

Preliminary Program
(August 26, 2022)

**Nanomechanical Testing in Materials
Research and Development VIII**

**October 2-7, 2022
Le Méridien Lav Split
Split, Croatia**

Conference Chair

**Sandra Korte-Kerzel
RWTH Aachen University, Germany**



Engineering Conference International
32 Broadway, Suite 314 - New York, NY 10004, USA
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Sunday, October 2, 2022

09:30 – 10:00 Check-in for Optional Tutorial Session (Vis – conference office)

10:00 – 13:00 **Tutorial Session**

13:00 – 14:00 Lunch (on your own)

15:00 – 16:30 Check-in for Conference (Vis – conference office)

Session I: Nanomechanics under extreme conditions

Chair: Sandra Korte-Kerzel, RWTH Aachen University, Germany

16:30 – 16:40

Conference Welcome

Sandra Korte-Kerzel, RWTH Aachen University, Germany
Larry Kabacoff, ECI Technical Liaison

16:40 – 17:20

Progress in the development of high strain rate nanoindentation testing

George Pharr, Texas A&M University, USA

17:20 – 17:50

In situ micromechanics during hydrogen charging: Effect of diffusible hydrogen on BBC Fe-based alloys and hydrogen protection through hydrogen barrier coatings

Maria Jazmin Duarte Correa, MPIE, Germany

17:50 – 18:10

In situ deformation observation via EBSD and EDS during high temperature tensile testing

Sebastian Krauss, Carl Zeiss Microscopy GmbH, Germany

18:10 – 18:30

In-situ nanomechanical testing at elevated humidities

Igor Zlotnikov, B CUBE, Germany

18:30 – 21:30

Opening Reception and Dinner (Gooshter Beach Club)

Monday, October 3, 2022

07:30 – 09:00 Breakfast buffet

Session II: Crystal plasticity

Chair: Marco Sebastiani, Roma TRE University, Italy

09:00 – 09:40

Keynote

On the contribution of nanomechanical testing to the study of Earth mantle deformations

Patrick Cordier, University of Lille, France

09:40 – 10:00

Orientation-dependent plastic deformability in micropillar compression of oxide ceramics

Hiroshi Masuda, University of Tokyo, Japan

10:00 – 10:30

Solid solution hardening effects on structural evolution and mechanical properties of nanostructured high entropy alloys

Karsten Durst, Technical University of Darmstadt, Germany

10:30 – 10:50

Plastic deformation of microsamples: Intermittent dislocation avalanches and their acoustic emission

David Ugi, Eötvös Lorand University, Hungary

10:50 – 11:30

Coffee Break

11:30 – 12:00

Plasticity of the C_{15} - $CaAl_2$ Laves phase at room temperature

Carl F. Kusche, RWTH Aachen, Germany

12:00 – 12:20

On the mechanistic origin of the enhanced strength and ductility in rare earth-based Mg alloys

Henry Ovri, Helmholtz Zentrum Hereon, Germany

12:20 – 12:50

Orientation, temperature and strain rate effects in deformation twinning of magnesium

Xavier Maeder, EMPA, Switzerland

13:00 – 14:30

Lunch

14:30 – 16:30

Networking / Time for *ad hoc* discussions

Session II: Crystal plasticity (continued)

Chair: Ralph Spolenak, ETH Zurich, Switzerland

16:30 – 16:50

Deformation twinning in Cr_2AlC MAX phase single crystals: A nanomechanical testing study

Christophe Tromas, Université de Poitiers, France

16:50 – 17:10

Micromechanical study of a precipitation-hardened dual phase high-entropy alloy

Szilvia Kalacska, University of St.-Etienne, France

17:10 – 17:30

Miniaturization effects on the tensile behavior of multicrystalline and polychristalline nickel-based superalloy: Influence of grain size, free surface and precipitation state

Damien Texier, Institut Clément Ader, France

Monday, October 3, 2022 (continued)

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| 17:30 – 17:50 | Dislocation mechanisms of toughening in Cu-graphene nanolayered composite
Subin Lee, KIT, Germany |
| 17:50 – 18:10 | Short Coffee Break |
| 18:10 – 18:30 | Plasticity of topologically close-packed phases in the Fe-Ta(-Al) system
Christina Gasper, RWTH Aachen, Germany |
| 18:30 – 18:50 | Imaging modalities of mechanical microscopy
Jeffrey M. Wheeler, FemtoTools AG, Switzerland |
| 19:00 – 20:00 | Poster Preview I |
| 20:00 – 21:30 | Dinner |
| 21:30 – 23:00 | Poster Session I (with social period) |

Tuesday, October 4, 2022

07:30 – 08:30 Breakfast buffet

Session III: Fracture

Chair: Gerhard Dehm, MPIE, Germany

08:30 – 09:00 **Studying local interface fracture of SiC-C-SiC composites using novel micro-mechanical specimens**
Jakob Schwiedrzik, EMPA, Switzerland

