Preliminary Program (August 7, 2017)

Nanomechanical Testing in Materials Research and Development VI

October 1-6, 2017

Dubrovnik, Croatia

Conference Chair

Karsten Durst
Technical University Darmstadt
Germany
08:30 - 09:00  Check-in for Optional Tutorial Session

09:00 – 13:00  Tutorial Session

**Advances in high temperature nanoindentation**
Jeff Wheeler, ETH Zurich, Switzerland

**Analysis of thermally activated processes during indentation**
Verena Maier-Kiener, Montanuniversität Leoben, Austria

**Industrial application of small scale mechanical testing**
Johann Michler, EMPA, Switzerland

13:00 – 14:00  Lunch (on your own)

14:00 – 15:45  Conference Check-in

15:45 – 16:00  **Welcome and Conference Overview**
Conference Chair: Karsten Durst
ECI Technical Liaison: Larry Kabacoff

16:00 – 17:00  **Keynote: Integrated experimental and simulation analysis of stress and strain partitioning in dual phase steels**
Dierk Raabe
Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf, Germany

17:00 – 19:00  **Session I: Introducing nanomechanical testing in research and development**

17:00 – 17:30  **Highlight: Imaging strain fields by ptychographic topography**
Steven Van Petegem, Paul Scherrer Institute, Villigen, Switzerland

17:30 - 17:50  **Plastic deformation of sub-micron Al and Be wires: A TEM and in situ TEM study**
Marc Legros, CEMES-CNRS, Toulouse, France

17:50 - 18:10  **The brittle-ductile transition of tungsten single crystals at the micro-scale**
Johannes Ast, EMPA Swiss Federal Laboratories for Materials Science and Technology, Switzerland

19:00 - 20:00  Welcome Reception

20:00 - 22:00  Dinner
Monday, October 2, 2017

07:30 - 09:00  Breakfast Buffet

09:00 – 13:00  Session II: Small scale fracture mechanics

09:00 - 09:40  Invited
Fracture mechanics of microsamples
Reinhard Pippan, Erich Schmid Institute of Materials Science of the Austrian Academy of Sciences, Austria

09:40 – 10:00  In situ HR-EBSD during micro-mechanical testing for microstructure, stress and plastic deformation characterizations in material
Xavier Maeder, EMPA - Swiss Federal Laboratories for Materials Science and Technology, Switzerland

10:00 - 10:20  Micromechanics of fully lamellar TiAl alloys
Jon Molina-Aldareguia, IMDEA Materials Institute, Spain

10:20 - 10:40  In situ stable fracture of ceramic interfaces
Finn Giuliani, Imperial College London, UK

10:40 – 11:10  Coffee break

11:00 - 11:30  Miniaturized fracture experiments on pearlitic steel: Challenges and solutions
Gerhard Dehm, Max-Planck-Institut für Eisenforschung GmbH, Düsseldorf, Germany

11:30 - 11:50  Understanding the performance of nano-structured ferritic alloys through micro-mechanical Testing
David Armstrong, University of Oxford, UK

11:50 - 12:10  Using simulations to investigate the apparent fracture toughness of microcantilevers
Steffen Brinckmann, Max-Planck-Institut für Eisenforschung, Düsseldorf, Germany

12:10 - 12:30  Fracture of silicon at low length scales
Jeffrey M. Wheeler, ETH Zurich, Switzerland

12:30 - 12:50  Elastic-plastic fracture toughness of electrodeposited Ni-W thick films using in-situ microcantilever bend tests
Denise Yin, Lehigh University, USA

13:00 - 14:30  Lunch

14:30 - 16:30  Free Time / Networking / Time for ad hoc discussions
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<thead>
<tr>
<th>Time</th>
<th>Session III: Coatings and small scale fracture mechanics</th>
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<tr>
<td>16:30 – 19:00</td>
<td>Multiple cracking events in metal bi-layers on polymer substrates&lt;br&gt;Megan J. Cordill, Erich Schmid Institute of Materials Science, Leoben, Austria</td>
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<td>16:30 - 16:50</td>
<td>Room temperature and high temperature micromechanical testing of SiC-SiC fiber composites for nuclear fuel cladding applications&lt;br&gt;Yevhen Zayachuk, Department of Materials, University of Oxford, UK</td>
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<td>16:50 - 17:10</td>
<td>Mechanical properties and failure of Ag nanowire transparent electrodes studied by means of in situ tensile testing&lt;br&gt;Nadine Schrenker, University Erlangen-Nürnberg (FAU), Germany</td>
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<td>17:10 - 17:30</td>
<td>Fracture behavior of metallic thin films as evaluated by bulge-tests and in situ TEM deformation experiments&lt;br&gt;Mathias Göken, FAU Erlangen-Nürnberg, Germany</td>
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<td>17:30 - 17:50</td>
<td>Micro-mechanical testing of transition metal (oxy)nitride coatings&lt;br&gt;James S.K-L. Gibson, RWTH Aachen University, Germany</td>
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<td>17:50 - 18:10</td>
<td>Invited&lt;br&gt;Filamentary growth of metals: microstructure and properties of (nano-) whiskers&lt;br&gt;Gunther Richter, Max-Planck-Institute for Intelligent Systems, Stuttgart, Germany</td>
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<td>18:10 - 19:00</td>
<td>Poster Preview I</td>
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<td>19:00 - 20:00</td>
<td>Dinner</td>
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<td>20:00 - 21:30</td>
<td>Poster Session I with Social Hour</td>
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**Tuesday, October 3, 2017**

