Technical Program

Sunday, September 11

Opening Session

7:00-7:45 PM **Invited*	H-Enhanced Deformation and Fracture in the Crack Tip Process Zone *R. Gangloff* (USA)
7:45-8:30 PM **Invited*	Hydrogen-Induced Deformation and Fracture: from Experiments and Modelling to Prognosis M. Dadfarnia, A. Nagao, S. Wang, M. L. Martin, B. P. Somerday, R. Kirchheim, R. O. Ritchie, I. M. Robertson, *P. Sofronis* (USA, Japan, Germany)
8:30-8:50 PM	*Break*
8:50-9:20 PM **Invited*	Toward the Sustainable Mobility and Society Challenges and Future of Fuel Cell Vehicles and Hydrogen *K. Hirose* (Japan)
9:20-9:50 PM **Invited*	Recent Advances in Hydrogen and Fuel Cell Technologies and Remaining Materials-Related Challenges *E. Gupta* (USA)

Monday, September 12

Advanced Methods for Characterizing Hydrogen-Materials Interactions

8:00-8:30 AM **Invited*	Determination of Local Hydrogen Concentrations in Metallic Materials Using Scanning Probe Methods and Geometric Scaling Laws *J. R. Scully,* R. F. Schaller, B. C. Rincon Troconis (USA)
8:30-8:50 AM	Development of an In Situ Measuring Cell to Non-Destructive, Local Measurement of Diffusible Hydrogen Content in Steels G. Manke, J. Jürgensen, *M. Pohl* (Germany)
8:50-9:10 AM	High Resolution ToF-SIMS Imaging of Deuterium Permeation and Cracking in Duplex Stainless Steels O. Sobol, G. Holzlechner, T. Wirth, D. Eliezer, *T. Boellinghaus*, W. E. S. Unger (Germany, Israel)
9:10-9:30 AM	Measurement of Hydrogen Distributions in Metals by Neutron Radiography and Tomography *A. Griesche*, E. Dabah, B. Pfretzschner, T. Schaupp, M. Schulz, N. Kardjilov (Germany)

9:30-9:50 AM Transmission Bragg Edge Measurements of Crack Tip Strain Fields From Fatigue of High Strength Pipeline Steel in a Hydrogen Environment
M. J. Connolly, A. J. Slifka, E. S. Drexler (USA)

9:50-11:00 AM *Poster Session I and Break*

Poster Session I

Effect of Hydrogen on Thermally Induced Martensitic Transformation Behavior in Austenitic Alloy
Y. Abe, M. Koyama, K. Tsuzaki (Japan)

Hydrogen Compatibility of Polymers for Infrastructure Applications
K. J. Alvine, K. Brooks, N. C. Menon, A. M. Kruizenga, C. San Marchi, D. B. Smith, A. K. Naskarak (USA)

Computational Modeling of Hydrogen-Assisted Fatigue Crack Growth in Steel Pipelines and Pressure Vessels
D. T. O'Connor, *R.L. Amaro*, E. S. Drexler, A. J. Slifka (USA)

Detection of Hydrogen Distribution and Evaluation in Duplex Stainless Steel by Scanning Kelvin Probe Force Microscopy
Z. Hua, *B. An*, T. Iijima, C. Gu, J. Zheng, C. San Marchi, B. P. Somerday (Japan, China, USA)

Development of Toughness Prediction Factors for C-½ Mo Steels Operating in Hydrogen Environments at Elevated Temperatures
M. Bharadwaj, C. D. Lundin, M. Prager (USA)

Hydrogen Absorption Kinetics and Its Influence on Tensile Properties of Three Commercial Dual-Phase Steels
S. P. Bhat (USA)

Influence of Hydrogen on Crack Propagation Behavior in 7XXX Aluminum Alloys
M. S. Bhuiyan, H. Toda, K. Uesugi, A. Takeuchi, N. Sakaguchi, Y. Watanabe (Japan)

