

Symposium Schedule

5 Aug. (Sun)		6 Aug. (Mon)			7 Aug. (Tue)			8 Aug. (Wed)			
		Room A	Room B	Room C	Room A	Room B	Room C	Room A	Room B	Room C	
8:30		<i>Registration Desk Open</i> (Kitakyushu International Conference Center)			<i>Registration Desk Open</i> (Kitakyushu International Conference Center)			<i>Registration Desk Open</i> (Kitakyushu International Conference Center)			8:30
9:00		Opening Ceremony			Thermoelectric Materials I (Keynote:1)	Surface and Interface	Centrifugal Processing	Structural Analysis and Design II	Environmental Coatings and Evaluation (Keynote:1)	Manufacturing	9:00
9:30					Plenary Lecture 1			Break			Break
10:00		Exhibition & Lunch						Modeling and Simulation I	Multi- dimensional Printing I (Keynote:1)	Spark Plasma Sintering for Industrialization I	Thermoelectric Materials II
10:30					Exhibition & Lunch			Break			Break
11:00		Exhibition & Lunch						Plenary Lecture 2			Break
11:30					Exhibition & Lunch						Plenary Lecture 2
12:00		Exhibition & Lunch						Plenary Lecture 2			
12:30					Exhibition & Lunch						Plenary Lecture 2
13:00		Exhibition & Lunch						Plenary Lecture 2			
13:30	Exhibition & Lunch				Plenary Lecture 2						Break
14:00				Exhibition & Lunch				Plenary Lecture 2			Break
14:30	Exhibition & Lunch						Plenary Lecture 2				Break
15:00				Exhibition & Lunch						Plenary Lecture 2	
15:30	Exhibition & Lunch						Plenary Lecture 2				
16:00				Exhibition & Lunch						Plenary Lecture 2	
16:30	Exhibition & Lunch						Plenary Lecture 2				
17:00				Exhibition & Lunch						Plenary Lecture 2	
17:30	Exhibition & Lunch						Plenary Lecture 2				
<i>Registration Desk Open</i> (RIHGA Royal Hotel Kokura)				<i>Registration Desk Close</i>						<i>Registration Desk Close</i>	
Welcome Reception		Poster session [Poster Room]			Poster session [Poster Room]			Technical Tour			
<i>Registration Desk Close</i>		<i>Registration Desk Close</i>			<i>Registration Desk Close</i>			<i>Registration Desk Close</i>			
		Banquet			Memorial Ceremony of Prof. M. Willert-Porada and Prof. T. Hirai						

6 Aug. (Mon) Kitakyushu International Conference Center

Main Hall

Opening Ceremony

Chair: Prof. Kouichi Nakano

9:20 – 9:30	Opening Address	Prof. Akira Kawasaki (President, Functionally Graded Materials Forum, Japan)
9:30 – 9:40	Congratulatory Address	Dr. Yuji Oie (President, Kyushu Institute of Technology)
9:40 – 9:50	Congratulatory Address	Guest of Honor

Plenary Lecture

Chair: Prof. Akira Kawasaki

9:50 – 10:40	PL-1	"Lessons learned with FGM development" Prof. Michael Gasik Aalto University Foundation, Finland
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10:40 – 11:00 Break

Room A

Modeling and Simulation I

Chairs: Prof. Vera Petrova and Prof. Kazunari Shinagawa

11:00 – 11:20	O-1	Dynamic behavior of a functionally graded coating subjected to moving contact with a semi-circular punch Mehmet N. Balci ¹ and Serkan Dag ² 1 Hacettepe University, Turkey 2 Middle East Technical University, Turkey
11:20 – 11:40	O-2 (Invited)	Dynamic Analysis of Functionally Graded Beams Asmita Rokaya and Jeongho Kim University of Connecticut, USA
11:40 – 12:00	O-3	Thermal Buckling of Functionally Graded Annular Micro-Plates with a Variable Length Scale Parameter Iman Eshraghi ¹ and Serkan Dag ² 1 University of Tehran, Iran 2 Middle East Technical University, Turkey
12:00 – 12:20	O-4	Thermal fracture of functionally graded materials: a semi-analytical model in application to thermal barrier coatings Vera Petrova ^{1,2} and Siegfried Schmauder ¹ 1 IMWF, University of Stuttgart, Germany 2 Voronezh State University, Russia
12:20 – 13:30		Exhibition & Lunch

Modeling and Simulation II

Chairs: Prof. Jeongho Kim and Prof. Kazunari Shinagawa

13:30 – 13:50	O-5	Time-dependent stress concentration reduction in graded material Guannan Wang ¹ and Marek-Jerzy Pindera ² 1 Texas Tech University, USA 2 University of Virginia, USA
13:50 – 14:10	O-6 (as P-1)	Multiscale grading of periodic materials Zhelong He and Marek-Jerzy Pindera University of Virginia, USA
14:10 – 14:30	O-7 (Invited)	Analysis of Sintering Behavior of Particle-Arrayed Structures by PFM/DEM Combined Method Kazunari Shinagawa Kyushu University, Japan
14:30 – 14:50	O-8	Micromechanical Homogenization of Elastic Moduli within Transverse Bamboo Cross Sections Xiaoyu Zhao ¹ and Guannan Wang ² 1 Shanghai University of Engineering Science, P. R. China 2 Texas Tech University, USA

Room B**Multi-dimensional printing I**

Chairs: Prof. Naoyuki Nomura and Prof. Soshu Kiriwara

- 11:00 – 11:30 O-9 (*Keynote*) **Control of Crystallographic Orientation Fabricated by Additive Manufacturing of Beta-type Ti Alloys**
Takayoshi Nakano, Koji Hagihara and Takuya Ishimoto
Osaka University, Japan
- 11:30 – 11:50 O-10 **Effects of heterogeneous nucleus TiC particles on relative density and microstructure of selective laser melted Ti-6Al-4V**
Tadachika Chiba¹, Masafumi Sato¹, Hisashi Sato¹, Yoshimi Watanabe¹, Naoko Sato² and Shizuka Nakano²
1 Nagoya Institute of Technology (NIT), Japan
2 National Institute of Advanced Industrial Science and Technology (AIST), Japan
- 11:50 – 12:10 O-11 (*Invited*) **5D printer for FGM**
Fujio Tsumori
Kyushu University, Japan
- 12:10 – 13:30 **Exhibition & Lunch**

