

Fall 10-5-2015

## Final Program

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Engineering Conferences International, "Final Program" in "Nanomechanical Testing in Materials Research and Development V", Dr. Marc Legros, CEMES-CNRS, France Eds, ECI Symposium Series, (2015). [http://dc.engconfintl.org/nanomechtest\\_v/1](http://dc.engconfintl.org/nanomechtest_v/1)

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## *Program*

# Nanomechanical Testing in Materials Research and Development V

October 4-9, 2015

Albufeira, Portugal

Conference Chair

**Dr. Marc Legros**  
CEMES-CNRS  
France



**Engineering Conference International**  
32 Broadway, Suite 314 - New York, NY 10004, USA  
www.engconfintl.org – [info@engconfintl.org](mailto:info@engconfintl.org)

**Grande Real Santa Eulalia Resort & Hotel Spa**  
**Praia de Santa Eulalia**  
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**Previous conferences in this series**

***Instrumented Indentation Testing in  
Materials Research & Development***

**October 9 – 15, 2005**

**Crete, Greece**

*Conference Chairs:*

George M. Pharr, University of Tennessee, USA

Carl McHargue, University of Tennessee, USA

***Nanomechanical Testing in Materials Research & Development II***

**October 11 - 16, 2009**

**Barga, Italy**

*Conference Chair:*

Mathias Goken, University Erlangen-Nurnberg, Germany

