

International Hydrogen Conference: Understanding Hydrogen-Materials Interactions

Park City, Utah, USA
17-21 September 2023

ISBN: 978-1-7138-9479-7

Printed from e-media with permission by:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571

Some format issues inherent in the e-media version may also appear in this print version.

Copyright© (2023) by Engineering Conferences International
All rights reserved.

Printed with permission by Curran Associates, Inc. (2025)

For permission requests, please contact Engineering Conferences International
at the address below.

Engineering Conferences International
32 Broadway, Suite 314
New York, NY 10004
USA

Phone: (212) 514-6760
Fax: (212) 514-6030

info@engconfintl.org

Additional copies of this publication are available from:

Curran Associates, Inc.
57 Morehouse Lane
Red Hook, NY 12571 USA
Phone: 845-758-0400
Fax: 845-758-2633
Email: curran@proceedings.com
Web: www.proceedings.com

Sunday, September 17, 2023

15:00 – 18:30	Conference Check-in (Grand Ballroom Lobby) / Dinner on own	
	<u>Opening Plenary Session</u>	
18:30 – 19:15	Electrochemistry of hydrogen uptake – Implications for evaluating resistance to hydrogen embrittlement <u>Alan Turnbull</u> , National Physical Laboratory, United Kingdom	1
19:15 – 20:00	Predicting hydrogen embrittlement in steels and high entropy alloys <u>William Curtin</u> , EPFL, Switzerland	2
20:00 – 20:15	Break	
20:15 – 21:00	Understanding Hydrogen Embrittlement/Environment-Sensitive Behavior of Materials via Microstructural Characterization: Advances, Applications and Opportunities <u>M. Grace Burke</u> , Idaho National Laboratory, USA	3
21:00 – 21:45	Advances in mechanical testing methods for hydrogen assisted cracking <u>Kevin Nibur</u> , Hy-Performance Materials Testing, LLC, USA	4

Special Notes and Locations

- Technical Sessions will be in the Kokopelli Grand Ballroom.
- The poster session will be in the Sundial Pavilion.
- Continental Breakfasts will be in the Grand Ballroom Lobby.
- The ECI office is the Painted Horse – Parlor 1.
- Speakers – Please have your presentation loaded onto the conference computer prior to the session start (preferably the day before).
- Speakers – Please leave at least 3-5 minutes for questions and discussion.
- Please do not smoke at any conference functions.
- Turn your mobile 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.
- Audiotaping, videotaping and photography of presentations are prohibited.

Monday, September 18, 2023

07:15 – 08:00	Continental Breakfast	
	<u>Session: Hydrogen Effects on Fracture I</u>	
08:00 – 08:30	Invited Computational models for predicting hydrogen-assisted failures	5
	<u>Emilio Martinez-Paneda</u> , Imperial College London, United Kingdom	
08:30 – 08:50	Hydrogen-enhanced creep deformation of SUY-1 pure iron	6
	Kentarou Wada, Kyushu University, Japan; Ryosuke Komoda, WPI I2CNER, Kyushu University, Japan; Toshihiro Tsuchiyama, WPI I2CNER, Kyushu University, Japan; <u>Masanobu Kubota</u> , WPI I2CNER, Kyushu University, Japan	
08:50 – 09:10	Hydrogen enhances cross-slip of dislocations in the vicinity of grain boundaries	7
	Ali Tehrani, Max-Planck-Institut für Eisenforschung GmbH, Germany; <u>Tilmann Hicke</u> , Max-Planck-Institut für Eisenforschung GmbH, Germany; Joerg Neugebauer, Max-Planck-Institut für Eisenforschung GmbH, Germany	
09:10 – 09:30	Surface engineering impacts on hydrogen charging and hardness of high strength steels	8
	<u>David Bahr</u> , Purdue University, USA; Jia-Huei Tsai, Purdue University, USA; Megan Reger, Purdue University, USA; David Johnson, Purdue University, USA	
09:30 – 09:50	Role of T phase in the hydrogen embrittlement suppression for Al-Zn-Mg-Cu alloys	9
	Yafei Wang, Kyushu University, Japan; Bhupendra Sharma, Kyushu University, Japan; Yuantao Xu, Kyushu University, Japan; Kazuyuki Shimizu, Iwate University, Japan; Hiro Fujihara, Kyushu University, Japan; <u>Hiroyuki Toda</u> , Kyushu University, Japan	
09:50 – 11:00	Poster Session 1 and Break	
	<u>Session: Hydrogen Effects on Additive Manufacturing and High Entropy Alloys</u>	
11:00 – 11:30	Invited Hydrogen embrittlement of CrCoFeMnNi high-entropy alloys: Cases of monotonic tension and fatigue loading	10
	<u>Motomichi Koyama</u> , Tohoku University, Japan	
11:30 – 11:50	Effect of hydrogen at cryogenic temperatures on tensile properties of 316L stainless steel obtained by different manufacturing process	11
	<u>Laura Moli-Sanchez</u> , Institut de la Corrosion - RISE, France; Christophe Mendibide, Institut de la Corrosion - RISE, France; Nicolas Bulidon, Institut de la Corrosion - RISE, France	
11:50 – 12:10	Hydrogen-assisted fracture of additively manufactured type 304L austenitic stainless steel	12
	<u>Chris San Marchi</u> , Sandia National Laboratories, USA; Thale Smith, Sandia National Laboratories, USA; Richard Karnesky, Sandia National Laboratories, USA; Joseph Ronevich, Sandia National Laboratories, USA; Joshua Sugar, Sandia National Laboratories, USA; Dorian Balch, Sandia National Laboratories, USA	