Thin Films and Coatings

Chairs: Prof. Chang-Chun Ge and Prof. Takashi Goto

- 13:30 – 13:50 O-12 **Preparation of Graded-Tungsten Coating by "Cold Spray + Chemical Vapor Deposition" Process for Nuclear Fusion Facilities**
Chang-Chun Ge¹, Xiao-Na Ren¹, Min Xia¹ and Peng Huang^{1,2}
1 University of Science and Technology Beijing, P. R. China
2 Southwest Jiaotong University, P. R. China
- 13:50 – 14:10 O-13 **A Normal Crack in a Functionally Graded Thermal Barrier Coating Bonded to a Homogeneous Elastic Substrate under Transient Thermal Loading**
Yuya Nakano and Sei Ueda
Osaka Institute of Technology, Japan
- 14:10 – 14:30 O-14 **Deposition of functionally graded wear-resistant coatings by a combination of pulsed arc evaporation and electro spark deposition**
Kuptsov K.A., Sheveyko A.N. and Shtansky D.V.
National University of Science and Technology "MISIS", Russia
- 14:30 – 14:50 O-15 **Oxidation Resistant Coatings of NbSi₂/Nb FGMs Layer for TiAl Intermetallic Compounds by Electron Beam Irradiation**
Katsuhiko Takagi¹, Toshimitsu Tetsui², Daisuke Yonekura¹ and Kazuhiro Hasezaki¹
1 Tokushima University, Japan
2 National Institute for Materials Science (NIMS), Japan
- 14:50 – 15:10 O-16 **Fabrication and Microstructure of Electrodeposited Cu-based Alloy Films Having High Composition Gradient**
(as P-11) Hiroyuki Hagiwara, Yoshihisa Kaneko and Makoto Uchida
Osaka City University, Japan

Room C**Spark Plasma Sintering for Industrialization I**

Chairs: Prof. Hiroshi Izui and Dr. Masao Tokita

- 11:00 – 11:20 O-17 (*Invited*) **Development of ZrO₂/Ti alloy FGMs Horn tip tool for Ultra-sonic Homogenizer by Spark Plasma Sintering (SPS) Method**
Masao Tokita¹, Yasuhiro Mitsu² and Hiroyuki Yoshida³
1 NJS Co.,Ltd., Japan; 2 Mitsui Electric Co.,Ltd., Japan
3 Chiba Industrial Technology Research Institute, Japan
- 11:20 – 11:40 O-18 **Development of lightning receptor for wind turbine blade by copper-graphite FGMs**
Toshiyuki Ueno¹, Takashi Yoshioka¹, Shuichi Asahina¹, Daisuke Nakasa², Yoshihiro Moriya² and Atsushi Minoda³,
1 Simane institute for industrial technology, Japan; 2 Moriya cutlery laboratory, Ltd, Japan
3 National institute of technology, Matsue college, Japan
- 11:40 – 12:00 O-19 **An Application of Weldable FGMs Cemented Carbide to Extruder Screw**
Y. Nakajima¹, Y. Miyakoshi¹, H. Takahashi¹, M. Tokita², H. Ando², K. Shimamura³ and K. Satoh³
1 Hokkaido Research Institute, Japan; 2 NJS Co., Ltd., Japan
3 Sapporo Kensaku Kogyo Co., Ltd., Japan
- 12:00 – 13:30 **Exhibition & Lunch**

Spark Plasma Sintering for Industrialization II

Chairs: Prof. Tatsuya Misawa and Dr. Masao Tokita

13:30 – 14:00 O-20 (*Keynote*) **Fabrication and Characterization of Functionally Graded Cylindrical Bars of Titanium Matrix Composites**
Hiroshi Izui, Naoya Hosokawa, Keisuke Kanazawa and Yoshiki Komiya
Nihon University, Japan

14:00 – 14:20 O-21 (*Invited*) **Heterogeneity of sintering temperature in the boundary between different materials and graphite die on Spark Plasma Sintering Process**
(as P-44) Tatsuya Misawa¹, Takumi Sakamaki², Yuji Kawakami¹ and Masakazu Kawahara³
1 Saga University, Japan; 2 National Institute of Technology, Kurume College, Japan
3 Kawahara SPS Technical Office, Japan

14:20 – 14:40 O-22 **Fabrication of FGMs Devices using Spark Plasma Sintering Technique**
Khaled Jabri¹, Tomohiro Sato¹ and Masao Tokita²
1 SINTER LAND INC., Ltd., Japan
2 NJS Co., Ltd., Japan

Poster Room

Poster session

15:10 – 17:00

P-1 ~ P-43

17:00 –

Banquet

7 Aug. (Tue) Kitakyushu International Conference Center

Room A

Thermoelectric Materials I

Chairs: Prof. Teruyuki Ikeda and Dr. Yoshikazu Shinohara

- 9:00 – 9:20 O-23 **Effects of Milling Rotational Speed on n-type $\text{Bi}_2\text{Te}_{2.67}\text{Se}_{0.33}$ Thermoelectric Semiconductors**
Kenichi Hanasaku and Kazuhiro Hasezaki
Tokushima University, Japan
- 9:20 – 9:40 O-24 **Thermal characteristics of energy cascade utilization system based on solar thermal power supply**
Koji Kusano, Yusuke Minami and Kazuhiro Hasezaki
Tokushima University, Japan
- 9:40 – 10:10 O-25 (Keynote) **Design and Synthesis of High Efficiency Peak to Peak (PtoP) type Thermoelectric Power Module Constructed by Functionally-Gradient-Layers**
SuDong Park, Jong Ho Park, Byungki Ryu, Jaywan Chung
Korea Electrotechnology Research Institute (KERI), South Korea
- 10:10 – 10:30 O-26 (Invited) **Theoretical Evaluation of Thermoelectric Materials with Uniform and Graded Structures for Thermoelectric Power Generation**
Yoshikazu Shinohara, Yoshiki Takagiwa, Yukihiko Isoda and Masahiro Goto
National Institute for Materials Science, Japan
- 10:30 – 10:50 Break