***Nanomechanical Testing in Materials Research & Development III***

**October 9 – 14, 2011**

**Lanzarote, Canary Islands, Spain**

*Conference Chair:*

Dr. Gerhard Dehm, University of Leoben, Austria

***Nanomechanical Testing in Materials Research & Development IV***

**October 6 - 11, 2013**

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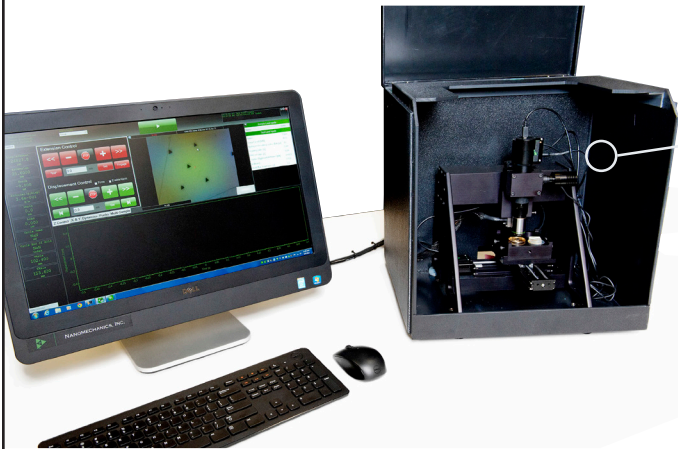
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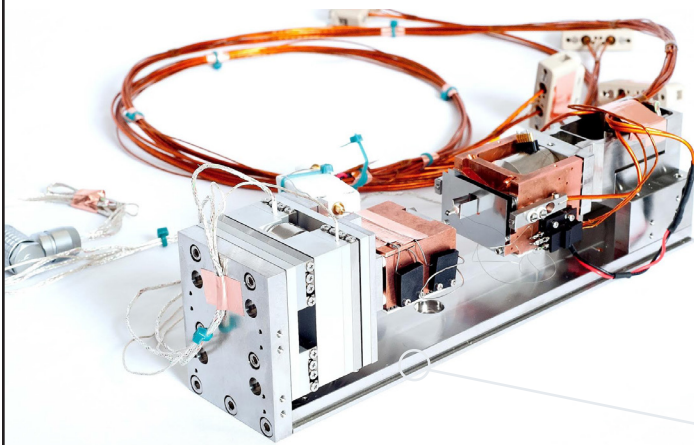
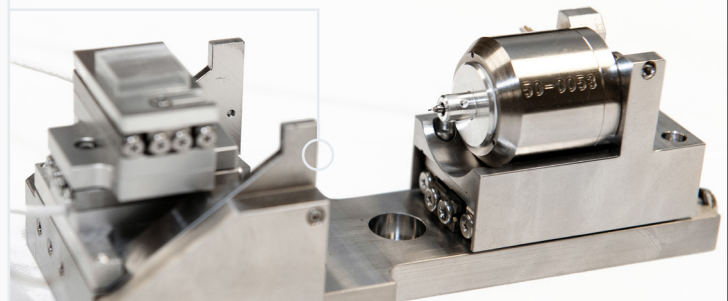
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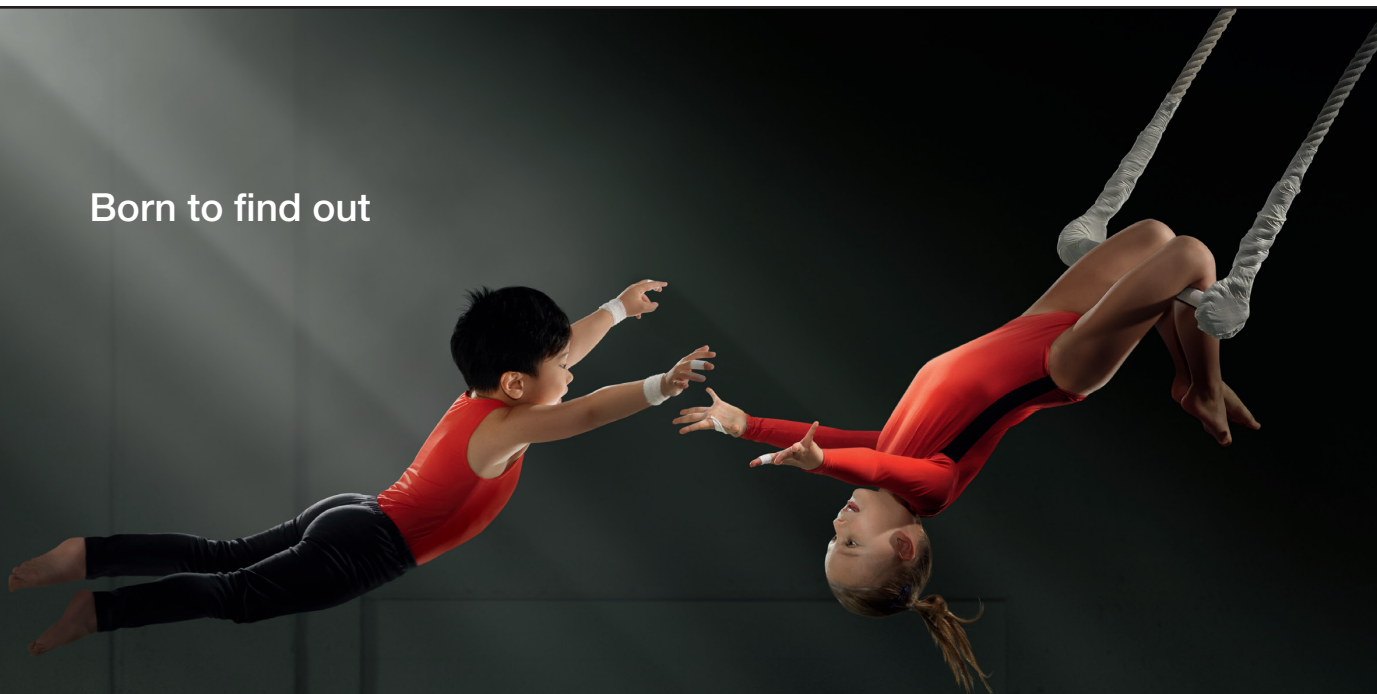
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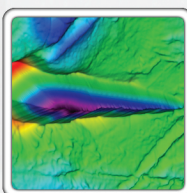
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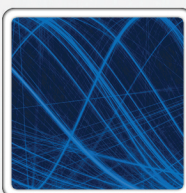
Maximum Performance Instruments for Quantitative Mechanical & Tribological Characterization at the Nanoscale and Microscale



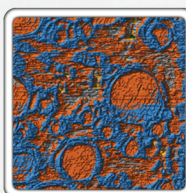
Mechanical Characterization



Tribology



Dynamic



Surface Characterization



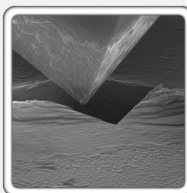
Electrical



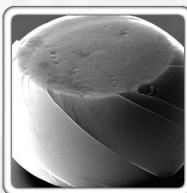
Harsh Environments

### Quantitative In-Situ Nanomechanics

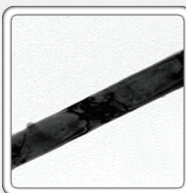
Quantitative In-Situ Nanomechanical Test Instruments Interfaced with Powerful SEM, TEM, XRM, and AFM Microscopy Techniques



