

# Joint HYDROGENIUS and I<sup>2</sup>CNER International Workshop on Hydrogen-Materials Interactions

**Time & Date : 9:00- , January 31 (Thursday), 2013**

**Venue : INAMORI Hall, 1st Floor of the INAMORI Frontier Research Center,  
Kyushu University Ito Campus**

## Program

Symposium Co-chairmen: Yukitaka Murakami (HYDROGENIUS and I<sup>2</sup>CNER, Kyushu University, Japan) and Petros Sofronis (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA)

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9:00-9:10 **Opening Remarks : Petros Sofronis**

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### Session I Keynote Lectures

Chairman: Petros Sofronis (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA)

9:10-9:50 *Keynote lecture I*

**On softening and hardening of metals by solute atoms focusing on hydrogen as a solute**

Reiner Kirchheim (I<sup>2</sup>CNER, Kyushu University, Japan and Institut für Materialphysik, Universität Göttingen, Germany)

9:50-10:30 *Keynote lecture II*

**What fractographs reveal about fundamental deformation processes**

Ian Robertson (I<sup>2</sup>CNER, Satellite at University of Illinois, USA), May Martin (I<sup>2</sup>CNER, Satellite at University of Illinois, USA), Petros Sofronis (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA), Kelly Nygren (I<sup>2</sup>CNER, Satellite at University of Illinois, USA), David Gross (University of Illinois, USA)

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10:30-10:40 Break

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### Session II Hydrogen Entry and Solubility

Chairman: Reiner Kirchheim (I<sup>2</sup>CNER, Kyushu University, Japan and Institut für Materialphysik, Universität Göttingen, Germany)

10:40-11:10 **Hydrogen solubility and diffusion and its effects on plastic deformation in**

**austenitic stainless steels**

Hannu Hänninen (Aalto University School of Engineering, Finland)

- 11:10-11:40 **Identification of hydrogen desorption peak temperatures, binding energies, and occupation ratios at vacancies, dislocations and grain boundaries in iron and steel**

Kenichi Takai and N. Abe (Sophia University, Japan)

- 11:40-12:10 **Theoretical study of the co-adsorption of hydrogen and unsaturated molecules on iron surface**

Aleksandar Staykov (I<sup>2</sup>CNER, Kyushu University, Japan), Junichiro Yamabe (HYDROGENIUS, I<sup>2</sup>CNER, Kyushu University and Int. Hydrogen Energy Center, Japan), Brian Somerday (Sandia National Laboratory, USA and I<sup>2</sup>CNER, Kyushu University, Japan)

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12:10-13:20 Break

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**Session III Standards, Components, Microstructures and Testing**

Chairman: Yukitaka Murakami (HYDROGENIUS and I<sup>2</sup>CNER, Kyushu University, Japan)

- 13:20-13:50 **Materials testing and recommendations for hydrogen components under fatigue**

Laurent Briottet (CEA/Grenoble, LITEN/DTBH/LCTA, France)

- 13:50-14:20 **Estimation of fatigue crack growth rate in contaminated H<sub>2</sub>S environments - review and discussion of tests methods**

Paolo Bortot (Tenaris-Dalmine, Italy) and Stefano Beretta (Politecnico di Milano, Italy)

- 14:20-14:50 **Hydrogen induced in bainitic and duplex stainless steels: correlation between microstructure and hydrogen diffusion**

Dilson Silva dos Santos, F. E. C. Salvio, B. R. S. da Silva and L.F. Lemus (Federal University of Rio de Janeiro, Brazil)

- 14:50-15:20 **Hydrogen embrittlement in structural steel and welded joints – experiments and numerical simulation**

Vigdis Olden (SINTEF, Norway)

- 15:20-15:50 **Integrity diagnosis of pressure vessel using novel mechanoluminescent sensor**

Chao-Nan Xu (AIST, Kyushu University and I<sup>2</sup>CNER, Kyushu University, Japan), Naohiro Ueno (AIST, Japan), Shogo Watanabe (Hydrogen Energy Test and Research Center, Japan) and Yukitaka Murakami (HYDROGENIUS and I<sup>2</sup>CNER, Kyushu University, Japan)

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15:50-16:10 Break

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**Session IV Hydrogen Embrittlement Mechanism and Applications**

Chairman: Brian Somerday (Sandia National Laboratory, USA and I<sup>2</sup>CNER, Kyushu University, Japan)

16:10-16:40 **Modelling hydrogen diffusion assisted by stress and strain**

Jesús Toribio and Viktor Kharin (University of Salamanca, Spain)

16:40-17:10 **The role of hydrogen in hydrogen embrittlement fracture of lath martensitic steel**

Akihide Nagao (JFE Steel Corporation, Japan and University of Illinois, USA), Cynthia Smith (University of Illinois, USA), Mohsen Dadfarnia (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA), Petros Sofronis (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA), Ian Robertson (I<sup>2</sup>CNER, Satellite at University of Illinois, USA)

17:10-17:40 **Ductility loss in ductile cast iron with internal hydrogen**

Hisao Matsunaga (HYDROGENIUS and I<sup>2</sup>CNER, Kyushu University, Japan)

17:40-18:10 **Hydrogen embrittlement of high strength steels: determination of the threshold stress intensity for small cracks nucleating at nonmetallic inclusions**

Yukitaka Murakami (HYDROGENIUS and I<sup>2</sup>CNER, Kyushu University, Japan), Toshihiko Kanazaki (Automobile R&D Center, Honda R&D Co., Ltd., Japan) and Petros Sofronis (I<sup>2</sup>CNER, Kyushu University, Japan and University of Illinois, USA)

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**Closing remark: Petros Sofronis**

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