Monday, September 18, 2023 (continued)

12:10 – 12:30	Mechanistic influence of sub-micrometer porosity on the hydrogen environment-assisted cracking behavior of additively manufactured 17-4PH steel Zachary Harris, University of Pittsburgh, USA; <u>Trevor Shoemaker</u> , University of Virginia, USA; Alfredo Zafra, Imperial College London, United Kingdom; Emilio Martinez-Paneda, Imperial College London, United Kingdom; James Burns, University of Virginia, USA	13
12:30 – 17:30	<i>Ad hoc</i> time	
17:30 – 18:30	Welcome Reception: Light Dinner (Sundial Pavilion)	
	<u>Session: Mechanisms of Hydrogen Embrittlement 1</u>	
19:00 – 19:30	Invited Defect-hydrogen interaction in Al alloys: Challenges and benefits revealed by ab initio calculations <u>Tilmann Hickel</u> , BAM Federal Institute for Materials Research and Testing, Germany; Ali Tehrani, Max-Planck-Institut für Eisenforschung, Germany; Poulami Chakraborty, Max-Planck-Institut für Eisenforschung, Germany; Marti Lopez Freixes, Max-Planck-Institut für Eisenforschung, Germany; Huan Zhao, Max-Planck-Institut für Eisenforschung, Germany; Baptiste Gault, Max-Planck-Institut für Eisenforschung, Germany; Joerg Neugebauer, Max-Planck-Institut für Eisenforschung, Germany	14
19:30 – 19:50	Hydrogen embrittlement susceptibility of deposited nickel-based alloy 82 <u>Anaïs Barou</u> , CIRIMAT, Université de Toulouse, CNRS INP-ENSIACET, France; <u>Éric Andrieu</u> , CIRIMAT, Université de Toulouse, CNRS INP-ENSIACET, France; Pierre Joly, FRAMATOME, France; Lydia Laffont, CIRIMAT, Université de Toulouse, CNRS INP-ENSIACET, France; Christine Blanc, CIRIMAT, Université de Toulouse, CNRS INP-ENSIACET, France	15
19:50 – 20:10	Effects of hydrogen on 4130 steel microstructure during tensile loading <u>Zachary Buck</u> , National Institute of Standards and Technology, USA; Matthew Connolly, National Institute of Standards and Technology, USA; May Martin, National Institute of Standards and Technology, USA; Damian Lauria, National Institute of Standards and Technology, USA; Jason Killgore, National Institute of Standards and Technology, USA; Peter Bradley, National Institute of Standards and Technology, USA; Yan Chen, Oak Ridge National Laboratory, USA; Andrew Slifka, National Institute of Standards and Technology, USA	16
20:10 – 20:30	The power of the chemical potential – Beyond textbook wisdom Reiner Kirchheim, University of Goettingen, Germany	17
20:30 – 20:50	Break	
	<u>Session: Mechanisms of Hydrogen Embrittlement II</u>	
20:50 – 21:10	A mechanistic interpretation for the initiation and propagation of hydrogen induced and assisted cracks Margot Pinson, Gent University, Belgium; Aurélie Laureys, Gent University, Belgium; <u>Tom Depover</u> , Gent University, Belgium; Kim Verbeken, Gent University, Belgium	18

Monday, September 18, 2023 (continued)

- | | | |
|---------------|--|----|
| 21:10 – 21:30 | Mechanisms of hydrogen trapping and clustering at nanovoids and dislocations in BCC metals
<u>Jun Song</u> , McGill University, Canada; Jie Hou, Hunan University, China | 19 |
| 21:30 – 21:50 | Three-dimensional crack propagation behavior in hydrogen-related fracture of high-strength martensitic steel
<u>Akinobu Shibata</u> , National Institute for Materials Science, Japan; Ivan Gutierrez-Urrutia, National Institute for Materials Science, Japan; Akiko Nakamura, National Institute for Materials Science, Japan; Taku Moronaga, National Institute for Materials Science, Japan; Kazuho Okada, National Institute for Materials Science, Japan; Yazid Madi, Mines Paris-PSL, France; Jacques Besson, Mines Paris-PSL, France; Toru Hara, National Institute for Materials Science, Japan | 20 |
| 21:50 – 22:10 | Incorporating mechanistic understanding of the H-embrittlement process into next generation EAC testing approaches
James Burns, University of Virginia, USA; <u>Zachary Harris</u> , University of Pittsburgh, USA | 21 |