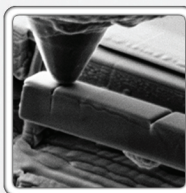
Indentation



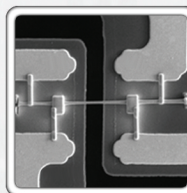
Compression



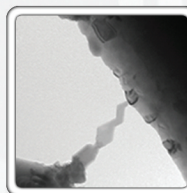
Tensile



Bend

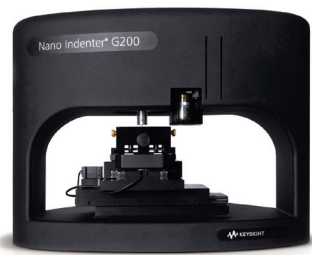


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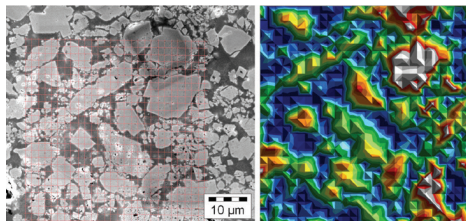
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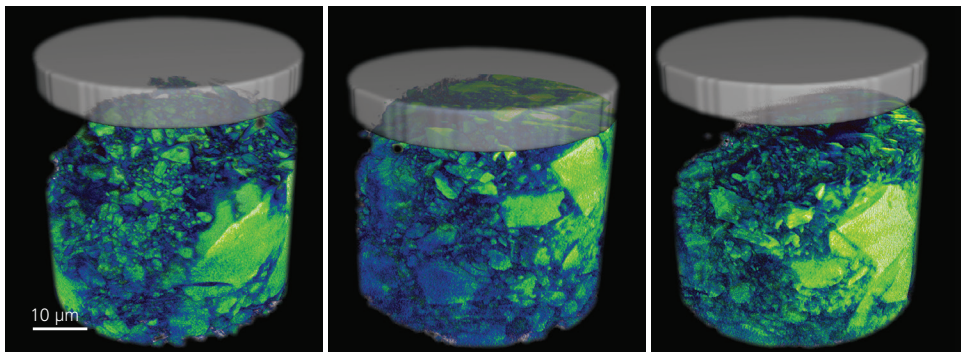
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## **Sunday, October 4, 2015**

- 14:00 - 15:30      **Short Course: Digital Image Correlation**  
Chris Eberl, Karlsruhe Institute of Technology and Marco Sebastiani, Roma TRE University, Italy
- 16:30 - 18:00      **Short Course: Fracture and adhesion - An introduction (with comments on size effects)**  
Etienne Barthel, SIMM/ESPCI, France
- 17:00 - 19:00      Conference check-in
- 18:15 - 18:30      **Opening Remarks**  
Conference Chair, Marc Legros, CEMES-CNRS, France, and ECI Technical Liaison, Ram Darolia
- 18:30 - 19:00      **Invited**  
**Measuring surface dislocation nucleation in defect-scarce nanostructures**  
Daniel S. Gianola, University of Pennsylvania, USA
- 19:00 - 20:00      Welcome Reception
- 20:00 - 21:30      Dinner

### **NOTES**

- Technical Sessions will be held in Sala Real.
- Poster Sessions will be held in the Real Foyer.
- Most meals will be in the Restaurante do Real. Changes will be announced.
- The conference banquet on Thursday will be held in the Restaurante Santa Eulalia.
- Audiotaping, videotaping and photography of presentations are prohibited.
- Speakers – Please leave at least 5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your cellular telephones to vibrate or off during technical sessions.
- After the conference, ECI will send an updated participant list to all participants. Please check your listing now and if it needs updating, you may correct it at any time by logging into your ECI account.
- Please do not smoke at any conference functions.
- Please write your name in the front of this program booklet so it can be returned if misplaced.

**Monday, October 5, 2015**

07:30 - 09:00 Breakfast Buffet

**Invited**

09:00 - 09:30 **Grain size strengthening – Just another length-scale effect?**  
Andy Bushby, Queen Mary University of London, United Kingdom

**Session 1- Chair M. Legros**

09:30 - 09:50 **Mechanical scaling behavior of nanoporous gold based on 3D structural analysis and indentation-based testing**  
Erica T. Lilleodden, Helmholtz-Zentrum Geesthacht, Germany

09:50 - 10:10 **A comprehensive study on the deformation behavior of ultra-fine grained and ultra-fine porous Au at elevated temperatures**  
Alexander Leitner, Montanuniversität Leoben, Austria

10:10 - 10:30 **Size effect on fracture toughness of gold thin films studied by bulge testing**  
Eva Preiß, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

