thorogood a,b*
a Australian Nuclear Science and Technology Organisation
b Department of Nuclear System Safety Engineering, Nagaoka University of Technology, (Plenary)
14:00 "NOVEL FUNCTIONAL INORGANIC-ORGANIC MATERIALS THROUGH ALD/MLD”
Maarit Karppinen*
Aalto University, (Plenary)
14:30 Break

Applications 1, Chair: Lee, Hanyang
Room A

14:40 "Synthesis of MoO₃ dendrite structure”
Yang Ying 1*, Ngo Minh Chu¹, Thi Mai Dung Do¹ and Hisayuki Suematsu*¹
¹Extreme Energy-Density Research Institute, Nagaoka University of Technology
15:00 "SEARCH FOR SYNTHESIS AND DEVELOPMENT OF CuSr₂Ca₃₋₁CuₓO₇ SUPERCONECTORS”
Zhenlei Feng , Hisayuki Suematsu ,Thi Mai Dung Do ,Tadachika Nakyama ,Ly Quoc Hong Phuc , Noa Yoshida
Nagaoka University of Technology

15:20 "Effect of Dehydration of Metakaolin and Potassium Based Geopolymers on Pore Size Distribution"
Minami Yamazaki, Yaru Yang, Thi Mai Dung Do, Tadachika Nakayama and Hisayuki Suematsu
Extreme Energy-Density Research Institute, Nagaoka University of Technology

15:40 "Atomic Layer Deposition of PtRu Bimetallic Alloy Thin Films for the Application of Work Function Metals"
Hyun Jae Wooa, and Se-Hun Kwon*
aSchool of Materials Science and Engineering, Pusan National University

16:00 "Simple Design of Nanostructured Chemi-capacitive Methanol and Acetone Gas sensor with Switchable Selectivity by Frequency"
Ji Young Parka, Min Seob Limb, Si-Woo Parkc, Gwang-Myeong Goa, Byungkwon Janga, Seil Kimb and Yong-Ho Choaa*
Materials Science and Chemical Engineering, Hanyang University
bElectrochemistry Department, Korea Institute of Materials Science

16:20 "Effect of deposition temperature on the polarization switching kinetics of ferroelectric hafnium zirconate thin films"
Dong Hyun Lee*, Geun Taek Yu, Se Hyun Kim, Ju Yong Park, and Min Hyuk Park
School of Materials Science and Engineering, Pusan National University

16:40 "In situ Mg driven and water donating hydrogenation process to selective conversion of glucose to sorbitol"
Lusha Qin,a Oi Lun Lia*
a School of Material Science and Engineering, Pusan National University

17:00 "Design of Porous CeO2-Ceramic Nanocatalyst for CO2-free H2 Evolution: through Thermodynamic Simulation"
Jimin Lee*, Minseob Lim and Yong-Ho Choa
Hanyang University, Ansan, Korea

17:20 “PREPARATION OF PLATE-LIKE BARIUM TITANATE PARTICLES FOR PYROELECTRIC POWER GENERATION”
Hideki Hashimotob, Shengfang Shic, Chisato Kakod, Hirohisa Tanakae, Yoonho Kimg, Masaaki Baba, Masatoshi Takeda, Tadachika Nakayama, and Tohru Sekinob
Faculty of Engineering, Sanjo City University
dSANKEN (The Institute of Scientific and Industrial Research), Osaka University
eSchool of Engineering, Kwansei Gakuin University
Root Tech. 1, Chair: Nakayama, Nagaoka

Room B

14:40  “The Application of gravity driven ceramic membrane technology for the rainwater reclamation system”
Toru Miwa*, Takahiro Watari*, Kengo Sakai*, Shoichi Tokunaga*, Nur Adlin*, Masashi Hatamoto*, Takashi Yamaguchi*
Nagaoka University of Technology

15:00  "Experimental study on dynamic structural responses of MRE sandwich beam by the magnetorheological effect”
Narongdet Sulatchaneenopdon*, Takeru Katagiri*, Hounge-Won Son*, Jon Garcia Baruetabena, Maria Jesus Elejabarrieta*, Tadachika Nakayama*, Hisayuki Suematsu*, Kochi Niihara*
Nagaoka University of Technology