Tuesday, September 19, 2023

07:15 – 08:00	Continental Breakfast	
	<u>Session: Hydrogen Effects on Fatigue</u>	
08:00 – 08:30	Invited Fatigue crack growth behavior of pipeline and pressure vessel steels in gaseous hydrogen	22
	<u>Joseph Allen Ronevich</u> , Sandia National Laboratories, USA; Milan Agnani, Sandia National Laboratories, USA; Chris San Marchi, Sandia National Laboratories, USA	
08:30 – 08:50	Fatigue crack growth of type 304/304L stainless steel in pressurized hydrogen gas at elevated temperature	23
	<u>Bryan D. Miller</u> , Naval Nuclear Laboratory, USA; John R. Brockenbrough, Naval Nuclear Laboratory, USA; Fassett Hickey, Southwest Research Institute, USA; Brian P. Somerday, Somerday Consulting LLC, USA; Thomas W. Webb, Naval Nuclear Laboratory, USA	
08:50 – 09:10	Mechanistic model for hydrogen accelerated fatigue crack growth in a low carbon steel	24
	<u>Mohsen Dadfarnia</u> , Seattle University, USA; Zahra Hosseini, University of Illinois at Urbana-Champaign, USA; Masanobu Kubota, WPI I2CNER, USA; Akihide Nagao, WPI-I2CNER, USA; Brian Somerday, University of Illinois at Urbana-Champaign, USA; Petros Sofronis, University of Illinois at Urbana-Champaign, USA; Robert Ritchie, University of California, Berkeley, USA	
09:10 – 09:30	Effect of water vapor content on the toughness and fatigue properties of two storage steels under NG/H2 gas pressure	25
	<u>Lisa Blanchard</u> , Université Grenoble Alpes, CEA LITEN, DTCH, LCA, France; Laurent Briottet, Université Grenoble Alpes, CEA LITEN, DTCH, LCA, France; Xavier Campaignolle, STORENGY SAS, France; Christophe Pommier, STORENGY FRANCE, France	
09:30 – 09:50	On the possible role of hydrogen in the formation of fatigue striation in a moist atmosphere	26
	Sarah Saanouni, Institut PPrime, France; Guillaume Benoit, Institut PPrime, France; Thomas Billaudeau, Airbus SAS, France; Manuel de Araujo, Airbus SAS, France; Jerome Rousset, Airbus SAS, France; Hadi Bahsoun, Institut Pprime, France; Patrick Villechaise, Institut Pprime, France; <u>Gilbert Henaff</u> , Institut Pprime, France	
09:50 – 11:00	Poster Session II and Break	
	<u>Session: Mechanisms of Hydrogen Embrittlement III</u>	
11:00 – 11:30	Invited Understanding of the hydrogen embrittlement mechanisms of nickel base alloys: A review of some recent advances on intergranular fracture	27
	<u>Abdelali Oudriss</u> , La Rochelle Université – LaSIE, France; Marie Landeiro Dos Reis, La Rochelle Université – LaSIE, France; Jamaa Bouhattate, La Rochelle Université – LaSIE, France; Xavier Feaugas, La Rochelle Université – LaSIE, France	

Tuesday, September 19, 2023 (continued)

11:30 – 11:50	Influence of ©/©' lattice misfit on hydrogen embrittlement mechanism of single-crystal nickel-based superalloy CMSX-4 <u>Jisung Yoo</u> , Korea Institute of Materials Science, South Korea; Seungwoo Song, Korea Research Institute of Standards and Science, South Korea; Jeonghyeon Do, Korea Institute of Materials Science, South Korea; Dae Won Yun, Korea Institute of Materials Science, South Korea; In Soo Kim, Korea Institute of Materials Science, South Korea; Baig-Gyu Choi, Korea Institute of Materials Science, South Korea	28
11:50 – 12:10	Modeling the frequency-dependent hydrogen-assisted fatigue crack growth in engineering alloys <u>Zuhair Gasem</u> , King Fahd University of Petroleum and Minerals, Saudi Arabia;	29
12:10 – 12:30	Atomic Mechanism and Criterion for Hydrogen-Induced Transgranular to Intergranular Fracture Transition <u>Yu Ding</u> , Norwegian University of Science and Technology (NTNU), Norway; Zhiliang Zhang, Norwegian University of Science and Technology (NTNU), Norway	30
12:30 – 13:45	Boxed Lunch Break (Sundial Pavilion) <u>Session: Advanced Methods for Characterizing Hydrogen-Metal Interactions I</u>	
13:45 – 14:15	Invited Kelvin Probe Techniques for mapping effective local hydrogen activity and permeation rates <u>Michael Rohwerder</u> , Max-Planck-Institut für Eisenforschung, Germany	31
14:15 – 14:35	Neutron dark-field imaging of hydrogen-fatigued pressure vessel steel Youngju Kim, University of Maryland, USA; <u>Daniel S. Hussey</u> , National Institute of Standards and Technology, USA; Caitlyn M. Wolf, National Institute of Standards and Technology, USA; Katie M. Weigandt, National Institute of Standards and Technology, USA; Pushkar Sathe, National Institute of Standards and Technology, USA; Peter N. Bajcsy, National Institute of Standards and Technology, USA; Paul A Kienzle, National Institute of Standards and Technology, USA; Sarah M. Robinson, National Institute of Standards and Technology, USA; Nikolai N. Klimov, National Institute of Standards and Technology, USA; Ryan P. Murphy, National Institute of Standards and Technology, USA; Michael G. Huber, National Institute of Standards and Technology, USA; Zachary N. Buck, National Institute of Standards and Technology, USA; Matthew J. Connolly, National Institute of Standards and Technology, USA	32
14:35 – 14:55	Integrated analysis of hydrogen embrittlement mechanisms of a steel from its mechanical behaviours and atom probe tomography <u>Sugin Zhu</u> , The University of Sydney, Australia; Qi Wang, The University of Sydney, Australia; Yuya Murata, Kobe Steel, Ltd., Japan; Takumi Kitayama, Kobe Steel, Ltd., Japan; Simon Ringer, The University of Sydney, Australia	33
14:55 – 15:15	In-Situ TEM study of the effect of hydrogen on crack propagation in steel <u>Cynthia Volkert</u> , University of Goettingen, Germany; Lin Tian, University of Goettingen, Germany; Kubota Masanobu, Kyushu University, Japan; Petros Sofronis, University of Illinois at Urbana-Champaign, USA; Reiner Kirchheim, University of Goettingen, Germany	34