07:30 - 09:00  Breakfast Buffet

09:00 – 13:00  **Session IV: In-situ Experiments II**

09:00 – 09:40  *Invited*

**Combined in situ mechanical testing and scale-bridging 3D analysis of nanoporous gold**
Erdmann Spiecker, University Erlangen-Nürnberg, Germany

09:40 - 10:00  **Plastic deformation and anisotropy of long-period-stacking-Ordered structures in Mg-Zn-Y alloys**
Stefanie Sandlöbes, RWTH Aachen University, Germany

10:00 - 10:20  **Mechanical hysteresis of the MAX phase Ti$_2$AlN: A nano-mechanical testing study**
Christophe Tromas, Institut Pprime - Université de Poitiers, France

10:20 - 10:40  **Plasticity of an atomically layered crystal: A combined nanomechanical and ab initio study on Mo$_2$BC**
Sandra Korte-Kerzel, RWTH Aachen University, Germany

10:40 – 11:10  Coffee Break

11:10 - 11:30  **The impact of grain boundary character on the size dependence of Bi-crystals**
Christoph Kirchlechner, Max-Planck-Institut für Eisenforschung, Düsseldorf, Germany

11:30 - 11:50  **Mechanical testing of nanotwinned alloys**
Andrea M. Hodge, University of Southern California, USA

11:50 - 12:10  **Mechanical testing of copper and copper alloy micropillars containing a single twin boundary**
Benoit Merle, University Erlangen-Nürnberg (FAU), Germany

13:00 - 19:00  Boxed lunch and optional excursion

19:00 – 20:15  Dinner

20:15 - 21:00  Poster Preview II

21:00 - 23:00  Poster Session II with Social Hour
Wednesday, October 4, 2017

07:30 - 09:00  Breakfast Buffet

09:00 – 13:00  Session V: New Instrumentation, Methods and Development

09:00 - 09:30  Highlight

**Interface strength and toughness measurements in multi-layered systems**
Daniel Kiener, Erich Schmid Institute, Montanuniversity Leoben, Austria

09:30 - 09:50  Room temperature plasticity in sub-micrometer thermally grown oxide scales
Magnus Hörnqvist Collander, Chalmers University of Technology, Sweden

09:50 - 10:10  Femtosecond laser and FIB: A revolutionary approach in rapid micro-mechanical sample preparation
Manuel J. Pfeifenberger, Montanuniversity Leoben, Austria

10:10 - 10:30  Microscale additive manufacturing of metal – mechanical properties
Alain S. Reiser, ETH Zurich, Switzerland

10:30 - 11:00  Coffee Break

11:00 - 11:30  Highlight

**Spatially resolved depth profiling of residual stress by micro-ring-core method**
Marco Sebastiani, Roma TRE University, Italy

11:30 - 11:50  Novel in situ nanomechanical tests: a new insight into the hydrogen embrittlement
Afrooz Barnoush, Norwegian university of science and technology, Norway

11:50 - 12:10  Development and application of an in situ-SEM nanoindenter coupled with electrical measurements
Solène Comby, Univ. Grenoble Alpes, CNRS, SIMaP Lab., Grenoble, France

12:10 - 12:30  Interfacial adhesion of compositional gradient ternary FCC alloy films
Rachel L. Schoepnner, EMPA Swiss Federal Laboratories for Materials Science and Technology, Switzerland

12:30 - 12:50  Strain rate influence on the thermo-mechanical deformation behavior of Aluminum thin films
Johannes Zechnor, KAI GmbH, Villach, Austria

13:00 - 14:30  Lunch

14:30 - 16:30  Networking Time / Time for ad hoc discussions
16:30 – 19:00  
**Session VI: Small Scale Testing of Advanced Materials**

16:30 - 16:50  
**Nanoscale compressive deformation mechanisms and yield properties of hydrated bone extracellular matrix**  
Jakob Schwiedrzik, EMPA - Swiss Federal Laboratories for Materials Science and Technology, Switzerland

16:50 - 17:10  
**Cyclic indentation test to characterize viscoelastic behavior of polymers**  
Olga Smerdova, Institut Pprime - Université de Poitiers, France