10:30 - 11:00 Coffee Break / Networking

**Invited**

11:00 - 11:30 **Probing grain boundary mechanisms by in-situ TEM**  
Frédéric Mompiau, CEMES-CNRS, France

**Session 2 - Chair K. Hemker**

11:30 - 11:50 **Interface fracture resistance of thin films at elevated temperatures**  
Rafael Soler, Max-Planck-Institut für Eisenforschung, Germany

11:50 - 12:10 **Characterization of mechanical behavior of nanocrystalline layer induced by SMAT using micro-pillar compression technique coupled with finite element analysis**  
Yangcan Wu, University of Technology of Troyes, France

12:10 - 12:30 **Fracture strength testing at the micron-scale on an ultra-fine grained W-Cr<sub>10</sub>-Ti<sub>2</sub> alloy**  
Moritz Lessmann, University of Manchester/Culham Centre for Fusion Energy, United Kingdom

12:30 - 12:50 **High temperature mechanical properties of Ni-base superalloy and diffusion aluminide bond coating: An in-situ SEM nanoindentation study**  
Sanjit Bhowmick, Hysitron, Inc., USA

**Monday, October 5, 2015 (continued)**

13:00 - 14:30 Lunch Buffet

14:30 - 16:00 Free time / *ad hoc* sessions

16:00 - 16:30 Afternoon coffee /Networking

**Invited**

16:30 - 17:00 **Deformation mechanisms of twinned nanoparticles and nanowires**  
Erik Bitzek, Friedrich-Alexander-Universität Erlangen-Nürnberg (FAU), Germany

**Session 3 – Chair S. Van Petegem**

17:00 - 17:20 **Free energy function of dislocation densities by large scale atomistic simulations**  
Christoph Begau, Ruhr-Universität Bochum, Germany

17:20 - 17:40 **Size-dependent mechanical properties of crystalline nanoparticles**  
Dan Mordehai, Technion, Israel

17:40 - 18:10 Coffee Break / Networking

18:10 – 18:30 **In-situ nanomechanical testing using X-ray microscopy**  
William M. Harris, Carl Zeiss X-ray Microscopy, Inc., USA

**Invited**

18:30 - 19:00 **Insights into dislocation grain-boundary interaction by X-ray  $\mu$ Laue diffraction**  
Christoph Kirchlechner, Max-Planck-Institute für Eisenforschung, Germany

19:00 - 19:30 Poster Preview 1 – Chairs: V. Maier, G. Pharr

19:45 - 21:00 Dinner

21:00 - 23:00 Poster Session and Social Hour

**Tuesday, October 6, 2015**

07:30 - 09:00 Breakfast Buffet

**Invited**

09:00 - 09:30 **Thermally activated processes in materials probed by nanoindentation - challenges, solutions, and insights**  
Verena Maier, Austrian Academy of Sciences, Austria

**Session 4 – Chair C. Tromas**

09:30 - 09:50 **Revealing dislocation structure around and underneath indentations in (001) strontium titanate single crystals at room temperature and 350° C**  
Karsten Durst, Technical University of Darmstadt, Germany

09:50 - 10:10 **High temperature indentation creep and nanoindentation testing of superalloys and TiAl alloys**  
Mathias Göken, Friedrich-Alexander-University Erlangen-Nürnberg (FAU), Germany

10:10 - 10:30 **Nanoindentation cartography in Al/Al-Cu-Fe composites: Correlation between chemical heterogeneities and mechanical properties**  
Christophe Tromas, Institut Pprime - Université de Poitiers, France

10:30 - 11:00 Coffee Break / Networking

**Invited**

11:00 - 11:30 **About the plastic response of silicate glasses at the micronscale**  
Guillaume Kermouche, Ecole des Mines de Saint-Etienne, France

**Session 5 – Chair J. Molina-Aldareguia**

11:30 - 11:50 **High-temperature small-scale fracture mechanics and plasticity of a hard-coating system**  
James P. Best, EMPA, Switzerland

11:50 - 12:10 **Size effects and deformation mechanisms in diamond and silicon**  
Jeffrey M. Wheeler, ETH Zurich, Switzerland

12:10 - 12:30 **Toward the understanding of the brittle to ductile transition at low size in silicon: Experiments and simulations**  
Sandrine Brochard, Institut Pprime, France

12:30 - 12:50 **Variable temperature ultra-nanoindentation system: Elevated and cryogenic temperature measurements**  
Marcello Conte, Anton Paar TriTec SA/EMPA, Switzerland