Phase Field Modelling of Second Phase Precipitation at a Low Angle Grain Boundary
C. Bjerkén (Sweden)

Novel Chamber for In Situ Observation of Hydrogen Effects by Neutron or X-Ray Scattering
P. E. Bradley, M. J. Connolly, A. J. Slifka, E. S. Drexler (USA)

Hydrogen Embrittlement Susceptibility of a Heat Treated Experimental Microalloyed Steel with Different Cooling Rates
J. Villalobos, *B. Campillo*, E. López-Martínez, O. Flores, S. Serna (México)

Measurement of Hydrogen in Metals Using Prompt Gamma-ray Activation Analysis
D. J. Turkoglu, R. L. Paul, R. G. Downing, *H. Chen-Mayer* (USA)

The E^2G Mechanistic Model of High Temperature Hydrogen Attack
C. H. Panzarella, *J. D. Cochran*, D. A. Osage (USA)

Modeling Hydrogen-Induced Fracture and Crack Propagation in High Strength Steels
M. Dadfarnia, A. Nagao, B. P. Somerday, P. E. Schembri, J. W. Foulk III, K. A. Nibur, D. K. Balch, R. O. Ritchie, P. Sofronis (USA, Japan)

Hydrogen Embrittlement Mitigation Techniques in High Strength Steel Manufacture
M. Draper, E. Thomas, K. Rackers, N. Fichtelberg, S. Ankem (USA)

Mechanical Testing and Modeling of 304 Stainless Under a Range of Gaseous Hydrogen Exposure Conditions
P. D. Ferro, R. Miresmaeili (USA, Iran)

Dislocation Mechanics Impact(s) on Hydrogen Embrittlement
C. Teresi, C. San Marchi, N. Moody, *W. Gerberich* (USA)

Hydrogen Gas Permeation through FeMnNiCoCr High Entropy Alloys
J. Furtado, R. M. Ribeiro, F. Barbier, D. S. dos Santos (France, Brazil)

Hydrogen Uptake and Embrittlement Susceptibility of Ferrite-Pearlite Pipeline Steels
O. M. I. Todoshchenko, Y. Yagodzinskyy, *H. Hänninen* (Finland)

The Effect of Variation in Metallurgy and Hydrogen Interactions on the Hydrogen Environment-Assisted Cracking of Monel K-500
Z. D. Harris, B. C. Rincon Troconis, J. R. Scully, J. T. Burns (USA)

Surface Cracking in SSRT Test of Carbon Steels in High-Pressure Hydrogen Gas
M. Hino, H. Matsunaga, J. Yamabe, S. Matsuoka (Japan)

Role of Grain Boundary for Hydrogen Diffusion in FCC-Pd and BCC-Fe
H. Iwaoka, M. Arita, *Z. Horita* (Japan)

Micro-mechanism of Hydrogen Induced Cracking between Superalloy 718 and Recently Developed Superalloy Haynes 282 are Compared
S. Jothi, S. V. Merzlikin, J. Andersson (UK, Germany, Sweden)

Hydrogen Isotope Trapping in Al-Cu Binary Alloys
P. Chao, *R. A. Karnesky* (USA)

Additive Manufacturing for Hydrogen Applications
P. Korinko, W. Everhart, J. Bobbitt, M. Morgan, M. Reigel (USA)

Mixed Mode Fracture Toughness Testing of Hydrogen-Charged 21Cr-6Ni-9Mn Stainless Steel
S. K. Lawrence, B. P. Somerday, G. Yee, D. K. Balch (USA)

Hydrogen Uptake and Its Effect on Mechanical Properties of 18%Cr Ferritic Stainless Steel
E. Malitckii, Y. Yagodzinskyy, P. Lehto, H. Remes, H. Hänninen (Finland)

Study of the Hydrogen Introduction in Bare and Al-Si Coated Steels during the Hot Stamping Process