15:20  "Molecular Dynamics Simulation on Nanoscale Wear Behavior at the Interface between Hydroxyapatite – Titanium Dioxide Based on Reactive Force Field”
Dinh Dat PHAM*, Yuichi OTSUKA* and Yukio MIYASHITA*
Nagaoka University of Technology

15:40  "FINITE ELEMENT ANALYSES FOR THE EFFECTS OF INTERFACIAL DELAMINATION ON DISPLACEMENT BEHAVIOR OF ACETABULAR CUP SUBJECTED TO CYCLIC LOADING”
Nguyen Quang MINH*, Yuichi OTSUKA*, Duong Thanh TUNG*, Yukio MIYASHITA*
Nagaoka University of Technology

16:00  "DEMONSTRATION OF MOTION CONTROL OF METAL MICROPARTICLES IN DIELECTRIC FLUID BY UNIFORM ELECTRIC FIELD”
Zhiming Shen*, Narongdet Sulatchaneenopdon*, Hyoung-Won SON*, Hisayuki Suematsu*, Tadachika Nakayama*
Extreme Energy-Density Research Institute, Nagaoka University of Technology

16:20  "MULTI-SCALE STRUCTURAL OPTIMIZATION CONSIDERING INTERACTIONS AMONG STRESS CONCENTRATION IN POROUS COMPOSITE USING LAGRANGE MULTIPLIER METHOD”
Ryota TOYODA*, Yuichi OTSUKA*, and Yukio MIYASHITA*

*Research Institute of Car and Life-style, Daihatsu Motor Co., Ltd.
Graduate School of Engineering, Nagaoka University of Technology
“Characterization of pressure-conductive elastomer sensors for the development of robots with tactile”

Takeru Katagiri*, Atuhiro Toeda, Kousuke Matuoka, Koutaro Kawahara, Tadachika Nakayama, Takanori Miyoshi

*Nagaoka University of Technology

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Aug. 5, 2021

Plenary 3, Chair: O. L. Li, Pusan National Univ.
Room A

8:30 “DESIGN AND FABRICATION OF MULTI-FUNCTIONAL CERAMIC-BASED COMPOSITES”
Shengfang Shi, So Nishiyama, Tomoyo Goto, Sung Hun Cho, and Tohru Sekine

*SANKEN (The Institute of Scientific and Industrial Research), Osaka University

*Institute for Advanced Co-Creation Studies, Osaka University, (Plenary)

Developing Self-Healing Ceramic Coatings for Extreme Environments, AUS-JPN project,
Chair: T. M. D. Do, Nagaoka

Room A

9:00 "MICRO-TENSILE STUDY OF ALPHA DAMAGE WITHIN MATERIALS FOR FISSION AND FUSION REACTORS”
Alan Xu, Michael Saleh, Tao Wei, Tim Palmer, Dhriti Bhattacharyya, Mihail Ionescu, Gordon Thorogood

*Nuclear Fuel Cycle Research, Australian Nuclear Science and Technology Organisation
+ School of Material Science and Engineering, University of New South Wales (Invited)

9:30 "SELF-CRACK-HEALING CERAMICS AND THEIR PERSPECTIVE APPLICATION IN AIRCRAFT GAS TURBINE ENGINE”
Son Thanh Nguyen, Ayahisa Okawa, Hisayuki Suematsu, Tadachika Nakayama and Koichi Niihara

*National Institute of Technology – Kushiro College, Kushiro, Japan
10:00 “Thermal Oxidation-induced Self-healing in Oxide-Based Ceramic Composites”
Makoto Nanko
\(^a\) Nagaoka University of Technology, (Invited)

10:30 Break

Applications 2, Chair: N. T. Son, National Inst. Tech. Kushiro College
Room A

10:40 "HIERARCHICAL STRUCTURE CONTROL OF MgAl\(_2\)O\(_4\) POROUS CERAMICS AND APPLICATION TO ORGANIC POLYMER FILTRATION MEMBRANE”
Zhiyuan Ma \(^a\), and Yoshikazu Suzuki \(^b\)*
\(^a\) Graduate School of Pure and Applied Sciences, University of Tsukuba
\(^b\) Faculty of Pure and Applied Sciences, University of Tsukuba, Tsukuba, (Invited)

11:00 "DEVELOPMENT OF RARE METAL-FREE SULFIDE-BASED THIN-FILM SOLAR CELLS”
Hideaki Araki\(^a\)*
\(^a\) National Institute of Technology (KOSEN), Nagaoka College, (Invited)