12:50 - 14:30 Lunch Buffet

14:30 - 16:00 Free time / ad hoc sessions

**Tuesday, October 6, 2015 (continued)**

- 16:00 - 16:30 Afternoon Coffee / Networking
- Invited**
- 16:30 - 17:00 **From micro-cantilever testing to deformation patterning in HCP polycrystals**  
Angus Wilkinson, University of Oxford, United Kingdom
- Session 6 – Chair F. Mompiou**
- 17:00 - 17:20 **Boundary motion coupled with tensile and compressive deformation: TEM observation of twinning-like lattice reorientation in Mg micropillars**  
Evan Ma, Johns Hopkins University, USA
- 17:20 - 17:40 **Understanding rate sensitivity in dual phase titanium alloys – a combined experimental and computational micro-pillar study**  
Tea-Sung (Terry) Jun, Imperial College London, United Kingdom
- 17:40 - 18:10 Coffee Break / Networking
- 18:10 – 18:30 **Mechanisms of plastic deformation of magnesium matrix nanocomposites elaborated by friction stir processing**  
Camila Mallmann, SIMAP-GPM2, France
- Invited**
- 18:30 - 19:00 **Multiscale characterization of the micromechanics of pure Mg**  
Jon Molina-Aldareguia, IMDEA Materials Institute, Spain
- 19:00-19:30 **An improved micromechanical method for investigating the mechanical properties of poly-silicon membranes**  
Krish Narain, Keysight Technologies, Böblingen, Germany
- 20:00 Dinner on your own

**Wednesday, October 7, 2015**

07:30 - 09:00 Breakfast Buffet

**Session 7 – Chair E. Ma**

09:30 - 09:50 **Importance of dynamics in small scale mechanical testing: Fast constant strain rate and ballistic testing**  
Warren Oliver, Nanomechanics, Inc., USA

09:50 - 10:10 **Effect of hydrogen on the nucleation and motion of dislocations**  
Mohammad Zamanzade, Saarland University, Germany

10:10 - 10:30 **Effect of hydriding on nanoscale plasticity mechanisms in nanocrystalline palladium thin films**  
Behnam Aminahmadi, University of Antwerp- EMAT, Belgium

10:30 - 11:00 Coffee Break / Networking

**Invited**

11:00 - 11:30 **In-situ observation of the onset of plastic deformation by prismatic loop emission**  
Sang Ho Oh, POSTECH, South Korea

**Session 8 – Chair A. Bushby**

11:30 - 11:50 **In-situ micropillar compression of bone shows remarkable strength and ductility but no damage**  
Jakob Schwiedrzik, EMPA Swiss Federal Laboratory for Materials Science and Technology, Switzerland

11:50 - 12:10 **Nanoindentation-based mechanical spectroscopy of wood cell walls**  
Joseph Jakes, USDA Forest Service, USA

12:10 - 12:30 **How to perform nanoindentation in difficult conditions? Applications to ultra soft materials and temperature environment**  
Michel Fajfrowski, Michalex, France

12:30 - 12:50 **Performance of a single interface in a biocomposite structure measured using microcantilever modulation experiment**  
Igor Zlotnikov, Max Planck Institute of Colloids and Interfaces, Germany

13:00 - 19:00 Boxed Lunch and excursion

19:00 - 20:00 Poster Preview 2 – Chairs: V. Maier, G. Pharr

20:00 - 21:30 Dinner

21:30 - 23:30 Poster Session and Social Hour

**Thursday, October 8, 2015**

07:30 - 09:00 Breakfast Buffet

**Invited**

09:00 - 09:30 **Mechanical properties of lithiated silicon: A candidate electrode for lithium ion batteries**

William D. Nix, Stanford University, USA

**Session 9 – Chair D. Gianola**

09:30 - 09:50 **Nanoindentation induced deformation anisotropy in WC,  $\beta$ -Si<sub>3</sub>N<sub>4</sub> and ZrB<sub>2</sub> crystals**

Tamás Csanádi, Slovak Academy of Sciences, Slovakia

09:50 - 10:10 **Hydrogen effects on nanoindentation behavior of metallic glass ribbons**

Yakai Zhao, Hanyang University, South Korea

10:10 - 10:30 **In-situ strain softening and strain hardening of natural geomaterials on the microscale**

Younane Abousleiman, University of Oklahoma, USA

10:30 - 11:00 Coffee Break / Networking

**Invited**

11:00 - 11:30 **Probing the initial stages of plasticity with nanoindentation**

Easo George, Ruhr University Bochum, Germany

**Session 10 – Chair J. Michler**

11:30 - 11:50 **Underpinning and benchmarking multi-scale models with micro- and nano-scale experiments**