M. Mandy, C. Georges, P. Drillet, T. Sturel, P. J. Jacques (Belgium, France)

Influence of Hydrogen on Grain Growth Dynamics of Nanograined Materials

M. L. Martin, A. Pundt, R. Kirchheim (Germany, Japan)

Mesoscale Numerical Simulation of Hydrogen Assisted Cracking in Duplex Stainless Steels

T. Mente, T. Boellinghaus (Germany)

Effect of Deformation Temperature on Hydrogen Embrittlement in Low-Carbon Martensitic Steel

Y. Momotani, A. Shibata, N. Tsuji (Japan)

Microstructural Change of Low-Alloy Steels Caused by Hydrogen-Induced Fatigue-Crack Growth

A. Nagao, S. Wang, K. E. Nygren, M. Dadfarnia, P. Sofronis, I. M. Robertson (Japan, USA)

Combined Effect of Mechanical Loading and Hydrogenating Conditions on Embrittlement of a 7XXX Aluminum Alloy (Al-Zn-Mg)

L. Oger, L. Peguet, E. Andrieu, R. Mainguy, *G. Odemer*, C. Blanc (France)

S-N Properties and Fatigue Fracture Surfaces of Carbon Steel in 0.7 and 115 MPa Hydrogen Gas Environment

Y. Ogawa, H. Matsunaga, J. Yamabe, M. Yoshikawa, S. Matsuoka (Japan)

Corrosion Experiments Using Spherical Uranium Powders

G. L. Powell, W. J. Siekhaus, N. E. Teslich (USA)

Hydrogen-Material Interactions in 3rd Generation Steels

A. Pushparasah, F. Martin, Q. Auzoux, T. Dieudonné, S. Cobo, L. Moli-Sanchez, K. Wolski (France, Belgium)

Relation Between Microstructure and Hydrogen: Consequence on the Fatigue Behavior of LBM Inconel 718

S. Puydebois, A. Oudriss, P. Bernard, L. Briottet, X. Feaugas (France)

Hydrogen-Accelerated Fatigue Crack Growth in Arc Welded X100 Pipeline Steel

J. A. Ronevich, B. P. Somerday (USA)

Kinetics of H_2 Uptake by 1,4-bis(phenylethynyl)benzene-Based Hydrogen Getters

D. J. Safarik, M. T. Janicke, C. J. Reichhardt, B. M. Patterson (USA)

Theoretical Analysis of Hydrogen-Dislocation Interactions

R. B. Sills, W. Cai (USA)

Effect of Baking on Electroplated Zn and Cd Coating on High Strength Steel Substrates – A Correlative Study of Mechanical Properties with Hydrogen Content

P. Behera, *K. R. Sriraman*, S. Brahimi, R. R. Chromik, S. Yue (Canada)

Hydrogen Transport in Martensitic Steels: a Multiscale Model

A. Turk, E. Galindo-Nava, D. Bombač, P.E.J. Rivera-Díaz-del-Castillo (UK)

The Role of Microstructural Defects on Hydrogen Diffusion in Armco Iron
E. Van den Eeckhout, A. Laureys, Y. Van Ingelgem, K. Verbeken (Belgium)

In situ Environmental TEM Investigation of the Hydrogen Effect on Silicon-based Materials
Y.-C. Wang, D.-G. Xie, L. Tian, Z.-W. Shan (China)

Design and Testing of Steel-Concrete Composite Vessel for Stationary High-Pressure Hydrogen Storage
Y. Wang, F. Ren, Y. C. Lim, J. Chen, M. Jawad, Z. Feng (USA)

Mitigate Hydrogen Induced Cracking in High Strength Steel Using Special Designed Welding Filler Wire
X. Yu, Z. Feng, D. Tzelepis (USA)