11:20 Fujimoto, Naragakuen (Invited)

11:40 "Plasma-engineered hybrid metal nanomaterials for high-performance cathode catalysts for fuel cell and metal-air batteries”
Oi Lun (Helena) Li \(^a\)*
\(^a\) Pusan National University, (Invited)

12:00 Break

Room A

13:00 "High-Energy-Density Physics Research in Nagaoka University of Technology”
Toru Sasaki\(^1\), Kazuki Igarashi, Yuki Narita, Momoka Iwasa, Yuki Kumagai, Kazumasa Takahashi, and Takashi Kikuchi
Nagaoka University of Technology, (Invited)

13:30 "COAXIAL ATMOSPHERIC PRESSURE PLASMA JET PROPERTY COMPARISON FOR HELIUM AND ARGON GASES”
Wanakuwathithawaduge Thomas Leon Suganda Fernando\(^1\), Kazumasa Takahashi\(^2\), Takashi Kikuchi\(^2\), and Toru Sasaki\(^2\)
1 Sabaragamuwa University of Sri Lanka
2 Nagaoka University of Technology (Invited)

14:00 "ELEMENTAL GRADIENT FUNCTIONAL THIN FILM PREPARATION BY SPUTTERING WITH MIXED POWDER TARGETS"
Kouki Sumoto a*, and Hiroharu Kawasaki a
aNational Institute of Technology, Sasebo College, (Invited)

14:30 Break

Beam and Plasma, Chair: T. Sasaki, Nagaoka Univ. Tech.
Room A

14:40 "COLOR CENTERS IN K-NA-CL CRYSTALS INDUCED BY PULSED INTENSE RELATIVISTIC ELECTRON BEAM AT 77K AND AGING BEHAVIOUR"
Yoji NAMIOKA a*, Do Thi Mai Dung a, Takashi KIKUCHI a, Tadachika NAKAYAMA a, and Hisayuki SUEMATSU a
aExtreme Energy-Density Research Institute, Nagaoka University of Technology

15:00 "Recombination of Color Centers in a NaCl Crystal Induced by Irradiated Pulsed Intense Relativistic Electron Beams at 77 K"
Hiroto Ito 1, Ryodai Shibata 1, Takashi Kikuchi 2, Thi Mai Dung Do 1, Tadachika Nakayama 1 and Hisayuki Suematsu 1
1 Extreme Energy-Density Research Inst., Nagaoka Univ. of Tech.
2 Nucl. System Safety Eng., Nagaoka Univ. Tech

15:20 "BLISTER AND BUBBLE FORMATION BY HIGH-ENERGY HELIUM ION BEAM IRRADIATION INTO TUNGSTEN FOR NUCLEAR FUSION"
Yuki Uchida a*, Seiki Saito b, Nobuo Saito c, Tsuneo Suzuki c, Kazumasa Takahashi c, Toru Sasaki c, and Takashi Kikuchi c
aNational Institute of Technology, Nagaoka College, bYamagata University
 cNagaoka University of Technology

15:40 "AC GLOW DISCHARGE ON LIQUID: ITS PROPERTIES AND APPLICATION FOR METAL NANOPARTICLE SYNTHESIS"
Van-Phuoc Thai a*, Nobuo Saito, Kazumasa Takahashi, Toru Sasaki, and Takashi Kikuchi
Nagaoka University of Technology

16:00 "STRENGTH RECOVERY OF SILICON CARBIDE DISPERSED Yb 2Si 2O 7 AT HIGH TEMPERATURE IN AIR OR STEAM ATMOSPHERE"
Ayahisa Okaw a*, Son Thanh Nguyen b, Hyounghwon Son b, Tadachika Nakayama b, *, Thi Mai Dung Do a, Hisayuki Suematsu a, Koichi Niihara a
"SYNTHESIS OF PEROXO-MODIFIED TITANATE NANOSTRUCTURES BY CHEMICAL BOTTOM-UP PROCESS AND THEIR PHOTOCATALYTIC PROPERTIES"
Hyunsu Park\textsuperscript{a}, Do Hyung Han\textsuperscript{a}, Tomoyo Goto\textsuperscript{a,b}, Sunghun Cho\textsuperscript{a}, Yukihiro Morimoto\textsuperscript{a}, and Tohru Sekino\textsuperscript{a}
\textsuperscript{a}SANKEN (The Institute of Scientific and Industrial Research), Osaka University
\textsuperscript{b}Institute for Advanced Co-Creation Studies, Osaka University