Tuesday, September 19, 2023 (continued)

15:15 – 15:35	Break	
	<u>Session: Advanced Methods for Characterizing Hydrogen-Metal Interactions II</u>	
15:35 – 15:55	Hydrogen trapping mechanisms of TiC and (Ti,Mo)C precipitates in steels Pang-Yu Liu, The University of Sydney, Australia; Ranming Niu, The University of Sydney, Australia; Patrick Burr, UNSW Sydney, Australia; <u>Yi-Sheng Chen</u> , The University of Sydney, Australia; Julie Cairney, The University of Sydney, Australia	35
15:55 – 16:15	In Situ neutron diffraction study of effect of hydrogen on deformation mechanisms in austenitic and duplex steels Lawrence Cho, Colorado School of Mines, USA; <u>Donald W. Brown</u> , Los Alamos National Laboratory, USA; Samantha K. Lawrence, Los Alamos National Laboratory, USA; Bjørn Clausen, Los Alamos National Laboratory, USA; Sven C. Vogel, Los Alamos National Laboratory, USA; Joseph A. Ronevich, Sandia National Laboratories, USA; Chris W. San Marchi, Sandia National Laboratories, USA; Lucas Ravkov, Queens University, Canada; Levente Balogh, Queens University, Canada; Yuran Kong, Colorado School of Mines, USA; Pawan Kathayat, Colorado School of Mines, USA; John G. Speer, Colorado School of Mines, USA; Kip O. Findley, Colorado School of Mines, USA	36
16:15 – 16:35	Imaging hydrogen interactions with materials at the nanoscale: SIMS-based correlative microscopy <u>Santhana Eswara</u> , Luxembourg Institute of Science and Technology, Luxembourg; Dustin Andersen, Luxembourg Institute of Science and Technology, Luxembourg; Tom Wirtz, Luxembourg Institute of Science and Technology, Luxembourg	37
16:35 – 16:55	In-Situ measurement of hydride corrosion of uranium using X-ray and neutron scattering techniques <u>Samantha K. Lawrence</u> , Los Alamos National Laboratory, USA; Travis Carver, Los Alamos National Laboratory, USA; Reeru Pokharel, Los Alamos National Laboratory, USA; Donald W. Brown, Los Alamos National Laboratory, USA; Bjørn Clausen, Los Alamos National Laboratory, USA	38
16:55 – 18:30	<i>Ad hoc</i> time	
18:30 – 21:00	Banquet & Award Ceremony	