Thermoelectric Materials II

Chairs: Prof. Kazuhiro Hasezaki and Prof. Shinji Munetoh

- 10:50 – 11:10 O-27 (Invited) **Graphene promoted oxygen vacancies in perovskite for enhanced thermoelectric properties**
Yuchi Fan¹ and Akira Kawasaki²
1 Donghua University, P. R. China
2 Tohoku University, Japan
- 11:10 – 11:30 O-28 **Development of Low-cost and Non-toxic Thermoelectric Material for Sensor Application**
Yoshiki Takagiwa¹, Yukihiko Isoda¹, Masahiro Goto¹, Yoshikazu Shinohara¹, Akiko Saito², and Teruyuki Ikeda²
1 National Institute for Materials Science (NIMS), Japan
2 Ibaraki University, Japan
- 11:30 – 11:50 O-29 **An efficient way of exploring microstructure and thermoelectric properties of multicomponent systems using composition-graded bulk materials**
Akiko Saitoh¹, Hirotohi Nishimine¹, Ayako Ikeda², Yoshiki Takagiwa², Tsuyoshi Nishi¹, Hiromichi Ohta¹, and Teruyuki Ikeda¹
1 Ibaraki University, Japan; 2 National Institute for Materials Science, Japan
- 11:50 – 12:10 O-30 (Invited) **Thermal probe method analysis for $\text{Ba}_8\text{Au}_x\text{Si}_{46-x}$ single crystal clathrate with Au composition gradient**
Shinji Munetoh, Yuuki Osakabe and Keita Yamasoto
Kyushu University, Japan
- 12:10 – 13:30 Exhibition & Lunch

Room B

Surface and Interface

Chairs: Dr. Hiroki Kurita and Prof. Hitoshi Kohri

- 9:10 – 9:30 O-31 (Invited) **Attempt to Increase the Toughness of Biodegradable Resin**
Hitoshi Kohri¹, Yuta Watanabe¹, Hiroyuki Tsukumo² and Yasumi Yuma²
1 Kogakuin University, Japan
2 KSK CO., LTD, Japan
- 9:30 – 9:50 O-32 **Joining of 93W Alloy and Mo1 Alloy with a Cu Interlayer by Plasma Activated Sintering**
Mei Rao, Jiahui Ding, Jian Zhang, Guoqiang Luo, Qiang Shen and Lianmeng Zhang
Wuhan University of Technology, P. R. China
- 9:50 – 10:10 O-33 **Structural Difference in Aluminum/Carbon Fiber Interface of Carbon Fiber Reinforced Aluminum Matrix Composites Fabricated by Two Different Powder Metallurgical Processes**
Grégory Laret¹, Hiroki Kurita², Jean-Marc Heinz³ and Jean-François Silvain¹
1 ICMCB-CNRS, France; 2 Shizuoka University, France
3 ENSCBP, France

10:10 – 10:30 O-34 **Development of surface treatment to realize novel biomaterial realize both tissue compatibility and antibacterial property**
Yusuke Tsutsumi, Masaya Shimabukuro, Peng Chen, Maki Ashida, Hisashi Doi and Takao Hanawa
Tokyo Medical and Dental University, Japan

10:30 – 10:50 Break

Biological and Optical Functions I

Chairs: Prof. Takayuki Narushima and Prof. Kouichi Nakano

10:50 – 11:10 O-35 *(Invited)* **Functionally Graded Metal Implants with Ability of Bone Integration**
Toshiki Miyazaki
Kyushu Institute of Technology, Japan

11:10 – 11:30 O-36 *(Invited)* **Several Boundaries and Functionally Graded Layers -Study on Biofilms that have Functionally Graded Characteristics on the Boundaries-**
Kouichi Nakano
Kyushu Institute of Technology, Japan

11:30 – 11:50 O-37 **Using Regenerated Cellulose as Adhesives in Cellulose-based Green Composites**
K. Suzuki, A. N. Nakagaito and H. Takagi
Tokushima University, Japan

11:50 – 12:10 O-38 **Preparation of Microcapsules coated with Styrene-modified CNF using Supercritical Carbon dioxide**
(as P-30) Shinichi Tokunaga, Kenji Mishima, Taku M. Aida, Tanjina Sharmin and Miyuki Nakamura
Fukuoka University, Japan

12:10 – 13:30 Exhibition & Lunch

Room C

Centrifugal Processing

Chairs: Prof. Takahiro Kunimine and Prof. Yoshimi Watanabe

9:10 – 9:30 O-39 **Fabrication of Cu Alloy-Based Self-Lubricating Functionally Graded Materials by Combination of Centrifugal Mixed-Powder Method and Aging Treatment**
Hisashi Sato, Tomoaki Kayano, Tadachika Chiba and Yoshimi Watanabe
Nagoya Institute of Technology, Japan

9:30 – 9:50 O-40 **Metal-Matrix FGMs with Matrix-Composition Gradient Processed by Centrifugal Sintered-Casting**
Takahiro Kunimine¹, Motoko Yamada², Hisashi Sato² and Yoshimi Watanabe²
1 Kanazawa University, Japan
2 Nagoya Institute of Technology, Japan

9:50 – 10:10 O-41 *(Invited)* **Fabrication of FGMs under Centrifugal Force and Their Some Applications**
Yoshimi Watanabe
Nagoya Institute of Technology, Japan

10:10 – 10:30 O-42 **Horizontal Type FGMs Manufacturing System under the Centrifugal Force, NOC 2000**
Yasumasa Oya¹, Hisashi Sato² and Yoshimi Watanabe²
1 OHYA-CHUZOSHO Co., Ltd., Japan
2 Nagoya Institute of Technology, Japan

10:30 – 10:50 Break

Multifunctions

Chairs: Prof. Thorsten Gerdes and Prof. Makoto Kobashi

10:50 – 11:20 O-43 *(Keynote)* **Copper/diamond functionally graded materials**
J.-F. Silvain^{1,2}, C. Azina^{1,2}, Y.F. Lu² and J.-L. Battaglia¹
1 CNRS, University of Bordeaux, France
2 University of Nebraska-Lincoln, USA