"DEVELOPMENT OF TiO\textsubscript{2}-MODIFIED HYDROXYAPATITE FOR THE REMOVAL OF ORGANIC POLLUTANTS"
Tomoyo Goto\textsuperscript{a,b,*}, Sung Hun Cho\textsuperscript{a}, Chikara Ohtsuki\textsuperscript{c} and Tohru Sekino\textsuperscript{a}
\textsuperscript{a}SANKEN (The Institute of Scientific and Industrial Research), Osaka University
\textsuperscript{b}Institute for Advanced Co-Creation Studies, Osaka University
\textsuperscript{c}Graduate School of Engineering, Nagoya University

"MINIATURIZATION OF ALUMINUM HYDROXIDE USING NANOSECOND PULSE IN ELECTROCOAGULATION"
Kodai Suzuki\textsuperscript{a}, Hiroyuki Saito\textsuperscript{a}, Hisayuki Suematsu\textsuperscript{a}, Koichi Niihara\textsuperscript{a} and Tadachika Nakayama\textsuperscript{a,*}
\textsuperscript{a}Extreme Energy-Density Research Institute, Nagaoka University of Technology

"Development of Polishing Method for Dielectric Materials Using Nanosecond Pulsed Electric Field"
Taishi Chiyoda\textsuperscript{a,*}, Kou Ezoe\textsuperscript{a}, Hironari Sugiyama\textsuperscript{a}, Hiroyuki Saito\textsuperscript{a}, Hisayuki Suematsu\textsuperscript{a}, Koichi Niihara\textsuperscript{a} and Tadachika Nakayama\textsuperscript{a,*}
\textsuperscript{a}Extreme Energy-Density Research Institute, Nagaoka University of Technology

"Low-temperature pyroelectric energy harvesting of lead-free ceramic Ba(Zr, Ti)O\textsubscript{3} using the Kim cycle"
Nguyen Chi Trung NGO\textsuperscript{1,*}, Hironari SUGIYAMA\textsuperscript{1}, Juan Paulo WIFF\textsuperscript{2}, Tsuneo SUZUKI\textsuperscript{1}, Hisayuki SUEMATSU\textsuperscript{1} and Tadachika NAKAYAMA\textsuperscript{1}
\textsuperscript{1}Extreme Energy-Density Research Institute, Nagaoka University of Technology
\textsuperscript{2}Department of Science of Technology Innovation, Nagaoka University of Technology

Sugiyama, Nagaoka

"DEVELOPMENT OF LOW TEMPERATURE BONDING METHOD BY APPLYING
NANOSECOND PULSED ELECTRIC FIELD TO SILVER NANOPARTICLES”
Hiroyuki Saito\textsuperscript{a}, Kan Yoshida\textsuperscript{a}, Hironari Sugiyama\textsuperscript{a}, Kazuki Nagao\textsuperscript{a}, Koichi Niihara\textsuperscript{a} and Tadachika Nakayama\textsuperscript{a}\textsuperscript{*}
\textsuperscript{a} Extreme Energy-Density Research Institute, Nagaoka University of Technology
16:20 “Effect of Composition on Interfacial Strength of Hydroxyapatite/TiO\textsubscript{2} Coating Fabricated by Suspension Plasma Spray”
Mirazul Mahmud Abir\textsuperscript{a}, Yuichi OTSUKA\textsuperscript{a}, Yukio MIYASHITA\textsuperscript{a}
\textsuperscript{a}Nagaoka University of Technology
16:40 “The potential of Ti\textsubscript{2}AlC MAX phase ceramics for the root technology”
Naoya Yamaguchi\textsuperscript{a}, Kuo Yenling\textsuperscript{a} and Makoto Nanko\textsuperscript{a}\textsuperscript{*}
\textsuperscript{a}Nagaoka University of Technology
17:00 Matsuyama, Nagaoka
17:20 Yoshida, Nagaoka
17:40 “**Watari, Nagaoka

Aug. 6, 2021

Networking sessions
All participants can organize/partipate networking sessions in the following rooms. No reservations are required.

Room A
Room B
Room C
Room D