

Program of  
**Joint Symposium of 3<sup>rd</sup> Innovative  
Measurement and Analysis for  
Structural Materials and  
TIA-Fraunhofer workshop**

第3回 内閣府 SIP 革新的構造材料 先端計測拠点  
TIA-Fraunhofer 合同国際シンポジウム

***SIP-IMASM 2017***  
Innovative measurement and analysis for structural materials

---

Oct. 3 – 5, 2017  
AIST Tsukuba Center, Auditorium



The SIP-IMASM is supported by the Structural Materials for Innovation (SM<sup>4</sup>I), Cross-ministerial Strategic Innovation Promotion Program (SIP).

Timetable of SIP-IMASM 2017

Oct. 3		Oct. 4		Oct. 5		Oct. 6
12:00~	Registration	9:30~	NDT Keynote 2 (40+10) H. Heuer (Fraunhofer)	9:00~	CFRP Keynote 4 (40+10) P. Feraboli (Lamborghini)	Additional lab tour upon request
13:30~	Guest speech, R. Kuroda(CAO) Welcome speech, R. Chubachi (President of AIST) Introduction, M. Ohkubo (AIST)	10:20~	Maintenance Invited talk 2 T. Takagi (Tohoku U.)	9:50~	Lightweight Invited talk 4 K. Mase (TOYOTA)	
14:00~	CFRP Keynote 1 (40+10) K. Potter (U. Bristol)	10:50~	Coffee	10:20~	Coffee	
14:50~	Design tool Invited talk 1 S. Fujimoto (NSSMC)	11:10~	Measurement SIP-IMASM (Metal, CFRP) M. Ukibe (AIST)	10:40~	CFRP Invited talk 5 P. Feraboli (Gemini)	
15:20~	Coffee	11:30~	Measurement SIP-IMASM (Metal, CFRP) M. Tezura (Tsukuba U.)	11:10~	Measurement SIP-IMASM (Assembly) S. Li (AIST)	
15:40~	Measurement SIP-IMASM (CFRP) A. Uedono (Tsukuba U.)	11:50~	Lunch	11:30~	Closing	
16:00~	Measurement SIP-IMASM (CFRP) M. Kimura (KEK)	13:30~	NDT Keynote 3 (40+10) B. Valeske (Fraunhofer)	13:00~	Lunch	
16:20~	Measurement SIP-IMASM (CFRP) N. Terasaki (AIST)	14:20~	Measurement Invited talk 3 H. Imai (Nissan arc)	13:10~	Opening	
16:40~	Photo	14:50~	Measurement SIP-IMASM (Ceramics) Y. Takeichi (KEK)	13:40~	Talk 1 H. Heuer (Alliance) (Fraunhofer IKTS)	
16:50~	SIP-IMASM Posters	15:10~	Measurement SIP-IMASM (Ceramics) H. Mamiya (NIMS)	14:10~	Talk 2 B. Valeske (Adhesion) (Fraunhofer IZFP)	
18:00~	Banquet	15:30~	Coffee	14:40~	Talk 3 A. Margraf (Fiber) (Fraunhofer IGCV)	
20:00~		15:50~	Measurement SIP-IMASM (Metal) T. Sasaki (NIMS)	14:50~	Talk 4 F. Manis (Fiber) (Fraunhofer IGCV)	
		16:10~	Measurement SIP-IMASM (Metal, CFRP) T. Nagoshi (AIST)	15:10~	Coffee	
		16:30~	Measurement SIP-IMASM (Metal) A. Yamazaki (Tsukuba U.)	15:30~	Invited talk 6 C. Sato (Adhesion) (40) (AIST/TIT)	
		16:50~	Measurement SIP-IMASM (Ceramics) M. Kimura (KEK)	16:10~	Talk 5 K. Oguchi (Simulation) (University of Tokyo)	
				16:40~	Talk 6 Y. Shimoi (Simulation) (AIST)	
				17:10~	Closing	
				17:20~		