Wednesday, September 20, 2023

07:15 – 08:00	Continental Breakfast	
	<u>Session: Engineering Perspectives and Approaches to Hydrogen Challenges</u>	
08:00 – 08:30	Invited Hydrogen embrittlement in energy industry: Perspective on mechanisms of Sulfide Stress Cracking (SSC) and approaches to improve SSC resistance in line pipe steels <u>Neeraj Thirumalai</u> , ExxonMobil Technology and Engineering Company, USA	39
08:30 – 09:00	Invited Engineering challenges encountered by designers of high pressure gaseous hydrogen storage vessels <u>John Felbaum</u> , FIBA Technologies, Inc., USA	40
09:00 – 09:20	Balanced material selection approach of 316 stainless steel for high pressure hydrogen systems <u>Xiaoli (Shelly) Tang</u> , Swagelok, USA	41
09:20 – 09:40	Welding high strength, ferritic steels for hydrogen service Matteo Ortolani, Tenaris, Italy; <u>Paolo Bortot</u> , Tenaris, Italy; Michele Sileo, Tenaris, Italy; Erick Escorza, Tenaris, Italy; Matthew Connolly, NIST, USA; Ashwini Chandra, DNV, USA	42
09:40 – 10:00	The effect of hydrogen in the HIP treatment of additive manufactured IN718 <u>Niklas Ehrlin</u> , Air Liquide, Sweden; Dawid Nadolski, Air Liquide, Sweden; Aurelien Prillieux, IRT, France; Mauro Ravaioli, IRT, France	
10:00 – 11:00	Poster Session III and Break	
	<u>Session: Uptake, Transport, and Trapping of Hydrogen</u>	
11:00 – 11:20	Internal friction study of hydrogen interactions in duplex stainless steel <u>Liese Vandewalle</u> , Ghent University, Belgium; Milan J. Konstantinović, Belgian Nuclear Research Centre, Belgium; Kim Verbeke, Ghent University, Belgium; Tom Depover, Ghent University, Belgium	43
11:20 – 11:40	Formation and deformation of hydrides in titanium <u>Stoichko Antonov</u> , National Energy Technology Laboratory, USA; Qing Tan, Max-Planck-Institut für Eisenforschung GmbH, Germany; Baptiste Gault, Max-Planck-Institut für Eisenforschung GmbH, Germany	44
11:40 – 12:00	Grain boundary networks as a fundamental feature to design materials to manage diffusion of hydrogen <u>Jamaa Bouhattate</u> , La Rochelle University, France; Abdelali Oudriss, La Rochelle University, France; Xavier Feaugas, La Rochelle University, France	45
12:00 – 12:20	An ab initio driven model for the trapping and diffusion of hydrogen in Fe-Cr-Ni alloys <u>Patrick Thomas</u> , Kansas City National Security Campus, USA; Jacob Pursley, Kansas City National Security Campus, USA; John Porter, Kansas City National Security Campus, USA; Dale Hitchcock, Savannah River National Laboratory, USA; Timothy Krentz, Savannah River National Laboratory, USA; Erich Wimmer, Materials Design, Inc., USA; Clive Freeman, Materials Design, Inc., USA	46

Wednesday, September 20, 2023 (continued)

12:20 – 19:00	<i>Ad hoc</i> time / Dinner on Own	
	<u>Session: Hydrogen Effects on Fracture II</u>	
19:00 – 19:30	Invited Hydrogen embrittlement in subsea pipelines – From natural gas to hydrogen gas transport	47
	<u>Vigdis Olden</u> , SINTEF Industry, Norway	
19:30 – 19:50	Mitigation of hydrogen embrittlement by carbon monoxide impurity in gaseous H₂	48
	<u>Ryosuke Komoda</u> , Kyushu Institute of Technology, Japan; Masanobu Kubota, International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), Kyushu University, Japan; Aleksandar Staykov, International Institute for Carbon-Neutral Energy Research (WPI-I2CNER), Kyushu University, Japan; Patrick Ginet, Air Liquide France Industrie, France; Francoise Barbier, Air Liquide Research & Development Innovation Campus Paris, France; Jader Furtado, Air Liquide Research & Development Innovation Campus Paris, France; Laurent Prost, Air Liquide Research & Development Innovation Campus Frankfurt, Germany; Akihide Nagao, Air Liquide Research & Development Innovation Campus Tokyo, Japan	
19:50 – 20:10	Austenitic stainless steel weld embrittlement by hydrogen and tritium	49
	<u>Timothy Krentz</u> , Savannah River National Laboratory, USA; Joseph Ronevich, Sandia National Laboratories, USA; Dorian Balch, Sandia National Laboratories, USA; Chris San Marchi, Sandia National Laboratories, USA	
20:10 – 20:30	Strain localization and hydrogen-related fracture in martensitic steels investigated by combined digital image correlation and electron backscatter diffraction	50
	<u>Xiaodong Lan</u> , National Institute for Materials Science, Japan; Kazuho Okada, National Institute for Materials Science, Japan; Ivan Gutierrez-Urrutia, National Institute for Materials Science, Japan; Akinobu Shibata, National Institute for Materials Science, Japan	
20:30 – 20:50	Break	
	<u>Session: Electrochemically Generated Hydrogen</u>	
20:50 – 21:10	ab initio insights into hydrogen UPTAKE AND EVOLUTION ON electrified solid/liquid interfaces	51
	<u>Mira Todorova</u> , Max-Planck-Institut für Eisenforschung, Germany; Sudarsan Surendralal, Max-Planck-Institut für Eisenforschung, Germany; Zhenyu Wang, Max-Planck-Institut für Eisenforschung, Germany; Jörg Neugebauer, Max-Planck-Institut für Eisenforschung, Germany	
21:10 – 21:30	Hydrogen permeation and embrittlement of ferritic SOEC/SOFC interconnect materials	52
	<u>David Kniep</u> , DECHEMA-Forschungsinstitut, Germany; J.F. Drillet, DECHEMA-Forschungsinstitut, Germany; M. Rudolphi, DECHEMA-Forschungsinstitut, Germany; M.C. Galetz, DECHEMA-Forschungsinstitut, Germany	