17:10 - 17:30  
**Fracture properties of hydrated cement paste constituents assessed with microbending and nanoindentation**  
Jiri Nemecek, Czech Technical University in Prague, Czech Republic

17:30 - 17:50  
**Nanomechanical behavior of nanocrystalline high-entropy alloy**  
Dong-Hyun Lee, Hanyang University, Seoul, Korea

17:50 - 18:20  
**Highlight**  
Quantifying the commonalities in structure and plastic deformation in disordered materials  
Daniel S. Gianola, University of California, Santa Barbara, USA

18:20 - 18:40  
**Nanoindentation of Au nanoparticles – A combined experimental/computational multiscale study**  
Dan Mordehai, Technion - Israel institute of Technology, Israel

18:40 - 19:00  
**A new type of superelastic and shape memory materials: ThCr$_2$Si$_2$-structured novel intermetallic compounds at small length scales**  
Seok-Woo Lee, University of Connecticut, USA

20:00 - 23:00  
Conference Dinner
Thursday, October 5, 2017

07:30 - 09:00 Breakfast Buffet

09:00 – 13:00 Session VII: New Developments in Indentation Testing

09:00 - 09:30 Highlight
Wide dynamic range 2-D nanoindentation: friction and partial slip at contacts
John B. Pethica, Trinity College Dublin, Ireland

09:30 - 09:50 Investigation of contact-induced near-surface materials transformations using nanomechanical testing.
Guillaume Kermouche, Ecole des Mines de Saint-Etienne, France

09:50 - 10:10 New methods for nanoindentation mapping to account for size dependence
Andy Bushby, Queen Mary University of London, UK

10:10 - 10:30 Scratching the surface of Lateral Size Effects (LSE): A critical comparison between indentation and scratch hardness size effects
Nigel Jennett, Coventry University, UK

10:30 - 11:00 Coffee Break

11:00 - 11:20 The formation and evolution of cracks during nanoindentation of fused quartz
Brittnee A. Mound, University of Tennessee, USA

11:20 - 11:40 Constitutive modeling of indentation cracking in fused silica
Sebastian Bruns, TU Darmstadt, Germany

11:40 - 12:00 Constant contact stiffness indentation relaxation test
Jean-Luc Loubet, CEMES-CNRS, Ecully, France

12:00 - 12:20 Spherical nanoindentation – advancements and prospects towards its application as a multifunctional testing technique
Alexander Leitner, Montanuniversität Leoben, Austria

12:20 - 12:40 Identification of macroscopic hardening law through spherical indentation: definition of an average representative strain and a confidence domain.
Charbel Moussa, MINES ParisTech, France

12:40 - 13:00 Size effect observed in spherical indentation test of single crystal copper
Stanislaw Kucharski, Institute of Fundamental Technological Research, Polish Academy of Science, Poland

13:00 - 14:30 Lunch

14:30 - 16:30 Session VIII: New instrumentation and Developments

14:30 – 14:50 Nanoindentation at elevated temperatures
Warren C. Oliver, Nanomechanics, Inc., Oak Ridge, USA

14:30-15:10 Temperature dependence of indentation size effects, pile-up and strain rate sensitivity in polycrystalline tungsten from 25-950 C
Ben D. Beake, Micro Materials Ltd, UK
15:10-15:30 Microcompression high cycle fatigue tests up to 10 million cycles
Gaurav Mohanty, Alemnis, Thun, Switzerland

16:30 – 19:00 Session IX: Deformation Mechanisms

16:30 - 16:50 Nanoindentation study of the temperature dependence of plastic instability in Al alloys.
Henry Ovri, Helmholtz Zentrum Geesthacht, Germany

16:50 - 17:10 Anisotropic deformation of ZrB2 ceramic grains during in-situ micropillar compression up to 500°C
Tamás Csanádi, IMR-SAS, Slovakia

17:10 - 17:30 Probing crystalline phases in cubic boron nitride as a function of boron content by massive nanoindentation and microsample testing
Joan Josep Roa Rovira, Universidad Politecnica de Cataluña, Barcelona, Spain

17:30 - 17:50 Determination of mechanical properties of different sized silicon and silica nanowires tested in SEM
Nicole Wollschläger, Bundesanstalt für Materialforschung und –prüfung, Germany

17:50 - 18:10 Initiation of fatigue damage in ultra-fine grained thin films: Schmid, Taylor or Hall-Petch?
Oleksandr Glushko, Montanuniversität Leoben, Austria

18:10 - 18:30 A micro-fatigue study of dislocation structures and dislocation interactions at grain boundaries in small scale samples
Jorge Rafael Velayarce, University of Saarland, Germany

19:00 - 21:00 Dinner

Friday, October 6, 2017
07:00 – 09:00 Breakfast and Departures