## 3<sup>rd</sup> Symposium on Innovative Measurement and Analysis for Structural Materials (SIP-IMASM2017) and TIA-Fraunhofer workshop

Oct.3-5 (SIP-IMASM), Oct. 5 (TIA-Fraunhofer Workshop)  
National Institute of Advanced Industrial Science and Technology(AIST)  
Tsukuba Central, Auditorium

**SIP-IMASM**  
Innovative measurement and analysis for structural materials

**【10/3(Tue.)】**

12:00 Registration

「Session chair: Paul Fons (AIST)」

13:30 Guest speech Ryo Kuroda (CAO)

Welcome speech Ryoji Chubachi (President of AIST)

Introduction Masataka Ohkubo (AIST) "Welcome to SIP-IMASM 2017"

14:00 **Keynote 1** Kevin Potter (U. Bristol) "Composites development in Bristol, Bristol Composites Institute (ACCIS) and the National Composites Centre"

14:50 **Invited** Shin-etsu Fujimoto (NSSC) "Development of Polymer Design Tool for CFRP"

15:20 **Coffee Break**

15:40 IMASM-1 Akira Uedono (U.Tsukuba) "Behaviours of Free Volumes During Curing Processes of Epoxy Resins for CFRP Studied by Positron Annihilation"

16:00 IMASM-2 Masao Kimura (KEK) "In situ Observation of Crack Initiation and Propagation in CFRP using a Newly-developed XAFS-CT"

16:20 IMASM-3 Nao Terasaki (AIST) "Mechanoluminescent Visualization From Portent Through Process of Destruction on CFRP Structural Material"

16:40 **Photo**

16:50 Poster session (see page 5-6)

18:00 **Banquet**

## 【10/4(Wed.)】

「Session chair: Hiroaki Mamiya (NIMS)」

- 09:30 **Keynote 2** Henning Heuer (Fraunhofer IKTS) "Non-Destructive Testing for Composite Materials: From Laboratory Feasibility Studies to Industrial Proofed Solutions"
- 10:20 **Invited** Toshiyuki Takagi (Tohoku U.) "Functional Fiber Reinforced Plastic and Nondestructive Evaluation for Advanced Maintenance"

### 10:50 Coffee Break

- 11:10 IMASM-4 Masahiro Ukibe (AIST) "Chemical and Electronic State X-ray Emission Analysis using SEM Equipped with Superconducting Energy Dispersive Spectroscopy for Carbon Fibers and Resins in CFRP"
- 11:30 IMASM-5 Manabu Tezura (U.Tsukuba) "Development of In Situ High-temperature Transmission Electron Microscopy at the University of Tsukuba in SIP-IMASM project"

### 11:50 Lunch

「Session chair: Akira Uedono (U. Tsukuba)」

- 13:30 **Keynote 3** Bernd Valeske (Fraunhofer IZFP) "Nondestructive Characterization and Quality Control of Lightweight Materials and Assemblies (Advanced Joining Technologies)- R&D and Applications in Automotive and Transport Industry"
- 14:20 **Invited** Hideto Imai (NISSAN ARC) "Advanced Analytical Technologies for Multi-materials: Initiatives at NISSAN ARC"
- 14:50 IMASM-6 Yasuo Takeichi (KEK) "Chemical State Mapping of Environmental Barrier Coating using a Newly-developed XAFS-CT"
- 15:10 IMASM-7 Hiroaki Mamiya (NIMS) "Multiscale Characterization of Advanced Ceramics and Alloys in Aerospace Applications"

### 15:30 Coffee Break

- 15:50 IMASM-8 Taisuke Sasaki(NIMS) "Microstructure Characterization of Structural Materials by Laser Assisted 3D Atom Probe"
- 16:10 IMASM-9 Takashi Nagoshi (AIST) "Sample Size Effect on Electrodeposited Sub-10 nm Nanocrystalline Nickel and possible application to CFRP"
- 16:30 IMASM-10 Akiyoshi Yamazaki (U.Tsukuba) "Beam Focusing and Elemental Mapping Using the Ion Microbeam System on the 6 MV Tandem Accelerator at the University of Tsukuba"
- 16:50 IMASM-11 Masao Kimura (KEK) "In situ XAFS/XRD Simultaneous Measurement of Barrier Coating up to 1500C"