09:00 – 09:20 **Micro-scale damage tolerance studies in ferroelectric barium titanate thin films**
Nidhin George Mathews, Indian Institute of Technology, Bombay, India

09:20 – 09:40 **Fracture properties of CrN hard coatings: Influence of the microstructure, alloying elements, and coating architecture**
Rainer Hahn, TU Wien, Austria

09:40 – 10:00 **Micro-mechanical approach of the intergranular stress corrosion cracking of austenitic stainless steels in PWR environment**
Rachma Azihari, CEA Sarclay, France

10:00 – 10:20 **Size effects in fracture mechanics: A detailed investigation on crack growth at the micro- and mesoscale**
Jutta Luksch, Saarland University, Germany

10:20 – 11:00 Coffee Break

11:00 – 11:30 **Environmental reliability and crack propagation resistance of 3d-printed ALD-coated nano-ceramics**
Marco Sebastiani, Roma TRE University, Italy

11:30 – 11:50 **Fracture behaviour of Ti/TiN multilayer thin film modeling and experimental validation**
Ashwini Kumar Mishra, Indian Institute of Technology, Bombay, India

11:50 – 12:10 **Grain size tailoring of tungsten copper nanocomposites to affect local fracture characteristics**
Klemens Schmuck, Montanuniversität Leoben, Austria

12:10 – 12:30 **Dislocation-based competition of plasticity and cracking in oxides: Understanding and application**
Xufei Fang, Technical University of Darmstadt, Germany

12:50 – 13:00 Meet up at the front lobby of the hotel for the excursion.

Buses leave promptly at 13:00

13:00 – 18:00 Excursion

Tuesday, October 4, 2022 (continued)

Session IV: Biological Materials

Chair: Christian Motz, Saarland University, Germany

18:45 – 19:25

Keynote

Nanomechanical characterisation of polymer nanotubes for application as 'soft' mechanical interfaces for biology

Sohini Kar-Narayan, University of Cambridge, United Kingdom

19:25 – 19:55

Strong, stiff & auxetic - Lessons learned from a fascinating biological material

Daniel Kiener, Montanuniversität Leoben, Austria

20:15 – 22:00

Dinner

Wednesday, October 5, 2022

07:30 – 09:00 Breakfast buffet

Session V: Novel sample geometries and methodical advances

Chair: Johann Michler, EMPA Thun, Switzerland

09:00 – 09:30 **Optomechanics of small-scale structures**
Ralph Spolenak, ETH Zürich, Switzerland

09:30 – 09:50 **Two photon lithography for synthesis of fracture mechanical specimen**
Alexander Jelinek, Montanuniversität Leoben, Austria

09:50 – 10:20 **High-temperature scanning indentation: A new technique to assess microstructural changes along thermal ramping**
Jean-Luc Loubet, Ecole Centrale de Lyon, France

10:20 – 10:40 **From microlattices to 3d microprinting of multiphase micro-components: Resolution limits and mechanical properties under extreme conditions**
Johann Michler, EMPA Thun, Switzerland

10:40 – 11:00 **Additive micromanufacturing and dynamic characterization of copper microlattices**
Rajaprakash Ramachandramoorthy, MPIE, Germany

11:00 – 11:30 Coffee Break

Session VI: In-situ nanomechanical testing

Chair: Maria Jazmin Duarte Correa, Max-Planck-Institut für Eisenforschung GmbH, Germany

11:30 – 12:00 **In situ 3D mapping of local stress and crystal defect structures during micro-mechanical testing by n3D-XRD-CT**
Thomas Edwards, EMPA Thun, Switzerland

12:00 – 12:20 **Deformation mechanism of cerium oxide nanocubes - an in situ transmission electron microscopy study**
Karine Masenelli-Varlot, University of Lyon, France

12:20 – 12:40 **Sub-100 nm in situ stress field mapping during nanoindentation of thin films using X-ray nanodiffraction**
Magnus Hörnqvist Colliander, Chalmers University, Sweden **Withdrawn**

14:00 – 13:00 **Deformation mechanisms of hierarchically structured 2D single-crystal materials revealed by real-time high-resolution in-situ nanomechanical testing**
Tyler Dolmetsch, Florida International University, USA

13:00 – 14:30 Lunch

14:30 – 16:30 Networking / Time for *ad hoc* discussions

Wednesday, October 5, 2022 (continued)

