

International Workshop *Innovative and Sustainable Metallurgy*

FRANCE
Abbaye des Prémontrés
Pont-à-Mousson

16>18 OCT 2024



Wednesday, October 16, 2024 | 9:30 a.m. – 12:15 p.m.

09:30 a.m.: Welcome Coffee

Opening – The Story of LabEx DAMAS

10:30 a.m.: Introduction – Welcome

Thierry Grosdidier (LEM3, FR), Nathalie Gey (LEM3, FR),
Sébastien Allain (IJL, FR) and Benoît Appolaire (IJL, FR)

François Montaigne (director of IJL, FR), Hamid Zahrouni (director of LEM3, FR)
and Nicolas Stein (director of M4, FR)

- **11:00 a.m.:** *On the Genesis of LaBex DAMAS: A Story About Nucleation and Growth?*
Sabine Denis (IJL, FR) and **Laszlo S. Toth** (LEM3, FR)
- **11:30 a.m.:** *Future in Metallurgy Under the Perspective of a Sustainable Development*
Yves Bréchet (Saint-Gobain, FR)

12:15 p.m.: Lunch

Wednesday, October 16, 2024 | 1:30 p.m. – 6:15 p.m.

Alloy Design and Microstructure Optimization

Organizers: Sébastien Allain, Julien Zollinger (IJL, FR), Alain Hazotte (LEM3, FR), Sabine Denis and Olivier Bouaziz (LEM3, FR)

1:30 p.m.: Introduction

Sébastien Allain and Julien Zollinger

New Alloy Formulations and Recycling Issues

- **1:45 p.m.:** *Scrap Metal Consolidation*
C. Cem Tasan (Massachusetts Institute of Technology, USA)
- **2:20 p.m.:** *Innovative and Sustainable Metallurgy in Aeronautics: Status, Development Opportunities and Challenges at SAFRAN*
Pierre Sallot (SAFRAN, FR)
- **2:55 p.m.:** *An Overview of New Opportunities Provided by Hybrid Modelling Coupling Multi-Physical and Data Models*
Frédéric Bonnet (ArcelorMittal, FR)

3:30 p.m.: Coffee Break

Solidification Processes and Associated Mechanisms

- **4:00 p.m.:** *The Emergence of Complex Microstructures During Solidification: A multiscale Challenge*
Damien Tournet (IMDEA Materials Institute, SP)
- **4:35 p.m.:** *Development of Isomorphous Inoculants for Titanium Alloys*
Jacob R. Kennedy (IJL, Nancy)

Solid State Phase Transformations

- **5:00 p.m.:** *Interface-Related Phenomena in Displacive Transformations of Steel*
Tadashi Furuhashi (Tohoku University, JP)
- **5:35 p.m.:** *Phase Transformations, Microstructure Heterogeneities and Resulting Mechanical Properties in As-Quenched and Tempered Martensitic Steels*
Juan Macchi (GPM, FR)
- **5:55 p.m.:** *Exploring Bainite: Origin of the Barrier, Carbon Supersaturation and the Impact of Deformation*
Imed-Eddine Benrabah (IJL, FR)

Thursday, 17 October 17, 2024 | 8:15 a.m. – 12:20 p.m.

Cutting-Edge Microstructure Characterization

Organizers: Nathalie Gey, Thomas Shenk (IJL, FR), Lionel Germain (LEM3, FR) and Vladimir Esin (IJL, FR)

8:15 a.m.: Introduction

Nathalie Gey and Thomas Schenk

Metallurgy by Synchrotron

- **8:30 a.m.:** *3D and 4D Orientation and Strain Mapping in Polycrystalline Materials*
Wolfgang Ludwig (MATEIS – ESRF, FR)
- **9:05 a.m.:** *Modeling the Effect of the Core Region of Dislocations to X-ray or Neutron Diffraction Patterns*
Gabor Ribarik (Eötvös Loránd University, HU)
- **9:40 a.m.:** *Bayesian Inference Approach to Estimating Elastic Constants of β Metastable Titanium Alloys Using High-Energy X-ray Diffraction and Micromechanical Modeling*
Ravi raj purohit Purushottam Raj Purohit (Xnovo Technology, DN)

10:00 a.m.: Coffee Break

Electron Diffraction-Based Microscopy

- **10:30 a.m.:** *Recent Progress in Automation in SEM-Based Microscopy – from 2D to 3D and In Situ Deformation and Heating*
Ali Gholinia (Manchester University, UK)
- **11:05 a.m.:** High-Angular Resolution in the Scanning Electron Microscope: Homography-Based Approach & Application Examples
Clement Ernould (IRT St Exupery, FR)
- **11:25 a.m.:** *In Situ TEM Straining: Understanding the Behavior of Metals and Alloys from the Motion of Their Dislocations*
Marc Legros (CEMES, FR)
- **12:00 p.m.:** *Kinetics and Mechanism of Austenite Decomposition in Carbonitrided Low-Alloy Steel*
Hugo Van-landeghem (SIMAP, FR)

12:20 p.m.: Lunch

Thursday, October 17, 2024 | 2:00 p.m. – 6:25 p.m.