## 【10/5(Thu.)】

「Session chair: Masao Kimura (KEK)」

- 09:00 **Keynote 4** Paolo Feraboli (Lamborghini) "Forged Composite as Technology for the Future (Lamborghini ACSL)"
- 09:50 **Invited** Kiyoshiba Mase (TOYOTA) "Prospect of Measurement and Analysis for Lightweight Vehicles"
- 10:20 **Coffee Break**
- 10:40 **Invited** Paolo Feraboli (Gemini) "CFSMC Technology as the Future for High Volume Composite Applications (Gemini Composites)"
- 11:10 IMASM-12 Shien Ri (AIST) "Full-field Displacement and Strain Measurement by Moire Technique and its Practical Application"
- 11:30 Closing
- 11:40 **Lunch**

## TIA-Fraunhofer Workshop

13:00 Opening

「Session chair: Lorenz Granrath (AIST)」

- 13:10 **Talk 1** Henning Heuer (Fraunhofer IKTS) "Fraunhofer Composite Lightweight Alliance"
- 13:40 **Talk 2** Bernd Valeske (Fraunhofer IZFP) "Nondestructive Characterization and Evaluation of Adhesive Bondings- R&D Results and Technology Development for Applications in Industry"
- 14:10 **Talk 3** Andreas Margraf (Fraunhofer IGCV) "Online Monitoring and Classification of Carbon Fiber Production Defects using Scalable Line Scan Optics and Computer Vision"
- 14:40 **Talk 4** Frank Manis (Fraunhofer IGCV) "Correlation Between Micro- and Macroscopic Characterization of Recycled Carbon Fibre Materials"
- 15:10 **Coffee Break**
- 15:30 **Invited** Chiaki Sato (AIST/Tokyo Tech) "Adhesion and Interfacial Phenomena Research Laboratory (AIRL)"
- 16:10 **Talk 5** Kanae Oguchi (U.Tokyo) "Numerical Simulation of Mid-IR Laser Ultrasound Testing for CFRP"
- 16:40 **Talk 6** Yukihiro Shimoi (AIST) "Adhesion Behavior of Polymer-Metal Interfaces: A Molecular Dynamics Simulation Study"
- 17:10 Closing

## Poster presentation of the SIM-IMASM team 【10/3(Tue)】

### CFRP & Polymer

- 1-1 Akira Uedono (U. Tsukuba) "Behaviors of Free Volumes During Curing Processes of Epoxy Resins for CFRP studied by Positron Annihilation"
- 1-2 Manabu Tezura (U. Tsukuba) "High-Resolution Transmission Electron Microscopy of Interfaces in Carbon Fiber Reinforced Plastics"
- 1-3 Hong Jun Zhang (U. Tsukuba) "Free-Volume Hole Properties of Epoxy Resins for CFRP studied by Positron Annihilation and PVT Experiments"
- 1-4 Nao Terasaki (AIST) "Mechanoluminescent Visualization: From portent through process of destruction on CFRP structural material"
- 1-5 Kazuya Kikunaga (AIST) "Evaluation of Electrical Conductivity of CFRP by Electrostatic Charge Distribution"
- 1-6 Masahiro Ukibe (AIST) "Chemical and Electronic State X-ray Emission Analysis using SEM equipped with Superconducting Energy Dispersive Spectroscopy for Carbon Fibers and Resins in CFRP"
- 1-7 Qinghua Wang (AIST) "Determination of Microscale Deformation Distributions of CFRP under Three-point Bending from Sampling Moiré Fringes"
- 1-8 Harumichi Tanigawa (AIST) "Fatigue Damage Evaluation of Epoxy Resin using Positron Annihilation"
- 1-9 Toshiki Watanabe (KEK) "In situ Observation of Crack Initiation and Propagation in CFRP using a Newly-Developed XAFS-CT"
- 1-10 Yumiko Takahashi (KEK) "Non-Destructive Characterization of CFRP using Synchrotron X-ray CT"
- 1-11 Tomohiro Ishii (KEK) "In Situ Observation of Crack Initiation and Propagation in CFRP using X-CT"
- 1-12 Masahiro Kusano (NIMS) "Non-Destructive Evaluation of Defects in FRP by Mid-IR Laser Ultrasonic Testing"
- 1-13 Kimiyoshi Naito (NIMS) "Interfacial Shear Strength Measurement for Interface-Controlled Carbon Fibers"
- 1-14 Hisashi Yamawaki (NIMS) "Detection of Delamination in CFRP plate using ultrasonic visualization technique"
- 1-15 Kanae Oguchi (U. Tokyo) "Numerical Simulation of Mid-IR Laser Ultrasound Testing for CFRP"