11:20 – 11:40 O-44 **Fabrication and Characterization of Al-Cu System Graded Impactors in Light Gas Gun Experiments**
Jianian Hu, Guoqiang Luo, Jiqin Chen, Jian Zhang, Qiang Shen and Lianmeng Zhang
Wuhan University of Technology, P. R. China,

11:40 – 12:00 O-45 *(Invited)* **Functionally graded carbon nanotube reinforced aluminum matrix composite tube fabricated by hot extrusion process**
Hansang Kwon^{1,2}, Kwangjae Park¹, Dasom Kim¹, Jehong Park², Seungchan, Cho³, Akira Kawasaki⁴ and Kwonhoo Kim¹,
1 Pukyong National University, South Korea; 2 Next Generation Materials Co., Ltd., South Korea; 3 South Korea Institute of Materials Science, South Korea; 4 Tohoku University, Japan

12:00 – 13:30 Exhibition & Lunch

Main Hall

Plenary Lecture

Chair: Dr. Yoshikazu Shinohara

13:30 – 14:20 PL-2

"Manufacture and properties of layered, graded and 3D anisotropic materials for applications in communications and energy storage"

Prof. Patrick S. Grant
Department of Materials, University of Oxford, UK

14:20 – 14:40

Break

Room A

Structural Analysis and Design I

Chairs: Dr. Daria Sidorenko and Prof. Fumio Narita

14:40 – 15:10 O-46

(keynote) **Electro-elastodynamic Behavior of Functionally Graded Piezoelectric Thin Plates**

Fumihiro Ashida¹, Takuya Morimoto¹ and Hidenori Ozaki²
1 Shimane University, Japan
2 OPTON Co. Ltd., Japan

15:10 – 15:30 O-47

Modelling of Functionally Graded Micro-beams with Variable Length Scale Parameters

Reza Aghazadeh, Serkan Dag and Ender Cigeroglu
Middle East Technical University, Turkey

15:30 – 15:50 O-48

(Invited) **Finite Element Analysis and Design of Flexible Functionally Graded Piezocomposites - Toward Effective Vibration and Temperature Energy Harvesting Materials**

Kotaro Mori¹, Zhenjin Wang² and Fumio Narita²
1 Ibaraki University, Japan
2 Tohoku University, Japan

15:50 – 16:10 O-49

Multiscale simulation of multiferroic composite materials

Shota Fukui and Yasutomo Uetsuji
Osaka Institute of Technology, Japan

16:10 – 16:30 O-50

Modern Design of Diamond Cutting Tools: Mechanical Alloying, Nanomodification, Functional Graded Coatings

Daria Sidorenko, Pavel Loginov and Evgeny Levashov
National University of Science and Technology "MISIS", Russia

16:30 – 16:50 O-51

Particle Size Effects on Mechanical Properties of Wood Plastic Composites

Naoyuki Shiraishi¹, Yasutomo Uetsuji¹ and Hirokazu Ito²
1 Osaka Institute of Technology, Japan
2 National Institute of Advanced Industrial Science and Technology, Japan

Room B

Multi-dimensional printing II

Chairs: Prof. Fujio Tsumori and Prof. Soshu Kiriara

14:40 – 15:00 O-52

(Invited) **Trial of functionally-graded Zr-based alloy builds for biomedical applications**

Naoyuki Nomura, Torun Gözden, Keiko Kikuchi and Akira Kawasaki
Graduate School of Engineering, Tohoku University, Japan

15:00 – 15:20 O-53

Cladded layer with graded composition WC/Co using Laser Metal Deposition

Yorihiro Yamashita¹, Yoshinori Funada¹, Takahiro Kunimine², Yuji Sato³ and Masahiro Tsukamoto³
1 Industrial Research Institute of Ishikawa, Japan; 2 Kanazawa University, Japan
3 Osaka University, Japan

15:20 – 15:40 O-54

(Invited) **Stereolithographic Additive Manufacturing of Metal and Ceramic Components with Functional Geometries**

Soshu Kiriara
Osaka University, Japan

15:40 – 15:50

Short Break

Biological and Optical Functions II

Chairs: Prof. Toshiaki Miyazaki and Prof. Kouichi Nakano

15:50 – 16:10 O-55

(Invited) **Formation and Antibacterial Activity of TiO₂ Layers on Ti-Au Alloys**

Takayuki Narushima, Kyosuke Ueda, Takatoshi Ueda and Naoki Sato
Tohoku University, Japan

16:10 – 16:30 O-56 **Evaluation of Optical Properties on FGPJ between Cu and SUS304 for Quality Assurance**
(as P-26) Kazuki Iwakiri and Kouichi Nakano
Engineering Kyushu Institute of Technology, Japan

16:30 – 16:50 O-57 **Effect of Thermo-mechanical Processing on Microstructure and Mechanical Properties of Harmonic-structure Pure Copper**
Guodong Li^{1,2}, Shuichi Morinaka², Mie Kawabata², Chaoli Ma¹ and Kei Ameyama²
1 Beihang University, P. R. China;
2 Ritsumeikan University, Japan

Room C

Processings

Chairs: Dr. J-F Silvain and Prof. Hansang Kwon

14:40 – 15:00 O-58 **Preparation of AlN/Mo Functionally Graded Materials by Tape Casting and Spark Plasma Sintering**
Yueqi Wu, Fei Chen, Mei Huang, Qiang Shen and Lianmeng Zhang
Wuhan university of technology, P. R. China,

15:00 – 15:20 O-59 *(Invited)* **Compositionally and porosity graded metal-ceramic composite for thermal barrier applications**
Christian Richter, Monika Willert-Porada, Andreas Rosin, Walter Krenkel and Thorsten Gerdes
University of Bayreuth, Germany

15:20 – 15:40 O-60 **Effect of Al/Ni Molar Ratio on Cell Morphology and Constituting Phase of Porous Ni-Al Intermetallic Compounds**
Yunmao Shu, Asuka Suzuki, Naoki Takata and Makoto Kobashi
Nagoya University, Japan