Multiscale Modelling in Metallurgy

Organizers: Benoit Appolaire (IJL, FR), Stéphane Berbenni (LEM3, FR), Imed-Eddine Benrhaba (IJL, FR), Julien Guérolé (LEM3, FR) and Jean-Sébastien Kroll-Rabotin (LEM3, FR)

2:00 p.m.: Introduction

Benoit Appolaire and Stéphane Berbenni

IA-Machine Learning

- **2:15 p.m.:** *Rethinking Materials Simulation with Machine-Learning Strategies*
Remi Dingreville (Sandia National Laboratories, USA)
- **2:50 p.m.:** *Application of Data Science on Mechanical Properties of Crystalline Materials*
Xiaolei Chen (ArcelorMittal, FR)

3:10 p.m.: Coffee Break

Cross-Scale Modelling

- **3:40 p.m.:** *Cosserat Crystal Plasticity and Recrystallization*
Samuel Forest (MINES Paris, FR)
- **4:15 p.m.:** *Alloy Plasticity: From the Atoms Up*
David Rodney (Université de Lyon, FR)
- **4:50 p.m.:** *Model-Free Data-Driven Approaches for Multiscale Mechanics of Solids*
Laurent Stainier (Université de Nantes, FR)

7:30 p.m.: Gala Dinner at the Abbey

Friday, October 18, 2024 | 8:15 a.m. – 12h15 p.m.

Innovative Techniques in Metal Processing

Organizers: Thierry Grosdidier, Pascal Laheurte (LEM3, FR), Laszlo S. Toth and Julien Martin (IJL, FR)

8:15 a.m.: Introduction

Laszlo S. Toth and Julien Martin

Additive Manufacturing

- **8:30 a.m.:** *Processing-Structure-Properties in Metals Additive Manufacturing (MAM)*
Tony Rollett (Carnegie Mellon, USA)
- **9:05 a.m.:** *Metal Additive Manufacturing for the Railway Industry: Recycled Materials and Geometric Solutions for the Supply of Mechanical Components with Optimized Resources Efficiency*
Paul Didier (PINT, FR)

Severe Plastic Deformation Processes

- **9:30 a.m.:** *Enhancing Alloy Microstructures and Deformation Process Efficiency via High Volume Surface Imaging and Convolutional Neural Network Analysis*
Terry Lowe (Colorado School of Mines, USA)
- **10:05:** *New “Industrially Relevant” Cyclic SPD Processes with Controlled Properties*
Satish V Kailas (IISc Bangalore, IN)

10:30 a.m.: Coffee Break

Surface Modifications and Coatings

- **11:00 a.m.:** *Recent Advances in Electrolytic Plasma Technologies for Surface Engineering of Light Alloys*
Aleksey Yerokhin (University of Manchester, UK)
- **11:35 a.m.:** *Development of Ceramic-Based Composite Coatings by Combining Cold-Spray Deposition and Plasma Electrolytic Oxidation*
Julien Martin (IJL, FR)

12:00 p.m.: Lunch

Friday, October 18, 2024 | 1:30 p.m. – 5:30 p.m.

Scientific Challenges in Metallurgy for a Sustainable Society

Organizers: Thibault Quatravaux (IJL, FR), Thierry Grosdidier, Olivier Mirgoux (IJL, FR) and Fabrice Patisson (IJL, FR)

1:30 p.m.: Introduction

Thibault Quatravaux and Thierry Grosdidier

Hydrogen Storage and Transportation

- **1:45 p.m.:** *Toward Room-Temperature Hydrogen Storage with High-Entropy Hydrides*
Kaveh Edalati (Kyushu University, JP)
- **2:20 p.m.:** *Mg-Ni Alloys Processed by Fast Forging for Hydrogen Storage*
Patricia Derango (Institut NEEL, FR)

Decarbonation of the Steelmaking Industry

- **2:45 p.m.:** *Direct Reduction: Key Technology Concepts and Its Role on Steelmaking Decarbonization*
José Barros Lorenzo (ArcelorMittal, FR)
- **3:20 p.m.:** *Specific Challenges Related to CO₂ Reduction in the Foundry Industry*
Neill Mc Donald (Saint-Gobain PAM Canalisation, FR)
- **3:55 p.m.:** *Sustainable Steel Through Hydrogen Plasma Smelting Reduction of Iron Ores*
Isnaldi R. Souza Filho (IJL, FR)

4:30 p.m.: Closing of the Workshop