Evaluating Material Performance for Hydrogen Service I

11:00-11:30 AM **Invited*	Hydrogen Embrittlement and its Impact on Oil and Gas Industry Operations *N. Thirumalai* (USA)
11:30-11:50 AM	Fatigue Crack Growth Rates of API X70 Pipeline Steel in Pressurized Hydrogen Gas Compared with an X52 Pipeline in Hydrogen Service *E. Drexler*, A. Slifka, R. Amaro, D. Lauria, J. Sowards, N. Hrabe (USA)
11:50-12:10 PM	Research on Fatigue of Cr-Mo Steel for Hydrogen Storage Vessels *L. Briottet*, I. Moro, J. Solin, J. Furtado, P. Bortot, N. de Miguel Echevarria, E. Mecozzi, R. Dey, J. Ronevich, B. P. Somerday (France, Finland, Italy, The Netherlands, UK, USA)
12:10-12:30 PM	Consideration of the Effects of Hydrogen in the Design of Type II Storage Vessels Built for Fatigue Resistance *A. Saxena*, A. Prakash, K. Nibur, I. Miller (USA)

Hydrogen Effects in Steels I

7:00-7:30 PM **Invited*	Hydrogen Effects on Tensile and Fatigue Properties in Austenitic Steels *K. Tsuzaki,* M. Koyama (Japan)
7:30-8:00 PM **Invited*	The Effects of Oxygen Impurities on Fretting Fatigue of Austenitic Stainless Steel in Hydrogen Gas *M. Kubota,* R. Komoda, J. Furtado (Japan, France)
8:00-8:20 PM	The Influence of High Internal Hydrogen Content on the Evolved Microstructure During Fatigue-Crack Growth in 316L Stainless Steel *K. Nygren*, A. Nagao, P. Sofronis, I. M. Robertson (USA, Japan)

8:20-8:40 PM Effects of Internal and External Hydrogen Environments on Crack Growth Susceptibility of an Iron Based Superalloy
N. R. Moody, W. M. Garrison, S. L. Robinson, M. W. Perra (USA)

8:40-9:00 PM *Break*

Hydrogen Dissolution, Transport, and Trapping I

9:00-9:20 PM Understanding the Effects of Microstructure in Hydrogen Transport During Electrochemical Permeation, Thermal Desorption and Degassing
E. I. Galindo-Nava, *P. E. J. Rivera-Díaz-del-Castillo* (UK)

9:20-9:40 PM Comparison of the Role of Four Different Carbides in the Hydrogen Induced Mechanical Degradation of Lab Cast Fe-C-X Alloys
T. Depover, E. Van den Eeckhout, *K. Verbeken* (Belgium)

9:40-10:00 PM Determination of Detrapping and Trapping Rate Constants for Hydrogen Based on Experimental Thermal Desorption Spectra
K. Ebihara, K. Saito, K. Takai (Japan)

10:00-10:20 PM Derivation of Hydrogen Trapping and Detrapping Kinetic Constants in Ni-Base Alloy 600 Through Coupled Experimental and Numerical Analysis
C. Hurley, *F. Martin*, L. Marchetti, J. Chêne, C. Blanc, E. Andrieu (France, Finland)

Tuesday, September 13

Modeling and Simulation I

8:00-8:30 AM **Invited* New Insights into H Trapping and Diffusion in Metallic Microstructures Obtained from Atomistic Simulations
M. Mrovec, D. Di Stefano, C. Elsässer, E. McEniry, R. Nazarov, J. Neugebauer, *T. Hickel* (Germany, USA)

8:30-8:50 AM Chemomechanical Origin of Hydrogen Trapping at Grain Boundaries
J. Song, X. Zhou, D. Marchand, T. Zhu, D. L. McDowell (Canada, USA)

8:50-9:10 AM Hydrogen Segregation to Grain Boundaries in Nickel
R. Dingreville, S. Berbenni, C. J. O'Brien, S. Foiles (USA, France)

