

Program of
**Joint Symposium of 3rd 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 (SM⁴I), Cross-ministerial Strategic Innovation Promotion Program (SIP).

Tentative timetable of SIP-IMASM 2017

Oct. 3		Oct. 4		Oct. 5		Oct. 6
12:00~	Registration	9:30~	NDT	9:00~	CFRP	Additional lab tour upon request
13:30~	Guest speech, R. Kuroda (CAO) + PJ overview M. Ohkubo (AIST)	10:20	Maintenance	9:50~	Lightweight	
14:00~	CFRP	10:20~	Invited talk 2	10:20	Invited talk 4	
14:50	Design tool	10:50	Coffee	10:40~	CFRP	
15:20	Measurement	11:10~	Measurement	11:10	Measurement	
15:40~	Measurement	11:30~	Measurement	11:30	SIP-IMASM (Assembly) S. Li (AIST)	
16:00~	Measurement	11:50	Lunch	11:40	Closing	
16:20~	Measurement	13:30~	NDT	Lunch	opening	
16:40~	Photo	14:20	Measurement	13:10~	TIA-Fraunhofer workshop	
16:50~	SIP-IMASM Posters	14:20~	Invited talk 3	13:40~	Talk 1	
18:00~	Banquet	14:50	Measurement	14:10	Talk 2	
		15:10~	Measurement	14:50	Invited talk 6	
		15:30	Coffee	15:10~	Coffee	
		15:50~	Measurement	15:40	Talk 3	
		16:10~	Measurement	15:40~	Talk 4	
		16:30~	Measurement	16:10	Talk 5	
		16:50~	Measurement	16:40	Talk 6	
		17:10		17:10	closing	
20:00				17:20		

3rd 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)

Introduction Masataka Ohkubo (AIST)

"Welcome to SIP-IMASM 2017"

14:00 Keynote 1 Kevin Potter (U. Bristol)

"The Development of Composites Research in Bristol University, 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: Masao Kimura (KEK)」

- 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 (KEK) "Multiscale and Multidimensional Microstructure Analysis on Advanced Ceramics in Aerospace Applications"
- 15:30 Coffee Break
- 15:50 IMASM-8 Taisuke Sasaki(NIMS) "Microstructure Analysis of Structural Materials by 3DAP/TEM"
- 16:10 IMASM-9 Takashi Nagoshi (AIST) "Sample Size Effect on Electrodeposited Sub-10 nm Nanocrystalline Nickel"
- 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: Akira Uedono (U. Tsukuba)」

- 09:00 Keynote 4 Paolo Feraboli (Lamborghini) "Lamborghini and Composite Material Applications (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) "Forged Composite/Chopped Carbon Fiber Materials (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

TIA-Fraunhofer Workshop

- 13:00 Opening
- 「Session chair: Lorenz Granrath (AIST)」
- 13:10 Talk 1 Henning Heuer (Fraunhofer IKTS) "Fraunhofer and Fraunhofer Composite 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 Chiaki Sato (AIST/TIT) "Adhesion and Interfacial Phenomena Research Laboratory (AIRL)"
- 14:50 Coffee Break
- 15:10 Talk 4 Andreas Margraf (Fraunhofer IGCV) "Online Monitoring and Classification of Carbon Fiber Production Defects using Scalable Line Scan Optics and Computer Vision"
- 15:40 Talk 5 Frank Manis (Fraunhofer IGCV) "Correlation Between Micro- and Macroscopic Characterization of Recycled Carbon Fibre Materials"
- 16:10 Talk 6 Kanae Oguchi (U.Tokyo) "Numerical Simulation of Mid-IR Laser Ultrasound Testing for CFRP"
- 16:40 Talk 7 Hiroyuki Shimoi (AIST) "Molecular Simulation for Adhesion Interface"
- 17:10 Closing

Poster presentation 【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 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 Nao Terasaki (AIST) "TBA"
- 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 Hongxin Wang (NIMS) "In-situ Nanoscale Characterization of Mechanical Response of CFRP"
- 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"
- 2-2 Wenfeng Mao (AIST) "Characterization of Defects in Mechanically Fatigued Stainless Steel by Positron Annihilation Spectroscopy"
- 2-3 Tomoya Senda (AIST) "Fatigue Damage Evaluation of Ti-6Al-4V using EBSD and Positron Annihilation"
- 2-4 Paul Fons (AIST) "TBA"
- 2-5 Yasuhiro Niwa (KEK) "Dynamic Observation of Fracture of Metals using Synchrotron Radiation"
- 2-6 Taisuke Sasaki (NIMS) "Microstructure Analysis of Structural Materials by 3DAP/TEM"
- 2-7 Norimichi Watanabe (NIMS) "Characterization of Precipitates Containing Boron in Heat-resistant Steels using TOF-SIMS"
- 2-8 Hiroaki Mamiya (NIMS) "Contrast Variation Analysis of Small Angle Scattering for a Heat Resistant Alloy"

Ceramics & Coating

- 3-1 Hiroaki Mamiya (NIMS) "Multiscale and Multidimensional Microstructure Analysis on Advanced Ceramics in Aerospace Applications"
- 3-2 Shogo Kikuchi (U. Tsukuba) "In Situ High-Temperature Transmission Electron Microscopy of Thermal Barrier Ceramics Coating"
- 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) "In Situ High-Temperature Transmission Electron Microscopy using Micrometer Regional Pinpoint Heating"
- 4-4 Shien Li (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
3rd 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,¹ Japan Science and Technology (JST),² and TIA open innovation platform.³ The symposium is held under the auspices of the Innovative Measurement and Analysis for Structural Materials (SIP- IMASM) team,⁴ which is part of the Structural Materials for Innovation (SM⁴I) program,^{5,6} one of the eleven SIP programs, led by Professor Teruo Kishi. The SM⁴I 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 3rd 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.⁷ 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.⁴

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 1st and 2nd SIP-IMASM symposium are available online.^{8,9}

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. SM⁴I: <http://www.jst.go.jp/sip/k03/sm4i/index.html> (Japanese),
6. SM⁴I: 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
8. SIP-IMASM2015: 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