Wednesday, September 20, 2023 (continued)

- 21:30 – 21:50 **Contribution of hydrogen to intergranular corrosion of 2024 aluminum alloy** 53
Christine Blanc, Université de Toulouse, France; Emilie Mondou, Université de Toulouse, France; Arnaud Proietti, UAR Raimond Castaing, France; Cédric Charvillat, Université de Toulouse, France; David Sinopoli, Airbus Helicopter SAS, France
- 21:50 – 22:10 **Investigation and prediction of hydrogen uptake kinetics of cathodic polarized metals in aqueous electrolytes** 54
Livia Cupertino-Malheiros, Imperial College London, United Kingdom; Alfredo Zafra, Imperial College London, United Kingdom; Tim Hageman, Imperial College London, United Kingdom; Emilio Martínez-Pañeda, Imperial College London, United Kingdom

Thursday, September 21, 2023

Departure

Poster Presentations

Monday, September 18, 2023

Mon - 1	Is microstructural homogeneity the answer to hydrogen embrittlement resistance? Andrew Slifka, NIST, USA	55
Mon - 2	Co-existence of hydrogen embrittlement mechanisms of a X100 seamless pipeline revealed by fracture mechanics tests at 100bar H2 under different loading cycles Laura Moli-Sanchez, Institut de la Corrosion, France	56
Mon - 3	In-situ wear behaviors of various rubbers in low-pressure hydrogen environment Byeong-lyul Choi, Korea University, South Korea	57
Mon - 4	Prevention of hydrogen embrittlement in Al-Zn-Mg alloys by dispersion of novel phases Kazuyuki Shimizu, Iwate University, Japan	58
Mon - 5	Investigation of grain-boundary effect on hydrogen behaviors in single- and polycrystalline medium-entropy CrCoNi alloy Ki Jeong Kim, Korea University, South Korea	59
Mon - 6	Oxidation potential and barrier effects of Cr-based coatings on aluminized press-hardened steels Mohamed Krid, Uclouvain, Belgium	60
Mon - 7	Analysis of hydrogen absorption - desorption mechanisms in Al-Si coated high strength steel during hot stamping process Mohamed Krid, Uclouvain, Belgium	61
Mon - 8	Probabilistic fracture mechanics toolkit for hydrogen blends in natural gas infrastructure Chris San Marchi, Sandia National Laboratories, USA	62
Mon - 9	Performance of conventional and additive manufactured austenitic stainless steels under gaseous hydrogen environment using in-situ hollow specimen technique Jonathan Nietzsche, Bundesanstalt fuer Materialforschung und -pruefung, Germany	63
Mon - 10	WITHDRAWN	
Mon - 11	Fractographic study for screening the hydrogen compatibility of X70 pipeline steels and welds Lisa Claeys, Ghent University, Belgium	64
Mon - 12	A model of internal crack extension due to a continuous build-up of hydrogen pressure: Application to a pressure vessel component Krzysztof Wolski, Mines Saint-Etienne, France	65
Mon - 13	Current status of hydrogen trapping evaluation by thermal desorption spectroscopy and advanced microstructural characterization Tom Depover, Ghent University, Belgium	66

Mon - 14	Modelling of hydrogen diffusion in a steel containing micro-porosity Alixé Dreano, Mines Saint-Etienne, France	67
Mon - 15	Application of in situ hydrogen charging during micromechanical testing Szilvia Kalacska, Laboratoire Georger Friedel, Mines St. Etienne, France	68
Mon - 16	Fine insight on high temperature hydrogen attack initiation and morphology on case studies Raphael Goti, TotalEnergies, France	69
Mon - 17	Combined high energy X-Ray diffraction and small-angle scattering measurements of strain, dislocation density and porosity near steel fatigue cracks grown in hydrogen Matthew J. Connolly, National Institute of Standards and Technology, USA	70
Mon - 18	Effect of hydrogen on creep properties of SUS304 austenitic stainless steel Masanobu Kubota, Kyushu University, Japan	71
Mon - 19	Modeling the frequency-dependent hydrogen-assisted fatigue crack growth in engineering alloys Zuhair Gasem, King Fahd University of Petroleum and Minerals, Saudi Arabia	72
Mon - 20	Investigating the effect of soluble hydrogen on plasticity in low-symmetry alpha-uranium Mary O'Brien, Los Alamos National Laboratory, USA	73
Mon - 21	Application of the small punch test to evaluate hydrogen embrittlement in steels and nickel alloys Rodrigo Alvarenga, LTAD-UFU, Brazil	74
Mon - 22	Comparison of J-r test techniques under gaseous hydrogen environment Mihaela Eliza Cristea, Tenaris Dalmine, Italy	75
Mon - 23	Strain-life testing in hydrogen; Adapting equipment for fully reversed loading of pressure vessel steels in hydrogen Peter Bradley, NIST, USA	76
Mon - 24	Hydrogen permeation through surface oxides of titanium iron alloys Andrew Rowberg, Lawrence Livermore National Laboratory, USA	77
Mon - 25	Measurements of hydrogen isotopes permeation in 316L stainless steel at low temperature Stephanie Thiebaut, CEA, France	78
Mon - 26	A study on mechanical properties of natural gas pipe material in high pressure hydrogen gas environment Won Jung Kim, Hyundai Steel, South Korea	79
Mon - 27	Hydrogen effects on fatigue and fracture properties of 17-4PH stainless steel Robert Wheeler, Sandia National Laboratories, USA	80
Mon - 28	Multi-layer hydrogen-barrier coating for natural gas transmission pipelines Gianluca Roscioli, Arculus Solutions, Inc., USA	81