9:10-9:30 AM Kinetic Monte-Carlo Modeling of $\frac{1}{2}[111]$ Screw Dislocation Movement in BCC Fe
I. H. Katzarov, *A. T. Paxton* (UK)

9:30-9:50 AM Dislocation Mediated Plasticity in Hydrogen Charged Metals: Coupled Non-Linear Finite Element and Discrete Dislocation Dynamics Simulations
Y. Gu, Z. Molaeinia, J. A. El-Awady (USA)

9:50-11:00 AM *Poster Session II and Break*

Poster Session II

Hydrogen Isotope Permeation and Trapping Experiments in AM Steels
D. Buchenauer, R. A. Karnesky (USA)

Hydride Precipitates in Zirconium Alloys: Formation, Dissolution, Stability After Temperature Cycling and Crystallographic Orientation Relationships
E. Conforto, S. Cohendoz, C. Berziou, P. Girault, X. Feaugas (France)

Hydrogen Embrittlement (HE) Susceptibility of High Strength Fastener Grade Steels
T. Das, K. R. Sriraman, S. Brahimi, S. Yue (Canada)

Effect of Metallurgical Parameter on the Hydrogen Induced Delayed Fracture Resistance of Model Martensitic Press Hardened Steels
T. Dieudonné, S. Cobo, B. Rémy, T. Sturel (France)

Cost-Effective Low Frequency High Pressure Hydrogen Cyclic Loading Test
Y. C. Lim, Y. Wang, J. Chen, J.-Y. Wang, L. Anovitz, *Z. Feng* (USA)

Study of the Diffusible Hydrogen in Aluminized Boron Steel
C. Georges, T. Sturel, P. Drillet, D. Cornette, J.-M. Mataigne (Belgium, France)

Fracture Behaviors in High Manganese Steels with Respect to Hydrogen Content, Strain Rate Sensitivity and Mesoscopic Segregation
X. Guo, A. Schwedt, S. Richter, U. Prahl, W. Bleck (Germany)

The Influence of Heat Treatment on Hydrogen Environment-Assisted Cracking in Monel K-500
Z. Harris, J. T. Burns (USA)

The Influence of Diffusible Hydrogen on the Mechanical Behavior of Third Generation Steels with a Bainitic-Martensitic Matrix Exhibiting a TRIP Effect
O. Hubert, C. Georges, S. Cobo, P. J. Jacques (Belgium, France)

Fracture Properties Measurement of Ferritic Steels with Unloading Elastic Compliance Method in High Pressure Gaseous Hydrogen
T. Iijima, H. Itoga, B. An, C. San Marchi, B. P. Somerday (Japan, USA)

Hydrogen Embrittlement at the Interface of Clad Steel Pipes – Fracture Mechanical Testing and FE Simulations
L. Jemblie, V. Olden, O. M. Akselsen, A. Alvaro, B. Nyhus (Norway)

Multi-Resolution Characterization and Prediction of Hydrogen-Assisted Intergranular Fracture of Ni-201

R. A. Karnesky, S. K. Lawrence, D. Medlin, B. P. Somerday, K. Hattar, R. Dingreville, C. O'Brien, S. Foiles (USA)

Effects of Large Amount of Hydrogen and Frequency on Fatigue Properties of Carbon Steel

Y. Kitamura, H. Nishiguchi, T. Fukuda (Japan)

Hydrogen Pick-Up in Sheet Steel during Annealing Process

V. G. Krishnardula, N. K. Ramisetti (USA)

Finite Element Analysis of Coupled Hydrogen Diffusion and Fracture Mechanics During Four Point Bending Tests

