Technical Program

Sunday, September 9

Opening Session

7:00-7:45 PM **Invited*	Hydrogen's Ubiquity: Fixating, Facilitating, Fracturing, Flip-Flopping *W. Gerberich*, E. Hintsala (USA)
7:45-8:30 PM **Invited*	Theory and Experiments on Hydrogen-Defect Interactions *R. Kirchheim* (Germany)
8:30-8:50 PM	*Break*
8:50-9:20 PM **Invited*	Title *K. Randolph* (USA)

Monday, September 10

Hydrogen Effects in Steels I

8:00-8:30 AM **Invited*	Measurement and Modeling of Temperature Dependent Internal Hydrogen Assisted Cracking *R. Gangloff* (USA)
8:30-9:00 AM **Invited*	Hydrogen Embrittlement of Steels: New Observations on Micromechanisms of Fracture *N. Thirumalai*, S. Rajagopalan, D. Valiveti, J. Li (USA)
9:00-9:20 AM	The Effect of Nano-Sized TiC Precipitates on Hydrogen Embrittlement of Tempered Lath Martensitic Steel *A. Nagao*, B. Eftink, M. Dadfarnia, B. Somerday, P. Sofronis (Japan, USA)
9:20-9:40 AM	Hydrogen Embrittlement in Ultrafine Elongated Grain Structure Steel Processed by Warm Tempforming *Y.Kimura*, T.Inoue, E.Akiyama, K. Tsuzaki (Japan)
9:40-10:00 AM	Identification of Hydrogen Desorption Peak Temperatures, Binding Energies, and Occupation Ratios at Vacancies, Dislocations and Grain Boundaries in Iron and Steel *K. Takai*, N. Abe (Japan)
10:00-11:00 AM	*Poster Session I and Break*

Poster Session I

Fatigue Crack Growth of Pipeline Steel in Gaseous Hydrogen - Predictive Model Calibration to API-5L X52
R. Amaro, E. Drexler, N. Rustagi, N. Nanninga, Y. Levy, A. Slifka (USA)

A Numerical and Experimental Study of the Disk Pressure Test
K. Ardon, Y. Charles, P. Levée, M. Gaspérini (France)

Mechanical Behavior and Fractography of 304 Stainless Steel with High Hydrogen Concentration
M. Au (USA)

On the Role of Hydrogen During the Corrosion Processes Affecting the 2024 Aluminum Alloy
C. Larignon, E. Andrieu, J. Alexis, G. Odemer, *C. Blanc* (France)

Effect of Material Characteristics on Hydrogen Embrittlement Susceptibility of High Strength Steel
S. Brahimi, S. Yue, S. Rajagopalan (Canada)

Hydrogen Embrittlement of a Low Alloyed Steel in High Pressure Wet Hydrogen
L. Briottet , A. Guilloud , P. Lemoine, I. Moro, E. Bousquet, C. Blanc, E. Andrieu, G. Odemer (France)

Comparison of the Tensile Behavior of a Tempered 34CrMo4 Steel Exposed In Situ to High Pressure H_2 Gas or to Cathodic H Charging
L. Moli-Sanchez, F. Martin, E. Leunis, L. Briottet, P. Lemoine, *J. Chêne* (France, Belgium)

Hydrogen Embrittlement in Super Duplex Stainless Steel Tubes UNS S32750 Under Mechanical Stress
B. da Silva, F. Salvio, D. dos Santos (Brazil)

On the Influence of Hydrogen on Fracture Modes of Symmetrical Tilt Grain Boundaries in Nickel
G. Xu, *M. Demkowicz* (USA)

Evaluation of the Effect of In-Situ Hydrogen Charging on the Mechanical Properties of Iron-Based Alloys
T. Depover, E. Wallaert, L. Duprez, K. Verbeken (Belgium, Germany)

Investigation Into the Effects of Hydrogen Embrittlement on Experimental 304 Stainless Steel Alloys Modified with Palladium and Ruthenium Additions
R. Doyle, B. Connolly (UK)