Kevin Hemker, Johns Hopkins University, USA

11:50 - 12:10 **Anisotropy of ultrafine-lamellar and nanolamellar pearlitic structures revealed by in-situ micro compression testing**

Marlene Kapp, Erich Schmid Institute of Materials Science, Austria

12:10 - 12:30 **Nano-scale behavior of irradiated nano-structured alloys**

David E.J Armstrong, University of Oxford, United Kingdom

12:30 - 12:50 **Probing nanoscale damage gradients in irradiated materials with spherical nanoindentation**

Nathan Mara, Los Alamos National Laboratory, USA

**Thursday, October 8, 2015 (continued)**

13:00 - 14:30 Lunch Buffet

14:30 - 16:00 Free time / *ad hoc* sessions

**Invited**

16:30 - 17:00 **Length-scale dependent deformation behavior of nanolayered Cu-based micropillars**

Gang Liu, Xi'an Jiaotong University, China

**Session 11 - Chair C. Kirchlechner**

17:00 - 17:20 **Transition in plastic deformation of nanolayered thin films: Role of interfaces and temperature**

Rejin Raghavan, Max-Planck-Institut für Eisenforschung, Germany

17:20 – 17:50 Coffee Break / Networking

17:50 - 18:10 **How residual stresses affect the fracture properties of layered thin films**

Daniel Kiener, Montanuniversität Leoben, Austria

18:10 - 18:30 **In-situ nano-mechanical tests in the light of  $\mu$ Laue diffraction**

Thomas W. Cornelius, CNRS, IM2NP (UMR 7334), France

**Invited**

18:30 - 19:00 **In-situ mechanical testing at the synchrotron**

Steven Van Petegem, PSI, Switzerland

20:00 - 22:00 Conference Banquet



**Friday, October 9, 2015**

07:30 - 09:00 Breakfast Buffet

**Invited**

09:00 - 09:30 **Cracking in brittle materials during nanoindentation: New insights gained from cohesive zone finite element modeling**  
George M. Pharr, University of Tennessee and Oak Ridge National Laboratory, USA

**Session 12 - Chair E. George**

09:30 - 09:50 **Extraction of crystal plasticity parameters of IN718 using high temperature micro-compression**  
Bin Gan, IMDEA Materials Institute, Spain

09:50 - 10:10 **Fracture toughness measurement with microscopic chevron-notched specimens**  
Goran Zagar, École Polytechnique Fédérale de Lausanne, Switzerland

10:10 - 10:30 **In-situ fracture tests of brittle materials at the microscale**  
Giorgio Sernicola, Imperial College London, United Kingdom

10:30 - 11:00 Coffee Break / Networking

**Invited**

11:00 - 11:30 **Some recent advances in nanomechanical testing: High strain rates, variable temperatures, fatigue and stress relaxation, combinatorial experimentation**  
Johann Michler, EMPA, Switzerland

**Session 13 – Chair G. Liu**

11:30 - 11:50 **Limits of determining stress states by FIB method due to Ga implantation**  
Diana Courty, ETH Zurich, Switzerland

11:50 - 12:10 **Studying fatigue damage evolution at grain boundaries using micro mechanical test methods**  
Christian Motz, Saarland University, Germany

12:10 - 12:30 **Accessing the phase transformation and deformation behavior of metastable stainless steels through cyclic nanoindentation**  
Ina Sapezanskaia, UPC, Spain

12:30 - 12:50 **Thermo-mechanical characterization of polymer samples using nanoindentation - From bulk characterization to thin film properties**  
Dennis Bedorf, SURFACE, Germany