E. Legrand, S. Brahimi, J. Song (Canada)

Multiscale Modeling of Nano-Hydrides around Ni-H Dislocations

G. P. M. Leyson, B. Grabowski, J. Neugebauer (Germany)

Heating Facilitates Giant Cavity Formation in Hydrogenated Aluminum

M. Li, D. Xie, Z. Shan (China)

Hydrogen Transport in Inconel Alloys 600 and 690

H. F. Lopez, O. Flores, A. Serna, J. M. Zagal (USA, México)

Investigating Grain Size as a Means to Reduce Hydrogen Embrittlement

A. Macadre, T. Tsuchiyama, S. Takaki (Japan)

Hydrogen Behavior in Al-Zn-Mg and Al-Cu-Mg Alloys Investigated by Means by Hydrogen Microprint Technique

T. Manaka, G. Itoh (Japan)

Computational Study of Hydrogen Trapping at Lattice Defects in Zinc and Cadmium Coatings

D. Marchand, X. Zhou, J. Song (Canada)

Role of Grain Boundaries in the Diffusion of Deuterium in Nickel Base Alloy 600 Studied by Thermal Desorption Mass Spectroscopy

C. Hurley, *F. Martin*, L. Marchetti, J. Chêne, C. Blanc, E. Andrieu (France, Finland)

Polymer Behavior in High Pressure Hydrogen Environments with Relevance to the Hydrogen Infrastructure

N. C. Menon, A. M. Kruizenga, A. Nissen, C. San Marchi, K. J. Alvine, K. Brooks, D. B. Smith, A. K. Naskar (USA)

The Effect of Electrochemical Hydrogen Charging on Microhardness and Impact Energy of X65 Pipeline Steel and Relevant Weld Metal of Different SMAW Electrodes

A. Latifi, *R. Miresmaeili*, A. Abdollah-zadeh, P. D. Ferro (Iran, USA)

Characterization of the Hydrogen Trapping in Retained Austenite of Quenching and Partitioning Steels by a Novel Deuterium Charging Technique

L. Moli Sanchez, Z. Zermout, L. Duprez (Belgium)

Size Effects on Deformation and Fracture of Scandium Deuteride Films
N. R. Moody, C. Teresi, E. Hintsala, D. P. Adams, N. Y. Yang, D. R. Kammler, M. S. Kennedy, W. W. Gerberich (USA)

Effect of Microstructure and Alloy Chemistry on Hydrogen Embrittlement of Precipitation Hardened Nickel Base Alloys
G. C. Obasi, Z. Zhenbol, D. Sampath, R. Morana, R. Akid, M. Preuss (UK)

Effect of Hydrogen Trapping on Fracture Mechanisms and Electrochemical Behavior of Ni-based Alloy 718
G. Odemer, E. Andrieu, C. Blanc, J.-M. Cloue, F. Galliano (France)

Methodology to Clarify Hydrogen Fracturing in Steels
M. Knyazeva, *M. Pohl* (Germany)

Mechanistic Modelling of Hydrogen Embrittlement in Steels
A. Raina, V. S. Deshpande, N. A Fleck (UK)

Influence of Experimental Conditions and Calculation Method on Hydrogen Diffusion Coefficient Evaluation at Elevated Temperatures
C. Muenster, *M. Rhode*, T. Mente, J. Steger, T. Boellinghaus (Germany)

Numerical Simulation of the Influence of Hydrogen on Short Fatigue Crack Growth Mechanisms in AISI304L
V. Schippl, S. Brück, C.-P. Fritzen, H.-J. Christ (Germany)

Hydrogen Influence on Fatigue Life and Short Crack Growth of X3CrNiMo13-4 and Modified X2CrNi19-11
M. Schwarz, S. Zickler, S. Weihe (Germany)

Application of a Computational Model to Predict Hydrogen-Assisted Fatigue Crack Growth in Steel Pipelines and Pressure Vessels
D. T. O'Connor, R. L. Amaro, E. S. Drexler, *A. J. Slifka* (USA)

Cementite-Hydrogen Interactions in Bearing Steels: from Atomic Scale Simulations to Macroscale Mechanical Testing
M. A. Stopher, D. Bombac, P. E. J. Rivera-Díaz-del-Castillo (UK)