15:40 – 16:00 O-61 *(Invited)* **Formation of Oriented and Graded Grain Structure in Fe-Cu-C Alloy by Liquid Phase Sintering and Carburization**
Ryuzo Watanabe¹, Yasuaki Okita² and Akira Kawasaki³
1 Japan Aerospace Technology Foundation, Japan; 2 JFE Steel Corp., Japan
3 Tohoku Univ., Japan

16:00 – 16:20 O-62 **Boron carbide reinforced Al composite plate fabricated by casting followed by rolling process**
Seungchan Cho, Donghyun Lee, Sangmin Shin, Ilguk Jo, Sang-Kwan Lee and Sang-Bok Lee
Korea Institute of Materials Science (KIMS), South Korea

16:20 – 16:40 O-63 **Bonding strength of Al/resin joint via functionally graded interpenetrating phase layer**
Asuka Suzuki¹, Yuta Arai², Naoki Takata¹ and Makoto Kobashi¹
1 Nagoya University, Japan
2 Nagoya University (Currently: The Japan Commercial Broadcasters Association)

17:00 –

Memorial Ceremony of Prof. M. Willert-Porada and Prof. T. Hirai

Room A

Structural Analysis and Design II

Chairs: Prof. Yan Shi and Prof. Yasutomo Uetsuji

- 9:00 – 9:20 O-64 **A Crack Parallel to the Interface Between a Functionally Graded Thermal Barrier Coating and a Homogeneous Elastic Substrate under Transient Thermal Loading**
Yasuhiko Masaoka and Sei Ueda
Osaka Institute of Technology, Japan
- 9:20 – 9:40 O-65 (Invited) **Plane axisymmetric unsteady thermal stress in an inhomogeneous hollow circular cylinder due to cyclic heat supply**
Hiromu Kanemaru¹, Ryuusuke Kawamura¹ and Yoshinobu Tanigawa²
1 University of Miyazaki, Japan
2 Professor Emeritus, Osaka Prefecture University, Japan
- 9:40 – 10:00 O-66 **Design, Fabrication and Characterization of Fe-Co Magnetostrictive Fiber/Epoxy Composite Materials with Villari Effect**
Kenichi Katabira¹, Yu Yoshida¹, Atsuji Masuda², Akihito Watanabe³ and Fumio Narita¹
1 Tohoku University, Japan; 2 Industrial Technology Center of Fukui Prefecture, Japan
3 Sakase Adtech Co., Ltd., Japan
- 10:00 – 10:20 O-67 **Direction-switchable functionally graded acoustic diodes**
Yingjie Chen, Yang Huang and Weiqiu Chen
Zhejiang University, P. R. China
- 10:20 – 10:40 O-68 (Invited) **Assembly of Isolated Three-Dimensional Origami Structures and Their Applications**
Yan Shi¹, Yihui Zhang² and Cunfa Gao¹
1 Nanjing University of Aeronautics & Astronautics, P. R. China
2 Tsinghua University, P. R. China.
- 10:40 – 11:10 Break

Room B

Environmental Coatings and Evaluation

Chairs: Prof. Masahiko Kato and Prof. Hiroyuki Waki

- 9:00 – 9:30 O-69 (Keynote) **Functionally Graded Thermal Barrier Coatings Fabricated by Cold Spray**
Kazuhiro Ogawa, Takumi Kitahara and Yuji Ichikawa
Tohoku University, Japan
- 9:30 – 9:50 O-70 (Invited) **Influence of Heat Cycles on Hardness and Young's Modulus of Thermal Barrier Coatings Measured by Nano-indenter**
Masahiko Kato¹, Taichi Iwata², Hiroyuki Akebono² and Atsushi Sugeta²
1 Fukuyama University, Japan
2 Hiroshima University, Japan
- 9:50 – 10:10 O-71 **Effect of Heat Treatment on Young's Modulus and Poisson's Ratio of Thermal Barrier Coating Evaluated by Bending of Three-Layered Specimen**
Tomoyuki Hayase and Hiroyuki Waki
Iwate University, Japan
- 10:10 – 10:30 O-72 (Invited) **Thermal diffusivity of thermal barrier coating from room temperature up to high temperature**
Megumi Akoshima¹ and Satoru Takahashi²
1 National Metrology Institute of Japan, AIST, Japan
2 Tokyo Metropolitan University, Japan
- 10:30 – 10:50 O-73 (Invited) **Evaluation of Thermal Conductivity for Suspension Plasma Sprayed Mullite Coating**
Keiko Kikuchi¹, Naoyuki Nomura¹, Akira Kawasaki¹, Kazuo Noda², Mikako Nagao², Yoichiro Habu² and Yoshiyasu Itoh²
1 Tohoku University, Japan; 2 TOCALO Co., Ltd, Japan
- 10:50 – 11:10 Break

Room C

Manufacturings

Chairs: Prof. Michael Gasik and Dr. Seungchan Cho

- 9:20 – 9:40 O-74 **Fabrication And Characterization Of Functionally Graded Fe/W Composites**
(as P-47) S. Heuer¹, J. Matejíček², M. Vilémová², T. Lienig¹, G. Pintsuk¹, J.W. Coenen¹, W. Theisen³ and Ch. Linsmeier¹,
1 Institut für Energie und Klimaforschung -Plasmaphysik, Germany; 2 Institute of Plasma Physics AS CR, v. v. i.,
Department of Materials, Czech Republic; 3 Lehrstuhl Werkstofftechnik, Ruhr-Universität Bochum, Germany

9:40 – 10:00 O-75

Construction of $\text{LiCoO}_2\text{-Li}_7\text{La}_3\text{Zr}_2\text{O}_{12}$ Graded Composite Cathode Materials for All-solid-state Batteries

Shangbin Song, Fei Chen, Wenping Zha, Dunjie Yang, Qiang Shen and Lianmeng Zhang
Wuhan university of technology, P. R. China

10:00 – 10:20 O-76

Fabrication of microstructure gradation in Ti-48Al-2Cr-2Nb alloys by electron beam melting