Tuesday, September 19, 2023

Tue - 1	Low cycle fatigue testing in high pressure gaseous hydrogen using tubular specimens Heiner Oesterlin, Fraunhofer IWM, Germany	82
Tue - 2	Hydrogen-induced degradation of mechanical properties despite reduction in brittle fracture-features in a 1.5 GPa dual-phase steel Rama Srinivas Varanasi, Tohoku University, Japan	83
Tue - 3	Observation and analysis of low temperature leak characteristics of the O-ring for hydrogen electric vehicles Sang Min Lee, Korea University, South Korea	84
Tue - 4	Effects of C and Al on hydrogen embrittlement mechanism in medium Mn-Ni steels Min Young Sung, Korea University, South Korea	85
Tue - 5	Semantic segmentation of microscopy images of lower bainite and tempered martensite high-strength steels Jun Song, McGill University, Canada	86
Tue - 6	Hydrogen embrittlement evaluation of HSLA steels using small punch and slow strain rate tests Rodrigo Alvarenga, LTAD - UFU, Brazil	87
Tue - 7	Hydrogen effects in thermoplastics and elastomers in high-pressure and low-pressure cycling environments under ambient and cold temperature conditions Nalini Menon, Sandia National Labs, USA	88
Tue - 8	Resonant tunneling of Hydrogen in Pd Takahiro Ozawa, The University of Tokyo, Japan	89
Tue - 9	Hydrogen embrittlement of an X70 pipeline steel assessed by slow strain rate tensile tests Margo Cauwels, Ghent University, Belgium	90
Tue - 10	Hydrogen barrier coatings and liners for steel pipelines Omer Dogan, DOE National Energy Tech Lab, USA	91
Tue - 11	Microstructural effects on fracture resistance of vintage pipeline steels in gaseous hydrogen Milan Agnani, Sandia National Laboratories, USA	92
Tue - 12	Fatigue cracks initiation in a low alloy steel: Impact of hydrogen on plasticity Marie Lemaitre, Univ. Grenoble Alpes, CEA, France	93
Tue - 13	Hydrogen induced cracking of ultra high strength 350 grade maraging steel Cédric Bosch, Mines Saint-Etienne, CNRS UMR 5307 LGF, France	94
Tue - 14	Influence of nano-sized VC and TiC carbides on hydrogen embrittlement in ferritic AHSS Tim Boot, Delft University of Technology, Netherlands	95

Tue - 15	Structural integrity analysis of trunnion studs under cathodic protection based on pre-cracked and notched specimens Rodrigo Alvarenga, LTAD - UFU, Brazil	96
Tue - 16	Effect of microstructure on hydrogen embrittlement susceptibility of martensitic and bainitic high strength steels Salim Brahim, McGill University, Canada	97
Tue - 17	A combined micromechanics/materials science approach to understanding high temperature hydrogen attack Kshitij Vijayvargia, University of Illinois Urbana-Champaign, USA	98
Tue - 18	Hydrogen effect on the activation enthalpy of plastic deformation Florian Schaefer, Saarland University, Germany	99
Tue - 19	Predicting hydrogen embrittlement of stainless steels using physics-based machine learning Michael Gao, National Energy Technology Laboratory, USA	100
Tue - 20	Effect of high-temperature hydrogen on diffusion and mechanical properties in additive manufactured Ni-base superalloy for gas turbine hot parts Daichi Akama, Mitsubishi Heavy Industries, Japan	101
Tue - 21	Effect of mechanical strength on the hydrogen embrittlement susceptibility and fracture behavior of a modified AISI 4130 steel Guilherme Martiniano, LTAD, UFU, Brazil	102
Tue - 22	Numerical simulation of hydrogen entering a second phase particle in aluminum Ken-ichi Ebihara, Japan Atomic Energy Agency, Japan	103
Tue - 23	Evaluating the sensitivities of AISC susceptibility in stainless-steel nuclear waste storage canister environments Sarah Blust, University of Virginia, USA	104
Tue - 24	The hydrogen effects on materials program at NIST-Boulder Matthew J. Connolly, National Institute of Standards and Technology, USA	105
Tue - 25	Evaluation of tungsten as a hydrogen permeation barrier in reduced activation steel F82H for nuclear fusion applications Dannisa Chalfoun, National Commission of Atomic Energy of Argentina (CNEA), Argentina	106
Tue - 26	Towards next generation, low cost, hydrogen resilient austenitic steels: Relating composition, microstructure and deformation modes across length Jessica Krogstad, University of Illinois, Urbana Champaign, USA	107
Tue - 27	MOVED TO Wed - 9	
Tue - 28	Effect of bainite morphology on hydrogen trapping in X70 microalloyed steel Lu Sun, University of Alberta, Canada	108