Session VII: New Methods & Analyses

Chair: Gaurav Mohanty, Tampere University, Finland

- 16:30 – 17:00 **Challenges in the phase identification of steels using unsupervised clustering of nanoindentation data**
Gerhard Dehm, MPIE, Germany
- 17:00 – 17:20 **Nanoindentation Surface Free Energy measurement over functionalized surfaces and structured substrates**
Edoardo Rossi, Roma TRE University, Italy
- 17:20 – 17:40 **A mathematical framework for high strain rate nanoindentation testing**
Sudharshan Phani Pardhasaradhi, ARCI, India
- 17:40 – 18:00 Short Coffee Break
- 18:00 – 18:20 **Correcting for substrate elasticity contributions in depth-sensing indentation of embedded particles**
Alejandra Slagter, EPFL, Switzerland
- 18:20 – 18:40 **Mechanics of elastic contact with an interface between adjacent materials**
Kian Tadayon, TU Dresden, Germany
- 18:40 – 19:00 **In-situ monitoring of the contact area during indentation creep testing**
Ude Hangen, Bruker BNS, United States
- 19:00 – 20:00 **Poster Preview II**
- 20:00 – 21:30 Dinner
- 21:30 – 23:00 **Poster Session II with social period**

Thursday, October 6, 2022

07:30 – 09:00 Breakfast buffet

Session VIII: Nanomechanics under Complex Stress States

Chair: George Pharr, Texas A&M University, USA

09:00 – 09:20 **Plasticity in nanoscale friction: Static and dynamic**
John Pethica, Trinity College Dublin, Ireland

09:20 – 09:40 **Brittle to ductile transition in metal/oxide nanolaminates on flexible substrates under uniaxial and biaxial tension**
Barbara Putz, EMPA Thun, Switzerland

09:40 – 10:00 **A new method to measure shear surface mechanical properties**
Gaylord Guillonneau, University of Lyon, France

10:00 – 10:20 **Micro-shear of silicon: Elastic strain analysis using digital image correlation**
Carmen Maria Lauener, ETH Zürich, Switzerland

10:20 – 10:40 **The size effect in copper tubes in torsion**
Haowei Zhang, Queen Mary University of London, United Kingdom

10:40 – 11:10 Coffee Break

Session IX: Grain Boundaries and Phase Transformations

Chair: Verena Maier-Kiener, Montanuniversität Leoben, Austria

11:10 – 11:40 **On grain boundary migration of a high-angle-grain boundary – Effect of shear stress and energy jump-driving force in micro-bicrystals**
Christian Motz, Saarland University, Germany

11:40 – 12:00 **Phase transformations and local deformation mechanisms - A case study on Cu 20 m.% Sn**
Lea Lumper, Montanuniversität Leoben, Austria

12:00 – 12:20 **Role of grain boundary on the deformation of micropillars**
Manmath Dash, University of Birmingham, United Kingdom

12:20 – 12:40 **Evolution of crystalline defects near grain boundaries during $\hat{\text{A}}\mu\text{N}$ -nanoindentation of the CrCoNi medium-entropy alloy**
Antoine Guitton, Université de Lorraine, France

12:40 – 13:00 **Size-dependent coherent twin boundary strength contribution in Cu micropillars**
Reza Hosseinabadi, MPIE, Germany

13:00 – 14:30 Lunch

14:30 – 16:30 Networking / Time for *ad hoc* discussions

Thursday, October 6, 2022 (continued)

Session X: Amorphous Materials

Chairs: Karsten Durst, Technical University of Darmstadt, Germany

- 16:30 – 17:00 **Uncovering exceptional micro-scale plasticity accommodation mechanisms in amorphous aluminum oxide through experimental and simulation results**
Gaurav Mohanty, Tampere University, Finland
- 17:00 – 17:20 **Electron beam induced softening of fused silica**
Sebastian Bruns, Technical University of Darmstadt, Germany
- 17:20 – 17:40 **Temperature-dependent dynamic plasticity of micro-scale fused silica**
Remo Widmer, Alemnis AG, Switzerland
- 17:40 – 18:00 **Fracture propagation in glassy polymers: From nanometer to centimeter**
Bruno Bresson, ESPCI ParisTech, France
- 18:00 – 18:20 Short Coffee Break
- 18:20 – 18:50 **Evidence of electron-irradiation activated creep in amorphous olivine at room temperature**
Guillaume Kermouche, Ecole des Mines de Saint-Etienne, France
- 18:50 – 19:10 **Full-field strain around propagating shear bands and von mises criteria for metallic glasses**
Oleksandr Glushko, Montanuniversität Leoben, Austria
- 19:10 – 19:30 **Plastic flow and structural heterogeneities in silicate glasses - A high throughput investigation**
Etienne Barthel, ESPCi Paris / Sorbonne University, France
- 19:30 – 19:50 **Densification of polymer glass film under combined high pressure and shear flow revealed via scanning X-ray microscopy**
Graham Cross, Trinity College Dublin, Ireland
- 20:30 – 22:30 Conference Banquet (7 Palms Restaurant)

Friday, October 7, 2022

- 07:30 – 09:00 Breakfast and Departures