M. Todai¹, T. Nakano², J.Y. Oh², K. Cho², H.Y. Yasuda², K. Hagihara², A. Ikeda³, M. Ueda⁴, and M. Takeyama⁵
1 Institute of Niihama National College of Technology, Japan; 2 Osaka University, Japan; 3 National Institute for Materials Science, Japan; 4 Metal Technology Co. Ltd., Japan; 5 Tokyo Institute of Technology, Japan

10:20 – 11:10

Break

Main Hall

Closing Ceremony

Chair: Prof. Shinji Munetoh

11:10 – 11:40

Closing Address

Prof. Akira Kawasaki (President, Functionally Graded Materials Forum, Japan)

11:40 – 13:00

Exhibition & Lunch

13:00 – 17:30

Technical Tour

Session	Poster Presentation NO.	Title	Authors
Modeling and simulation	P-1 (as O-6)	Multiscale grading of periodic materials	Zhelong He and Marek-Jerzy Pindera University of Virginia, USA
	P-2	Thermomechanical processing of Harmonic Structure Designed Low Carbon Steels	Ryohei Iritani ¹ , Ryuhei Kai ¹ , Mie Ota Kawabata ² and Kei Ameyama ² 1 Graduate School of Science and Engineering Ritsumeikan University, Japan 2 Collage of Science and Engineering, Ritsumeikan University, Japan
	P-3	Unique UltraFine Grain Refinement in Harmonic Structure Designed Pure Titanium by Thermo-mechanical Processing	Akito Shimamura ¹ , Motoki Miyakoshi ¹ , Mie Kawabata ² , Guy Dirras ³ and Kei Ameyama ² 1 Graduate School of Science and Engineering Ritsumeikan University, Japan 2 Department of Mechanical Engineering Ritsumeikan University, Japan 3 Université Paris, France
	P-4	Harmonic Structured design of SUS316L austenitic stainless steel via Powder Mixture Process	Koki Yagi ¹ , Morihiro Hariki ¹ , Masashi Nakatani ¹ , Mie Kawabata ² and Kei Ameyama ² 1 Graduate School of Science and Engineering, Ritsumeikan University, Japan 2 Collage of Science and Engineering, Ritumeikan University, Japan
	P-5	Homogenized linear and nonlinear elastic properties of a type of laminated open-cell structures with negative Poisson's ratios	K Suga ¹ , H Tanaka ¹ , D Okumura ¹ and Y Shibusaki ^{1,2} 1 Osaka University, Japan 2 Vietnam Japan University, Vietnam
	P-6	Simulation on Ejection Characteristics of High Viscous Fluid in Precision Micro-Dispensing System	Kwang-Hee Lee and Chul-Hee Lee Department of Mechanical Engineering, Inha University, South Korea
Thin film and coating	P-7	Pulsed laser deposition of La _{0.7-x} Ho _x Sr _{0.3} MnO ₃ thin film with gradient composition	Chuanbin Wang, Haixia Liu, Qiang Shen and Lianmeng Zhang State Key Lab of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, P. R. China
	P-8	Deformation of Harmonic Structure Designed SUS304L Austenitic Stainless Steel at Elevated Temperatures	M.Hariki ¹ , K.Yagi ¹ , M.Nakatani ¹ , C.Menapace ² , A.Molinari ² , K.Isonishi ³ , M.O.Kawabata ⁴ and K.Ameyama ⁴ 1 Graduate School of Science and Engineering, Ritsumeikan University, Japan 2 College of Industrial Engineering, University of Trento, Italy 3 College of Education, Shiga University, Japan 4 College of Science and Engineering, Ritsumeikan University, Japan
	P-9	Effect of Si thin layer on aluminum-containing plating	Yukihiro Kang and Kazuhiko Noda Shibaura Institute of Technology, Japan
	P-10	The Effect of different annealing temperature on optical and electronic properties of ZnO/Mo/ZnO multiple thin films	Chia-Chin. Chiang ¹ , Tao-Hsing. Chen ^{1*} , Liren Tsai ¹ , Te-Hua Fang ¹ , Shih-Han Wang ² and Bo-Lun Jiang ¹ 1 Department of Mechanical Engineering, National Kaohsiung University of Science and Technology, Kaohsiung, Taiwan 2 Department of Chemical Engineering, National Yunlin University, Taiwan
	P-11 (as O-16)	Fabrication and Microstructure of Electrodeposited Cu-based Alloy Films Having High Composition Gradient	Hiroyuki Hagiwara ¹ , Yoshihisa Kaneko ² and Makoto Uchida ³ Department of Mechanical Engineering, Faculty of Engineering, Osaka City University, Japan
	P-12	Hard Cr-B-C-N nanofilms produced by pulsed arc evaporation and magnetron sputtering of ceramic SHS-targets	Ph.V. Kiryukhantsev-Korneev, K.A. Kuptsov, A.N. Sheveyko and E.A. Levashov National University of Science and Technology "MISIS", Russia
Thermoelectric Materials	P-13	Functionally graded metal-ceramic composite for thermal management in energy conversion system	Jehong Park ¹ , Seungchan Cho ² , Akira Kawasaki ³ and Kwangjae Park ⁴ 1 Next-Generation Materials Co., Ltd, South Korea 2 Korea Institute of Materials Science, South Korea 3 Tohoku University, Japan 4 Pukyong National University, South Korea
	P-14	Effect of Brazing on Joining Boundary of β -FeSi ₂ Thermoelectric Material	Masachika Shibuya, Yukihiro Isoda and Yoshikazu Shinohara National Institute for Materials Science, Japan
	P-15	Unidirectional solidification and multiple diffusion couple technique as tools to accelerate the study of thermoelectric materials	Akiko Saitoh ¹ , Hiroto Nishimine ¹ , and Ayako Ikeda ² , and Teruyuki Ikeda ³ 1 Graduate School of Science and Engineering, Ibaraki University, Japan 2 National Institute for Materials Science, Japan 3 Department of Materials Science and Engineering, Ibaraki University, Japan
	P-16	Fabrication of thermoelectric power generation modules using Fe ₂ Al ₅ compounds	Takeshi Souma, Keisuke Kinouchi and Shouhei Miki National Institute of Technology, Kagawa College, Takamatsu, Japan
	P-17	Single Crystallization of Ba ₈ Ga _x Ge _{46-x} Clathrate by CZ method	Ginshiro Utsumi, Hayato Baba, Shota Iwashita and Shinji Munetoh Kyushu University, Japan