Fatigue Testing of Pipeline Welds in Pressurized Hydrogen Environments
E. Drexler, N. Rustagi, D. Lauria, R. Amaro, A. Stevenson, P. Keefe, A. Slifka (USA)

Effect of Chromium Content on the Hydrogen Permeation in Ni alloys
O. Flores, H. Martinez, B. Campillo, G. Aramburo, G. Lara, I. Puente, J. Zagal, A. Aguilar, H. Lopez (México, USA)

Hydrogen Embrittlement Resistance of an Ultra High Strength Steel Sheet for Automobile
S.Takagi, Y. Toji, M. Yoshino, K. Hasegawa, N. Wada, K. Takai, Y. Hagihara (Japan)

Hydrogen Enhanced Dislocation Emission at a Crack Tip
Y. Wang, D. Connétable*, D. Tanguy* (France)

Role of Welding on the Hydrogen Embrittlement Susceptibility of a Tempered X4CrNiMo 16.5.1 Martensitic Stainless Steel
L. Marchetti, E. Herms, J. Chêne*, S. Thiebaut,* F. Buy, J. Farre (France)

Changes in Mechanical Properties and Electronic Structures of Hafnium Hydrides by Hydrogen-Induced Phase Transformations
B. Tsuchiya, R. Sahara, M. Oku, K. Kurosaki, K. Konashi (Japan)

Combination of Electrochemical Methods with Thermal Analysis to Reveal Diffused and Trapped Hydrogen in Steels: A Microstructural Perspective
A. Uluc, A. Böttger (The Netherlands)

Effects of Cyclic Plastic Strain on Hydrogen Environment Assisted Cracking in High-Strength Steel
F. Vucko, C. Bosch, D. Delafosse (France)

Effect of Intermetallic Compound Particles on the Invading Behavior of Hydrogen into Aluminum
T. Watakabe, G.Itoh, Y.Hatano (Japan)

Advanced Methods for Characterizing Hydrogen-Materials Interactions I

11:00-11:20 AM	In-Situ Examination of Hydrogen Behavior in Stainless Steel by Using Energy Dispersive Diffraction Synchrotron E. Dabah, T. Kannengiesser, T. Boellinghaus, *D. Eliezer* (Israel, Germany)
11:20-11:40 AM	Application of Kelvin Force Microscopy and Secondary Ion Mass Spectroscopy to Evidence Hydrogen Embrittlement of the 2024 Aluminum Alloy C. Larignon, E. Andrieu, J. Alexis, L. Lacroix, G. Odemer, *C. Blanc* (France)
11:40-12:00 PM	Investigating the "Strongest Links" Against H-embrittlement in Nickel-Based Superalloys *J. Hanson*, M. Wang, M. Demkowicz, S. Gradečak (USA)
12:00-12:20 PM	Hydrogen Enhanced Plasticity and Failure Revisited 2012 *M. Martin*, A. Nagao, I. Robertson, P. Sofronis (USA, Japan)

Addressing Hydrogen Embrittlement in Technology I

7:00-7:30 PM **Invited*	Hydrogen Embrittlement-Related Issues and Needs in the Hydrogen Value Chain *J. Furtado* (France)
7:30-8:00 PM **Invited*	Prognostic Control of Cracking in Structures and Components Operating in Hydrogen Service Environments *P. Irving* (UK)
8:00-8:20 PM	Microstructure and Mechanical Property Performance Evaluation of Commercial Grade API Pipeline Steels in High Pressure Gaseous Hydrogen *D. Stalheim*, S. Jansto, T. Boggess, S. Ningileri, D. Bromley (USA, Canada)
8:20-8:40 PM	Measurement of Fatigue of Pipeline Steel in High Pressure Hydrogen Gas *A. Slifka*, E. Drexler, R. Amaro, N. Rustagi, D. Lauria, A. Stevenson, P. Keefe, N. Nanninga, Y. Levy, D. Stalheim, L. Hayden (USA)
8:40-9:00 PM	*Break*