### Metals

- 2-1 Takashi Nagoshi (AIST) "Sample Size Effect on Electrodeposited Sub-10 nm Nanocrystalline Nickel and possible application to CFRP"
- 2-2 Wenfeng Mao (AIST) "Characterization of Defects in Mechanically Fatigued Stainless Steel by Positron Annihilation Spectroscopy"
- 2-3 Tomoya Senda (AIST) "Positron Lifetime and EBSD Studies of Mechanically Fatigued Titanium Alloy"
- 2-4 Paul Fons (AIST) "XAFS Measurements of VN Nano-precipitates in 9%Cr High-temperature Steel Alloys"
- 2-5 Taisuke Sasaki (NIMS) "Microstructure Characterization of Structural Materials by Laser Assisted 3D Atom Probe"

- 2-6 Norimichi Watanabe (NIMS) "Characterization of Boron Distribution in Heat-resistant Steels by TOF-SIMS"
- 2-7 Norimichi Watanabe (NIMS) "Interface Melting in the Si/Al Interface Observed by TOF-SIMS"
- 2-8 Hongxin Wang (NIMS) "Informatics-aided Confocal Raman Microscopy for 3D Characterization of Stress in Silicon"
- 2-9 Hiroaki Mamiya (NIMS) "Study of the Nanoparticles Influence on the Mechanical Properties of Ni-fee N-containing ODS Alloy by Alloy Contrast Variation Analysis"

### **Ceramics & Coating**

- 3-1 Hiroaki Mamiya (NIMS) "Multiscale Characterization of Advanced Ceramics and Alloys in Aerospace Applications"
- 3-2 Shogo Kikuchi (U. Tsukuba) "The Development of In Situ High Temperature Transmission Electron Microscopy for Heat-Resistant Ceramics"
- 3-3 Yasuo Takeichi (KEK) "Chemical State Mapping of Environmental Barrier Coating using a Newly-Developed XAFS-CT"
- 3-4 Kenichi Kimijima (KEK) "In situ XAFS/XRD Simultaneous Measurement of Barrier Coating up to 1500C"

### **Measurement**

- 4-1 Akiyoshi Yamazaki (U. Tsukuba) "Profiling of Hydrogen in Thick Films with Microbeam Transmission ERDA Method"
- 4-2 Akiyoshi Yamazaki (U. Tsukuba) "Two-Dimensional Mapping for Additive Light Elements in Structural Materials using Microbeam PIXE Method"
- 4-3 Hideki Kobayashi (U. Tsukuba) "Development of In Situ High-Temperature Transmission Electron Microscopy using Micrometer Regional Pinpoint Heating"
- 4-4 Shien Ri (AIST) "Full-Field Displacement and Strain Measurement by Moire Technique and its Practical Application"
- 4-5 Keiichi Hirano (KEK) "X-ray Analyzer-based Phase-Contrastcomputed Laminography II"

## **Welcome to the joint symposium of 3<sup>rd</sup> Innovative Measurement and Analysis for Structural Materials (SIP-IMASM2017) and TIA-Fraunhofer workshop**