13:00 - 14:00 Lunch Buffet and departures

## **Poster Presentations List**

1. **A new dynamic module for in-situ nanomechanical testing at high strain rate**  
Gaylord Guillonnet, Ecole Centrale de Lyon/EMPA, Switzerland
2. **High temperature nanoindentation testing of amorphous silicon carbonitride thin films**  
Radim Ctvrtlik, Palacky University, Czech Republic
3. **Deformation behavior of bulk metallic glasses produced via Severe Plastic Deformation and the influence of a second phase**  
Lisa Kraemer, Austrian Academy of Sciences, Austria
4. **The measurement of viscosity of ultrathin polymer films.**  
Dariusz Jarzabek, Institute of Fundamental Technological Research, Poland
5. **The measurement of the adhesion force between ceramic particles and metal matrix in ceramic reinforced-metal matrix composites.**  
Dariusz Jarzabek, Institute of Fundamental Technological Research, Poland
6. **Using in-situ microLaue diffraction to understand plasticity in MgO**  
Ayan Bhowmik, Imperial College London, United Kingdom
7. **A comparison of nanotribology and nanoindentation**  
Steffen Brinckmann, Max-Planck-Institut für Eisenforschung, Germany
8. **Orientation dependence of dislocation transmission through twin-boundaries studied by in situ  $\mu$ Laue diffraction**  
Nataliya Malyar, Max-Planck-Institut für Eisenforschung GmbH, Germany
9. **Fracture behavior of high strength pearlitic steel wires**  
Bernhard Völker, Montanuniversität Leoben, Austria
10. **Quantification of mechanical properties gradient by nano-indentation and micro-compression testing on mechanically-induced transformed surfaces**  
David Tumbajoy Spinel, Ecole des Mines de Saint-Etienne, LGF UMR5307 CNRS, France
11. **Dislocation dipoles and the nucleation of cracks in silicon nanopillars**  
Jacques Rabier, DPMM, Institut P', CNRS-Université de Poitiers-ENSMA, France
12. **Combining in situ tensile testing and orientation microscopy in the SEM: A MEMS based setup for studying time dependent deformation of thin films by TKD and STEM**  
Jan Philipp Liebig, Friedrich-Alexander-Universität Erlangen-Nürnberg, Germany
13. **Development and application of an in-situ nanoindenter coupled with electrical measurements**  
Solène Comby, University of Grenoble Alpes/SIMaP lab, France

14. **Comparison of in situ micromechanical time dependent plasticity techniques: micropillar compression, nanoindentation and micro-tensile tests**  
Juri Wehrs, EMPA, Switzerland
15. **EBSD investigation of microstructure refinement from impact-based surface treatments**  
Xavier Maeder, EMPA, Swiss Federal Laboratories for Materials Science and Technology, Switzerland
16. **Investigating the plastic deformation of Molybdenum from -196°C to 950°C using nano- and micro-indentation**  
Katherine Plummer, Oxford University, United Kingdom
17. **Ultra small scale high cycle fatigue testing by micro-cantilevers**  
Jicheng Gong, University of Oxford, United Kingdom
18. **A direct comparison of high temperature nanoindentation and tensile creep measurements for aluminum**  
Warren Oliver, Nanomechanics Inc., USA
19. **Nanoindentation, micropillar compression and nanoscratch testing of ZrB<sub>2</sub> grains**  
Ján Dusza, Slovak Academy of Sciences, Slovakia
20. **Study of sub-surface ion-implanted hardened layers with depth-sensing indentation**  
Alexey Useinov, Technological Institute for Superhard and Novel Carbon Materials, Russia
21. **An Improved method for point deflection measurements on rectangular membranes**  
Benoit Merle, University Erlangen-Nürnberg (FAU), Germany
22. **Annealing effect on coherent-incoherent interface tri-component nanoscale metallic multilayer thin films**  
Aidan A. Taylor, EMPA, Switzerland
23. **Obtaining mechanical properties of superelastic materials from microindentation data**  
Dmitry Zhuk, National Research Nuclear University «MEPhI», Russia
24. **Mechanical response of face-centered cubic metallic nanospheres under uniaxial compression**  
Selim Bel Haj Salah, Institut Pprime, France
25. **Micromechanical behavior of thermal barrier coatings after isothermal oxidation**  
Carlos Serna, Universidad Nacional de Colombia, Colombia
26. **Effects of lithiation on the fracture toughness and mechanical properties of LiMn<sub>2</sub>O<sub>4</sub> cathode battery materials**  
Marco Sebastiani, Roma TRE University, Italy
27. **Chemomechanical effects in thin film and bulk oxides**  
Steve Bull, Newcastle University, United Kingdom