Hydrogen Dissolution, Transport, and Trapping I

9:00-9:20 PM	Hydrogen Solubility and Trapping in AISI 316L Austenitic Stainless Steel *M. Ganchenkova*, O. Todoshchenko, Y. Yagodzinskyy, H.Hänninen (Russia, Finland)
9:20-9:40 PM	Consequences of H-Vacancy Interactions: an Ab Initio Insight *R. Nazarov*, T. Hickel, J. Neugebauer (Germany)
9:40-10:00 PM	Hydrogen Permeation and Trapping on 2¼ Cr-1 Mo Artificial Aged Steel L. Lemus, *D. dos Santos* (Brazil)
10:00-10:20 PM	Thermohydrogen Treatment of Highly Beta-Stabilized Titanium Alloy Ti 38-644 (Beta-C) P. Schmidt, V. Macin, *H.-J. Christ* (Germany)

Tuesday, September 11

Modeling and Simulation I

8:00-8:30 AM **Invited*	Understanding H-embrittlement in High-Strength Steels by Ab Initio Methods *J. Neugebauer*, U. Aydin, R. Nazarov, J. von Pezold, T. Hickel (Germany)
8:30-8:50 AM	Atomistic Modeling of Hydrogen Trapping in Steels *S. Desai*, N. Thirumalai (USA)
8:50-9:10 AM	Molecular Statics Study of the Effect of Hydrogen on Edge Dislocation Motion in Alpha-Fe *S. Taketomi*, R. Matsumoto, N. Miyazaki (Japan)
9:10-9:30 AM	Atomistic Simulation on Vacancy Generation and Accumulation Mediated by Dislocations in Hydrogen Embrittlement S. Li, Y.-C. Lo, L. Qi, T. Neeraj, R. Srinivasan, *J. Li* (USA, China)
9:30-9:50 AM	Clusters of Intergranular Vacancies Impact Fracture *D. Tanguy* (France)
9:50-11:00 AM	*Poster Session II and Break*

Poster Session II

Mechanical Properties of X70 Steel in Gaseous Hydrogen
U. Baek, S. Nahm, H. Lee, Y. Lee (Republic of Korea)

Hydrogen Effect on Mechanical Properties and Fracture Toughness of Ni-alloy
A. Balitskii, L. Ivaskevich, V. Mochulskyi (Ukraine)

Hydrogen's Effects on Materials Under Conditions Relevant to Refining of Crude Oil
M. Barney, B. Somerday (USA)

Hydrogen Embrittlement of AlZnMg Alloys: Experiments and Simulations
N. Ben Ali, D. Tanguy, R. Estevez (France)

Hydrogen Permeation Properties of a Ferritic-Pearlitic Steel Under Wet Hydrogen Atmosphere
E. Bousquet, C. Blanc, E. Andrieu, G. Odemer (France)

Fatigue Crack Growth of a C-Mn Steel and of Its Welds Under Hydrogen Pressure
I. Moro, *L. Briottet*, P. Lemoine, O. Doyen, G. de Dinechin (France)

Advanced Methods for Characterizing Hydrogen-Materials Interactions II

11:00-11:20 AM	Direct Characterization of Dislocation Pipe Diffusion in the Pd-H System Using Incoherent Quasi-Elastic Neutron Scattering and Advanced Computational Methods *B. Heuser*, D. Trinkle, E. Schiavone (USA)
11:20-11:40 AM	Imaging and Quantification of Hydrogen Isotope Trapping *R. Karnesky*, N. Bartelt, N. Teslich, M. Kumar (USA)
11:40-12:00 PM	In-situ Detection of Deuterium in Duplex Stainless Steels Using Time-of-Flight Secondary Ion Mass Spectrometry (TOF-SIMS) F. Straub, W. Unger, T. Mente, *T. Boellinghaus* (Germany)
12:00-12:20 PM	Interactions Between Gaseous Hydrogen and Aluminum Alloys *R. Kolasinski*, R. Karnesky, C. San Marchi (USA)
12:20-1:45 PM	*Lunch* **Boxed lunches are provided in Trappers Room.*