The international joint symposium is open to the public and is supported by the cross-ministerial strategic innovation promotion program (SIP) of the Cabinet Office – Government of Japan,<sup>1</sup> Japan Science and Technology (JST),<sup>2</sup> and TIA open innovation platform.<sup>3</sup> The symposium is held under the auspices of the Innovative Measurement and Analysis for Structural Materials (SIP- IMASM) team,<sup>4</sup> which is part of the Structural Materials for Innovation (SM<sup>4</sup>I) program,<sup>5</sup> one of the eleven SIP programs, led by Professor Teruo Kishi. The SM<sup>4</sup>I program is concerned with development of innovative materials for the transportation industry, especially aircrafts. The joint symposium focuses on the measurement and analysis of light composite materials like Carbon Fiber Reinforced Plastics (CFRP) for aircrafts and automobiles. In addition, we cover heat-resistant alloys, ceramics coatings, and manufacturing.

The 3<sup>rd</sup> international symposium, SIP-IMASM2017, is held jointly with the TIA-Fraunhofer workshop from October 3 to 5 2017 at the auditorium in the AIST Tsukuba Campus, Japan.<sup>7</sup> An additional lab tour can be arranged upon request on October 6. The sessions include keynote talks, invited talks, and annual reports from the SIP- IMASM team members of AIST, NIMS, University of Tsukuba, KEK, and the University of Tokyo. The SIP-IMASM team is developing unconventional measurement instruments and measurement protocols to acquire information that is inherent in structural materials and essential for the improvement of mechanical performance and lifetime prediction.<sup>4</sup>

In this symposium, we have invited the leading authorities in structural materials development, characterization, and related fields, and shall present our latest R&D results in an attempt to promote cooperation with researchers over an extensive range of structural materials scientists and analytical scientists. For international collaboration, the TIA-Fraunhofer session based on the recent AIST-Fraunhofer MOU is organized.

The SIP-IMASM team makes use of a wide range of world leading research facilities including a synchrotron radiation source, an ion beam accelerator, and high-intensity positron beams. Together with these facilities, we employ unconventional X-ray spectroscopy with superconductivity; nano-characterization techniques such as the 3D atom probe and TEM operatable at >1000 °C; and nondestructive testing techniques such as multiscale sampling moiré-DIC displacement imaging and mechanoluminescence imaging. These advanced techniques are integrated with mechanical testing including microfabrication test samples and simulation. The reports of the 1<sup>st</sup> and 2<sup>nd</sup> SIP-IMASM symposium are available online.<sup>8,9</sup>

Masataka Ohkubo, Chair  
Sept. 26, 2017

1. **CAO:** <http://www8.cao.go.jp/cstp/gaiyo/sip/index.html> (Japanese)
2. **SIP:** <http://www.jst.go.jp/sip/> (Japanese)
3. **TIA:** <https://www.tia-nano.jp/en/index.html>
4. **SIP-IMASM team:** <https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/index.html>
5. **SM<sup>4</sup>I:** <http://www.jst.go.jp/sip/k03/sm4i/index.html> (Japanese),
6. **SM<sup>4</sup>I:** [http://www.jst.go.jp/sip/k03/sm4i/dl/jst\\_pamphlet\\_Japan.pdf](http://www.jst.go.jp/sip/k03/sm4i/dl/jst_pamphlet_Japan.pdf)
7. **Access to AIST:** [http://www.aist.go.jp/aist\\_e/guidemap/tsukuba/tsukuba\\_map.html](http://www.aist.go.jp/aist_e/guidemap/tsukuba/tsukuba_map.html)
8. **SIP-IMASM2015:** [https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/sympo/2015/Annual\\_Report2015\\_SIP-IMASM\\_20150929v7.pdf](https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/sympo/2015/Annual_Report2015_SIP-IMASM_20150929v7.pdf)
9. **SIP-IMASM2016:** [https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/sympo/2016/SIP-IMASM\\_abstract\\_report\\_2016.pdf](https://staff.aist.go.jp/m.ohkubo/SIP-IMASM/sympo/2016/SIP-IMASM_abstract_report_2016.pdf)