Thermoelectric Materials	P-18	Effect of Vacancy in $Ba_8Au_xSi_{46-x}$ Clathrate on Carrier Type by Rietveld Refinement and First-Principles Calculation	Shota Iwashita, Yuki Osakabe, Shota Tatsumi, Yuichi Kotsubo and Shinji Munetoh Kyushu university, Japan
	P-19	Thermoelectric Properties of $Ba_8Au_xGe_ySi_{46-x-y}$ Clathrate at High Temperature	Shinsuke Aramaki, Jyunpei Iwanaga, Yuuki Osakabe and Shinji Munetoh Kyushu University, Japan
	P-20	SPS simultaneous sintering of two powders with different melting points	Kenta Yajima, Shinsuke Aramaki and Shinji Munetoh Kyushu University, Japan
	P-21	Fabrication of single crystal $Ba_8Cu_xSi_{46-x}$ clathrate with composition gradient by two-stage Czochralski method	Hayato Baba, Yuki Osakabe, Shinji Munetoh and Osamu Furukimi Kyushu University, Japan,
	P-22	Thermoelectric properties of Functionally Graded PEDOT/PSS films Synthesized by an Original Gel Film Formation Process	Ryota Maeda ^{1,2} , Hiroshi Kawakami ³ (formerly ²), Yoshikazu Shinohara ² , Yoshiki Takagiwa ² and Ikuzo Kanazawa ¹ 1 Tokyo Gakugei University, Japan 2 National Institute for Materials Science (NIMS), Japan 3 New Energy and Industrial Technology Development Organization (NEDO), Japan
Surface and Interface	P-23	Crystal Structure and Magnetism of Diffusion Phase in High Purity Fe/Si Diffusion Reaction System	X. Ren ¹ , Z. Lei ² , K. Matsuyama ¹ , I. Sasaki ¹ , M. Takezawa ¹ , H. Era ¹ and T. Ogawa ³ 1 Kyushu Institute of Technology, Japan 2 Nippon Koshuha Steel, Japan 3 Fukuoka Industrial Technology Center, Japan
	P-24	Graded Coating of Al-Cu Alloy with Ti-N Film by Reactive DC Sputtering	Tsutomu Sonoda and Akira Watazu National Institute of Advanced Industrial Science and Technology (AIST),
Biological and Optical Functions	P-25	White oxide coating of β Ti-alloy orthodontic wire by atmospheric-pressure plasma treatment	Naho Mitsuishi ¹ , Eri Miura-Fujiwara ² , Makoto Yamada ¹ , Michiko Ito ³ , Tadachika Chiba ¹ , Hisashi Sato ¹ , Masaaki Nakai ⁴ , Toshikazu Akahori ⁵ , Seigo Takashima ³ , Yoshimi Watanabe ¹ , Mitsuo Niinomi ^{5,6,7,8} and Tsutomu Takeuchi ⁹ 1 Nagoya Institute of Technology, Japan; 2 University of Hyogo, Japan; 3 PLACIA, Plasma Center for Industrial Applications, Nagoya Industries Promotion Corporation, Japan; 4 Kinki University, Japan; 5 Meijo University, Japan; 6 Tohoku University, Japan; 7 Osaka University, Japan; 8 Nagoya University, Japan; 9 Takeuchi Katan Ltd., Japan
	P-26 (as O-56)	Evaluation of Optical Properties on FGPJ between Cu and SUS304 for Quality Assurance	Kazuki Iwakiri and Kouichi Nakano Graduate School of Life Science and Systems Engineering Kyushu Institute of Technology, Japan
	P-27	Production of Nano-devices for Cancer Therapy Using Ultra Sonication in Liquid Carbon Dioxide	Eito Arita ¹ , Kenji Mishima ^{1,2} , Tanjina Sharmin ^{1,2} , Taku M. Aida ^{1,2} , Miyuki and Nakamura ^{1,2} 1 Department of Chemical Engineering, Faculty of Engineering, Fukuoka University, Japan 2 Research Center of Composite Material, Fukuoka University, Japan
	P-28	Microencapsulation of Drugs with pH-responsive Polymer for Controlled Release of Drug by PGSS Process of CO ₂	Ryunosuke Mitani ¹ , Kenji Mishima ^{1,2} , Tanjina Sharmin ^{1,2} , Taku M. Aida ^{1,2} and Miyuki Nakamura ^{1,2} 1 Department of Chemical Engineering, Faculty of Engineering, Fukuoka University, Japan 2 Research Center of Composite Material, Fukuoka University, Japan
	P-29	Production of Liposome Using Ultrasonic Irradiation and High Pressure Cell	Hiroyuki Tashiro ¹ , Kenji Mishima ^{1,2} , Taku M. Aida ^{1,2} , Tanjina Sharmin ^{1,2} and Miyuki Nakamura ^{1,2} 1 Department of Chemical Engineering, Faculty of Engineering, Fukuoka University, Japan 2 Research Center of Composite Material, Fukuoka University, Japan
	P-30 (as O-38)	Preparation of Microcapsules coated with Styrene-modified CNF using Supercritical Carbon dioxide	Shinichi Tokunaga, Kenji Mishima, Taku M. Aida, Tanjina Sharmin and Miyuki Nakamura Fukuoka University, Japan
Multifunctions	P-31	Fabrication and characterization of Al-SUS316L FGMs manufactured by spark plasma sintering	Kwangjae Park ¹ , Dasom Kim ¹ , Jehong Park ² , Seungchan Cho ³ , Akira Kawasaki ⁴ , Kwonhoo Kim ¹ and Hansang Kwon ^{1,2} 1 Pukyong National University, South Korea 2 Next-Generation Materials Co., Ltd. (NGM), South Korea 3 Korea Institute of Materials Science, South Korea 4 Tohoku University, Japan
	P-32	Tangle deformation of elastic loop-structures with multiple revolute hinges under uniform compression in a circumferential direction	H Tanaka ¹ , T Nanjo ¹ and Y Shibutani ^{1,2} 1 Osaka University, Japan 2 Vietnam Japan University
	P-33	Single Crystallization Of $Ba_8Pt_xSi_{46-x}$ Clathrate For Improvement Of Thermoelectric Properties	Masahide Yasuda, Hayato Baba, Yuki Osakabe and Shinji Munetoh Kyushu University, Japan