Wednesday, September 20, 2023

Wed - 1	WITHDRAWN	
Wed - 2	WITHDRAWN	
Wed - 3	Assessment of hydrogen embrittlement behavior in Al-Zn-Mg alloys by multi-modal 3D image-based simulation Hiro Fujihara, Kyushu University, Japan	109
Wed - 4	Effects of hydrogen embrittlement on the fracture strength of notched tensile specimens: An Engineering Approach Marcelo Paredes, Texas A&M University, USA	110
Wed - 5	Improvement of resistance against hydrogen embrittlement by increasing carbon segregation at prior austenite grain boundary in low-carbon martensitic steels Kazuho Okada, National Institute for Materials Science, Japan	111
Wed - 6	In situ micromechanics during hydrogen charging: Case study of diffusible hydrogen in bcc iron alloys Maria Jazmin Duarte Correa, Max-Planck-Institut für Eisenforschung GmbH, Germany	112
Wed - 7	In-situ microcantilever bending of titanium revealing hydrogen-dislocation interactions Liesbet Deconinck, Ghent University, Belgium	113
Wed - 8	Fatigue crack growth resistance and fracture toughness of pipe welds exposed to a blend of hydrogen and natural gas under high pressure Guillaume Benoit, Institut Prime, ISAE-ENSMA, France	114
Wed - 9	Accelerated methods for quantitative assessment of hydrogen embrittlement and hydrogen stress cracking using incremental step loading Joshua Jackson, US Corrosion Services, USA	115
Wed - 10	Hydrogen diffusion and trapping in a low alloy steel containing micro-porosity Frédéric Christien, Mines Saint-Etienne, France	116
Wed - 11	A new approach for characterization of steel weld metal hydrogen cracking susceptibility Marie Quintana, Welding & Materials Consultant to BMT Canada Limited, USA	117
Wed - 12	Effect of microstructure on the internal hydriding behavior of uranium Zachary Harris, University of Pittsburgh, USA	118
Wed - 13	Effect of hydrogen partial pressure on crack initiation and growth rate in X52 vintage steel Fernando Daniel León-Cázares, Sandia National Laboratories, USA	119
Wed - 14	Evaluation of the “nickel effect” in sulfide stress cracking of low alloy steels using thiosulfate as an alternative to H₂S-containing environments Dannisa Chalfoun, National Commission of Atomic Energy of Argentina (CNEA), Argentina	120
Wed - 15	Effect of hydrogen on phase stabilities in steels Tilman Hickel, Max-Planck-Institut für Eisenforschung GmbH, Germany	121

Wed - 16	Hydrogen delayed cracking assessment for super high strength hot rolled heavy gauge martensitic steels Robin Dedoncker, Arcelormittal Global R&D, Belgium	122
Wed - 17	The history of hydrogen embrittlement mitigation in the fastener industry - We finally SAW the light Salim Brahim, McGill University, Canada	123
Wed - 18	Effects of pre-existing hydrogen to stress triaxiality and damage evolution on ultra high strength steel Hye-Jin Kim, Hyundai-Steel Company, South Korea	124
Wed - 19	External hydrogen embrittlement assessment of pipeline base metal and heat affected zone through slow strain rate tensile testing Lise Jemblie, SINTEF Industry, Norway	125
Wed - 20	Atomistic simulations of hydrogen distribution in Fe-c steels Xiaowang Zhou, Sandia National Laboratories, USA	126
Wed - 21	Hydrogen embrittlement evaluation of stainless steels in cryogenic temperature Jaeyoung Park, Korea Research Institute of Standards and Science, South Korea	127
Wed - 22	Evaluation of the hydrogen compatibility of material: A comparison with different methodologies Kyung-Oh Bae, Korea Research Institute of Standards and Science, South Korea	128
Wed - 23	Multi scale study of the effect of hydrogen and grain boundary character on plasticity mechanisms in pure nickel Abdelali Oudriss, La Rochelle Université - LaSIE, France	129
Wed - 24	Analysis of hydrogen induced failure by hydrogen injection methods in micro-alloyed steels Jae-Myung Kim, Hyundai steel, South Korea	130
Wed - 25	Effect of atmospheric environments on the environment-assisted cracking behavior of 5xxx-Series aluminum alloys Gabiella Marino, University of Virginia, USA	131
Wed - 26	Assessment of hydrogen embrittlement of natural gas pipeline steels Irina Pushkareva, CanmetMATERIALS, Canada	132