Hydrogen Dissolution, Transport, and Trapping II

1:45-2:15 PM **Invited*	Evaluation of Hydrogen Trapping in Iron-Based Alloys by Thermal Desorption Spectroscopy D. Perez Escobar, *K. Verbeken*, L. Duprez, M. Verhaege (Belgium, Germany)
2:15-2:35 PM	Analytical and Numerical Calculation of Hydrogen Desorption Rate During TDS Analysis Using the Kissinger Formula and the McNabb-Foster Model *F. Wei*, M. Enomoto, K. Tsuzaki (Japan)
2:35-2:55 PM	Influence of Metallurgical and Mechanical States on the Diffusion and Trapping of Hydrogen in Quenched and Tempered Martensitic Steels *J. Creus*, S. Frappart, G. Courlit, C. Berziou, E. Conforto, X. Feaugas, F. Thébault, L. Delattre (France)
2:55-3:15 PM	Role of Dislocation Patterns on Hydrogen Trapping in Deformed Nickel: a Deuterium-Thermal Desorption Analysis *F. Martin*, P. Laghoutaris, L. Marchetti, A. Oudriss, X. Feaugas, J. Bouhattate, J. Creus, J. Chêne (France)
3:15-3:35 PM	*Break*

Hydrogen Effects on Mechanical Properties of Structural Metals

3:35-3:55 PM — Environment Assisted Cracking of Steam Turbine Blade Steels – a Consistent Rationalization Based on Hydrogen Assisted Cracking
A. Turnbull, S. Zhou (UK)

3:55-4:15 PM — Effect of Metallurgical State and Temperature on the Hydrogen Embrittlement Susceptibility of Alloy 718
E. Andrieu, C. Blanc, J.-M. Cloue, *F. Galliano*, G. Odemer (France)

4:15-4:35 PM — Crack Tip Electrochemistry Control of Stress Corrosion Cracking of Low Temperature Sensitized Al-Mg Alloys
C. Crane, R. Gangloff (USA)

4:35-4:55 PM — Fatigue Crack Growth of a C-Mn Steel and of its Welds Under Hydrogen Pressure
I. Moro, *L. Briottet*, P. Lemoine, O. Doyen, G. de Dinechin (France)

4:55-5:15 PM — Effects of Cycle Frequency, Electrode Potential and Waveform on Corrosion-Fatigue Crack Growth in High-Strength Steels
M. Knop, N. Birbilis, S. Lynch (Australia)

Wednesday, September 12

Hydrogen Effects in Steels II

8:00-8:30 AM **Invited*	Electron Concept for Hydrogen Brittleness of Austenitic Steels *V. Gavriljuk*, V. Shyvanyuk, S. Teus, B. Shanina (Ukraine)
8:30-9:00 AM **Invited*	Hydrogen Embrittlement in Fe-Mn-C High Strength Austenitic Steels *K. Tsuzaki*, M. Koyama, E. Akiyama (Japan)
9:00-9:20 AM	Effect of Strain-Induced Martensite on Hydrogen Charged TRIP Steel *J. Ronevich*, J. Speer, G. Krauss, D. Matlock (USA)
9:20-9:40 AM	Influence of Microstructure and Titanium-Carbonitrides on the Susceptibility to Hydrogen Embrittlement (HE) in Ultra-High Strength Thin Steel Grades for the Automotive Industry *J. Rehrl*, K. Mraczek, A. Pichler, E. Werner (Austria, Germany)
9:40-10:00 AM	Crystallographic Analysis of Hydrogen-Related Fracture in Medium Carbon Martensitic Steel *A. Shibata*, T. Murata, N. Tsuji (Japan)
10:00-11:00 AM	*Poster Session III and Break*