	P-34	Manufacturing P- and N-type polycrystalline $Ba_3Pt_4Si_{16-x}$ clathrates and improvement of thermoelectric performance	Yuichiro Magami, Shota Iwashita, Yuki Osakabe and Shinji Munetoh Kyushu University, Japan
Structural Analysis and Design	P-35	Improvement of Mechanical Properties of Harmonic Structure Nickel Compact via Thermo-Mechanical Processing	M. Nagata ¹ , N. Horikawa ^{1,2} , M. Nakatani ¹ , M. Ota ³ and K. Ameyama ³ 1 Graduate School of Science and Engineering, Ritsumeikan University, Japan 2 Komatsu Ltd., Tokyo, Japan 3 Department of Mechanical Engineering, Ritsumeikan University, Japan
	P-36	Preparation and Characterization of Four-Point Bending Properties of Cellulose Nanofiber/Epoxy Composites	Yingmei Xie, Kenichi Katabira and Fumio Narita Department of Materials Processing, Graduate School of Engineering, Tohoku University, Japan
	P-37	Development and Characterization of Fe-Co Magnetostrictive Filler/Polymer Composite Sheets	Zhenjin Wang, Zhenjun Yang, Kenichi Katabira and Fumio Narita Department of Materials Processing, Graduate School of Engineering, Tohoku University, Japan
	P-38	The numerical calculation and characteristic analysis on quasi-isentropic loading waves by the Mg-Cu graded density materials	Chengcheng Zhang ¹ , Guoqiang Luo ¹ , Qiang Shen ^{1,*} , Jian Zhang ¹ , Lianmeng Zhang ¹ and Jinsong Bai ² 1 State Key Lab of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, P. R. China 2 National Key Laboratory of Shock Wave and Detonation Physics, China Academy of Engineering Physics Institute of Fluid Physics, P. R. China
Processing	P-39	Mechanical Properties of Thermo-mechanically Processed Pure Titanium with Harmonic Structure	Motoki Miyakoshi ¹ , Akito Shimamura ¹ , Mie Kawabata ² , Guy Dirras ³ and Kei Ameyama ² 1 Graduate School of Science and Engineering Ritsumeikan University, Japan 2 Department of Mechanical Engineering Ritsumeikan University, Japan 3 Université Paris, France
	P-40	Structural control and bonding strength evaluation of Fe/resin joints via functionally graded interpenetrating phase layer	Kazuki Noritake, Asuka Suzuki, Naoki Takata, Makoto Kobashi Department of Materials Process Engineering, Graduate school of Engineering, Nagoya University, Japan
	P-41	High Performance Titanium Fabrication by Dehydrogenation of TiH ₂ Powder	Shogo Yamada ¹ , Mie Kawabata ² and Kei Ameyama ² 1 Graduate school of Mechanical Engineering, Ritsumeikan University, Japan 2 Department of Mechanical Engineering, Ritsumeikan University, Japan
	P-42	Unique Deformation Behavior of Cu-9at%Ge Alloy with Harmonic Structure	Naoya Harima ¹ , Shuichi Morinaka ¹ , Mie Kawabata ² , Kei Ameyama ² and Alexsei Vinogradov ³ 1 Graduate school, Ritsumeikan University, Japan 2 Faculty of Science and Engineering, Ritsumeikan University, Japan 3 Faculty of Science and Engineering, NTNU, Norway
	P-43	Investigation of Various Factors on Strength of Plaster 3D Printing Mold	Sohei Hasegawa, Tsukusi Kii, Hisashi Sato and Yoshimi Watanabe Nagoya Institute of Technology, Japan
	P-44 (as O-21)	Heterogeneity of sintering temperature in the boundary between different materials and graphite die on Spark Plasma Sintering Process	Tatsuya Misawa ¹ , Takumi Sakamaki ² , Yuji Kawakami ³ and Masakazu Kawahara ⁴ 1 Department of Electrical and Electronic Engineering, Faculty of Science and Engineering, Saga University, Japan 2 Advanced Engineering School, National Institute of Technology, Kurume College, Japan 3 Department of Materials System Engineering, National Institute of Technology, Kurume College, Japan 4 Kawahara SPS Technical Office, Japan
Manufacturing	P-45	Porous Graded Tungsten by Tape-casting using Temporary Space-holder	Jian Zhang, Shuai Ge, Dongqing Zhou, Guoqiang Luo, Qiang Shen and Lianmeng Zhang State Key Lab of Advanced Technology for Materials Synthesis and Processing, Wuhan University of Technology, P. R. China,
	P-46	Harmonic Structure Design of Al and Al Alloys by SPD-PM Process	Kazuaki Aoi ¹ , Takayuki Sahara ² , Mie Kawabata ³ and Kei Ameyama ³ 1 Graduate School of Science and Engineering, Ritsumeikan University, Japan 2 Mitsubishi Logisnext Co.LTD, Japan 3 Faculty of Science and Engineering, Ritsumeikan University, Japan
	P-47 (as O-74)	Fabrication And Characterization Of Functionally Graded Fe/W Composites	S. Heuer ¹ , J. Matejíček ² , M. Vilémová ² , T. Lienig ¹ , G. Pintsuk ¹ , J.W. Coenen ¹ , W. Theisen ³ and Ch. Linsmeier ¹ 1 Forschungszentrum Jülich GmbH, Institut für Energie und Klimaforschung - Plasmaphysik, Germany 2 Institute of Plasma Physics AS CR, v. v. i., Department of Materials, Engineering, Czech Republic 3 Lehrstuhl Werkstofftechnik, Ruhr-Universität Bochum, Germany