The Influence of Hydrostatic Pressure on Hydrogen Adsorption and Permeation
X. L. Xiong, X. T, P. Qian, *Y. J. Su* (China)

Relationship Between HCP Phase Stability and Hydrogen Embrittlement Susceptibility in Fe-30Mn-(6-x)Si-xAl Austenitic Alloys
D. Taniuchi, M. Koyama, K. Tsuzaki (Japan)

Hydrogen Embrittlement Susceptibility of a Welded APX4 Martensitic Steel: New Insight on the Role of Dislocations
F. A. Martin, B. Bourdiliau, A. Maquignon, S. Ringeval, *S. Thiébaut* (France)

On Hydrogen-Induced Cracking and Blistering in Iron
M. C. Tiegel, M. L. Martin, C. Borchers, R. Kirchheim (Germany, Japan)

A Finite Element Model to Simulate Toughness Decrease in Presence of Hydrogen
C. Colombo, G. Gobbi, *L. Vergani* (Italy)

Relationship Between Fatigue Crack Growth Behavior and Susceptibility to Hydrogen Embrittlement in 7000 Series Aluminum Alloys
R. Yamada, G. Itoh, A. Kurumada, M. Nakai (Japan)

Effect of Sn Addition on Hydrogen Embrittlement to Ultra-High Strength Steel
W. S. Yang, H. J. Kim, S. A. Park, H. Y. Jeong, Y. D. Jeong, J. M. Han (Korea)

Hydrogen-Related Fracture Behavior Under Stress Concentration in Low Carbon Martensitic Steel
T. Yonemura, Y. Momotani, A. Shibata, N. Tsuji (Japan)

Hydrogen Behavior in a Plasma-Charged Dual Phase Stainless Steel
A. Yousefi, G. Itoh, T. Manaka, M. Aoki (Japan)

A Cohesive Zone Model Based Uniform Hydrogen Degradation Law for High Strength Steels
H. Yu, J. S. Olsen, A. Alvaro, V. Olden, J. He, *Z. Zhang* (Norway)

Molecular Dynamics Simulations of Hydrogen Diffusion in Aluminum
X. W. Zhou, R. Kolasinski, F. El Gabaly Marquez, M. D. Allendorf (USA)

Hydrogen Effects in Steels II

11:00-11:30 AM **Invited*	Promoted Generation of Damage and Premature Fracture Due to Hydrogen-Enhanced Creation of Strain-Induced Vacancies *M. Nagumo*, K. Takai (Japan)
11:30-11:50 AM	Role of Special Boundaries on the Hydrogen Embrittlement of 304L Stainless Steel at High Strain Rates *E. M. Kahl*, L. Shanahan, M. I. Hartshorne, A. C. Left, B. P. Somerday, L. Lamberson, M. L. Taheri (USA)
11:50-12:10 PM	The Influence of Hydrogen on Corrosion Fatigue Crack Growth Behavior in Type 304/304L Stainless Steel in Elevated Temperature Deaerated Pressurized Water *B. D. Miller*, D. J. Paraventi, C. B. Geller, T. W. Webb (USA)
12:10-12:30 PM	Environmentally-Assisted Fatigue Crack Growth in ARMCO Iron Under High Pressure of Gaseous Hydrogen G. Bilotta, M. Arzaghi, G. Benoit, D. Halm, *G. Hénaff* (France)
12:30-1:45 PM	*Lunch* **Boxed lunches are provided in Trappers Room.*

Evaluating Material Performance for Hydrogen Service II

1:45-2:15 PM **Invited*
Hydrogen in Metals Challenges in the Oil and Gas Industry Focus on Deep Corrosive Oil and Gas Wells
J. D. Burk (USA)

2:15-2:35 PM
Effect of Heat Treatment and Chemical Composition on the High Temperature Hydrogen Attack (HTHA) Resistance of C-$^1/_2$ Mo Steels
C. D. Lundin, *M. Bharadwaj*, W. C. Hoskins, M. Prager (USA)