Poster Session III

Monitoring Hydrogen Entry and Corrosion Behavior Under Simulated Atmospheric Corrosion
E. Akiyama, S. Li, T. Shinohara, K. Tsuzaki (Japan)

Evaluation of Hydrogen Embrittlement Severity in Pulse Plasma Nitrided Steel by Means of In Situ Electrochemical Nanoindentation
M. Asgari, A. Barnoush, R. Johnsen, R. Hoel (Norway)

The Effects of Solute Hydrogen on the Mechanical Properties and Crystallization Behavior of Solar Grade Silicon
D. Bahr, M. Zbib (USA)

Hydrogen Diffusion and Trapping in Random Heterogeneous Materials: Some Advances Using FEM on Polycrystalline Description
E. Legrand, *J. Bouhattate*, X. Feaugas, D. Li, H. Garmestani (France, USA)

Hydrogen Trapping in Super Martensitic and Duplex Stainless Steel Alloys
R. Bar, *E. Dabah*, D. Eliezer, T. Kannengiesser, T. Boellinghaus (Israel, Germany)

Recent Developments on Modeling the Hydrogen Deformation Interactions: Implications to Fracture
M. Dadfarnia, M. Martin, B. Somerday, P. Sofronis, I. Robertson (USA, Japan)

Modeling and Simulation II

11:00-11:20 AM	Impurity-Induced Interfacial Decohesion *J. Bassani* (USA)
11:20-11:40 AM	Intergranular Decohesion Induced by Mobile Hydrogen in Iron: First-Principles Calculations *M. Yamaguchi*, J. Kameda, K.-I. Ebihara, M. Itakura, H. Kaburaki (Japan)
11:40-12:00 PM	A 3D Cohesive Modelling Approach for Hydrogen Embrittlement in Welded Joints of X70 Pipeline Steel A. Alvaro, *V. Olden*, O. Akselsen (Norway)
12:00-12:20 PM	Theoretical Study of the Co-adsorption of Hydrogen and Unsaturated Molecules on Iron Surface *A. Staykov*, B. Somerday (Japan, USA)

Addressing Hydrogen Embrittlement in Technology II

7:00-7:30 PM **Invited*	Fundamental Studies on Tribology in Hydrogen *J. Sugimura* (Japan)
7:30-7:50 PM	Industrially-Relevant Multiscale Modelling of Hydrogen Embrittlement *N. Winzer*, M. Mrovec, D. Di Stefano, I. Katzarov, A. Paxton (Germany, UK)
7:50-8:10 PM	A Unified Modeling of Hydrogen Induced Cracking/Blistering in Steel Pipelines *A. Traidia*, G. Lubineau, S. Duval, A. Sherik, M. Abufour (Saudi Arabia)
8:10-8:30 PM	Determination of the Hydrogen Concentration in High Strength Steels After Phosphating Processes Using the Hydrogen Collecting Analysis (HCA) Technique F. Unterumsberger, S.Kühn, *M. Pohl* (Germany)
8:30-8:50 PM	*Break*

Hydrogen-Deformation Interactions

8:50-9:10 PM	Nanomechanical Approach to Understand the Mechanism of the Hydrogen Embrittlement *A. Barnoush*, M. Zamanzade, H. Vehoff (Germany)
9:10-9:30 PM	Hydrogen Effects on Plastic Deformation of AISI 316LN Single Crystals *Y. Yagodzinskyy*, E. Malitckii, T. Saukkonen, H. Lankinen, H. Hänninen (Finland)
9:30-9:50 PM	Interaction Hydrogen-Plasticity in the X14CrMo17 Ferritic Stainless Steel *V. Gaspard*, D. Delafosse, A. Fraczkiewicz (France)
9:50-10:10 PM	Influence of Hydrogen and Oxygen Content on the Mechanical Behavior of Zirconium Between 275 and 325°C and Titanium at 20°C *J. Couzinié*, B. Barkia, V. Doquet, I. Guillot (France)