28. **Influence of temperature on the deformation behavior of single-and bi-crystal microbending beams**  
Jorge Rafael Velayarce, Saarland University, Germany
29. **Irradiation-induced ductilization in the Zr-based metallic glasses**  
Jaewon Heo, Korea Advanced Institute of Science and Technology, South Korea
30. **Nanomechanical testing of ODS steels irradiated with 1 MeV/amu heavy ions**  
Katerina Kornieieva, Joint Institute for Nuclear Research (JINR), Russia
31. **Can it be measured - Fracture Toughness from Repetitive Nano-impacts Test?**  
Emilio Frutos Torres, Czech Technical University Prague, Czech Republic
32. **Environmentally controlled modulus mapping of biocomposite materials employing the concept of effective mass**  
Bernd Bayerlein, Max Planck Institute of Colloids and Interfaces, Germany
33. **Elevated temperature microcompression transient testing of nanocrystalline materials: Creep, stress relaxation and strain rate jump tests**  
Gaurav Mohanty, EMPA, Switzerland
34. **Combining nanoindentation with complementary techniques for mechanical and structural characterization of ultra uow-k (ULK) thin films**  
André Clausner, Fraunhofer IKTS-MD, Germany
35. **A new technique to measure the true contact area using nanoindentation testing**  
Gaylord Guillonneau, Ecole Centrale de Lyon/EMPA, Switzerland
36. **Nanotwin governed toughening mechanism in hierarchically structured materials**  
Sungmin Moon, POSTECH, South Korea
37. **Fracture behavior of brittle ceramics at the nanoscale**  
Dahye Shin, KAIST, South Korea
38. **Numerical simulations of twin formation and extension in thin face-centred cubic metallic films**  
Sandrine Brochard, Institut Pprime, France
39. **Layer orientation and size effects on micropillar compression of Al/SiC nanolaminates**  
Lingwei Yang, IMDEA Materials Institute, Spain
40. **Microscopic three-point bending test to probe plate-like silicon particles from AlSi alloys**  
Martin G. Mueller, École Polytechnique Fédérale de Lausanne, Switzerland
41. **Measuring the fracture toughness of Titanium Carbide reinforcements at the micron-scale**  
Lionel Michelet, École Polytechnique Fédérale de Lausanne, Switzerland

42. **Size dependent deformation of beta brass**  
Oscar Torrents Abad, INM - Leibniz Institute for New Materials, Germany
43. **A universal characterization method on viscous materials using depth sensing indentation**  
Abdul Shah, University Of Central Lancashire, United Kingdom
44. **Thermally activated deformation in cast aluminium microwires**  
Suzanne Verheyden, Ecole Polytechnique Fédérale de Lausanne, Switzerland
45. **Measuring the strength of brittle microscopic spheres by means of compression tests**  
Václav Pejchal, École Polytechnique Fédérale de Lausanne, Switzerland
46. **Indentation behavior of superelastic hard carbon**  
Olga Chernogorova, Baikov Institute of Metallurgy and Materials Science (IMET), Russia
47. **Micromechanical testing of ion-irradiated ferritic/martensitic steels**  
Anna Kareer, University of Oxford, United Kingdom
48. **Orientation-dependent mechanical behaviour of electrodeposited copper with nanoscale twins**  
Maxime Mieszala, EMPA, Swiss Federal Laboratories for Materials Science and Technology, Switzerland
49. **Deformation and fatigue behavior measurement of thin films undergoing thermo-mechanical loading at high strain rates – A novel test setup**  
Johannes Zechner, KAI GmbH, Austria
50. **Length-scale enabled quantification of surface damage by indentation: A case study separating the components of contact response due to indentation size, residual stress, and damage caused by surface machining and grinding**  
Nigel Jennett, Coventry University, United Kingdom
51. **High-temperature fracture test using chevron-notched tungsten microcantilevers**  
Bo-Shiuan Li, University of Oxford, United Kingdom
52. **Fundamental nanomechanic investigations using combinatorial deposition techniques**  
Rachel Schoepner, EMPA, Switzerland
53. **Diffusion-based deformation in elevated temperature micropillar compression of Mg-Nb multilayers**  
Keith B. Thomas, EMPA, Switzerland
54. **Mechanical and optical properties of silicon nitride thin films on glass**  
Lukas Simurka, ŞİŞECAM Science and Technology Center, Turkey
55. **Pushing the envelope for high temperature nanoindentation measurements**  
Marcello Conte, Anton Paar/EMPA, Switzerland

56. **A new designed 1200 °C high temperature instrumented nano indentation probe to investigate the mechanical behavior of materials**  
Michel Fajfrowski, Michalex, France
57. **Identification of in situ lignin strength based on micropillar compression and micromechanical modeling of wood cell walls**  
Johann Jakob Schwiedrzik, EMPA Swiss Federal Laboratories for Materials Science and Technology, Switzerland
58. **In situ high temperature TEM tensile testing of pseudo single crystalline Si for PhotoVoltaic applications**  
Arthur Lantreibecq, CEMES-CNRS, France
59. **High-temperature nano-impact testing of a hard-coating system**  
James P. Best, EMPA, Switzerland
60. **Testing of nanostructure within active carbons particles**  
Bronislaw Buczek, AGH-University of Science and Technology, Poland