2:35-2:55 PM
Experimental Investigation of the Effects of Test Temperature on Fatigue Crack Growth Acceleration and Fracture Behaviour of Austenitic Stainless Steels, 304L And 316L
M. J. Lewandowski, R. J. Pargeter, P. A. S. Reed (UK)

2:55-3:15 PM
Effect of Gaseous Hydrogen Environment on Fatigue Growth in Austenitic Steel
K. Kannan, K. A. Nibur (USA)

3:15-3:35 PM
Break

Hydrogen Dissolution, Transport, and Trapping II

3:35-3:55 PM
Hydrogen Diffusion Ahead of the Crack Tip: the Role of Strain Gradients
E. Martínez-Pañeda, S. del Busto, C. F. Niordson, C. Betegón (Spain, Denmark)

3:55-4:15 PM
A Review of Hydrogen/Defects Interactions in Nickel Alloys: Vacancies, Dislocations, Dislocation Patterns and Grain-Boundaries Contributions
A. Oudriss, A. Metsue, M. Hallil, J. Li, C. Savall, J. Creus, J. Bouhattate, X. Feugaus (France)

4:15-4:35 PM
Contribution of Hydrogen to the Intergranular Corrosion Damage in a 2024 T351 Aluminum Alloy: an AFM/KFM Investigation
M. Lafouresse, M. L. de Bonfils-Lahovary, C. Charvillat, L. Laffont, C. Blanc (France)

4:35-4:55 PM
Characterization of Localized Trapped Hydrogen in Ferritic Steel During Simulated Corrosion Under Load
S. V. Merzlikin, W. Krieger, A. Bashir, H. Springer, M. Rohwerder (Germany)

4:55-5:15 PM
Hydrogen Uptake in Steels Exposed to High-Pressure H_2 Gas
A. Nagao, S. Takagi, N. Ishikawa (Japan)

Wednesday, September 14

Mechanisms of Intergranular Cracking

8:00-8:30 AM
**Invited*
Linkage Between Strain Localization and Environmentally Assisted Cracking
G. S. Was, M. D. McMurtrey, *K. Stephenson*, D. Johnson, I. M. Robertson, D. Farkas (USA)

8:30-9:00 AM
**Invited*
On the Atomistics and Thermodynamics of Hydrogen Related Chemomechanics
R. Kirchheim (Germany, Japan)

9:00-9:20 AM
Essential Factors for the Separation of Grains in Nickel Under Hydrogen Environment
S. Wang, K. Nygren, A. Nagao, I. M. Robertson, P. Sofronis (Japan, USA)

9:20-9:40 AM
Do Hydrogen-Deformation Interactions Aid Intergranular Cracking?
Z. Harris, S. K. Lawrence, J. T. Burns, B. P. Somerday (USA)

9:40-10:00 AM
Grain Boundary Character and Hydrogen-Assisted Intergranular Fracture in Ni-Base Alloy 725
M. Seita, J. P. Hanson, A. Bagri, S. Gradečak, *M. J. Demkowicz* (USA)

10:00-11:00 AM
Poster Session III and Break

Poster Session III

Hydrogen Resistance of Hydrogen Gas Turbines and Hydrogen Cooled 4-Pole Generators Structural Materials
A. I. Balitskii (Ukraine, Poland)

Hydrogen Diffusion Coefficient Study in Hot Isostatic Pressed and Forged Duplex Stainless Steel Microstructures
L. Blanchard, S. Paul, K. Sotoudeh, H. Dong (UK)

Hydrogen Dependent Material Properties of UHSS For Aerospace Applications
B. Steffens, *T. Boellinghaus* (Germany)

Effect of Hydrogen on Low Cycle Fatigue Performances for Severe Straining Conditions
P. Bortot, M. E. Cristea, P. Darcis, S. Foletti (Italy)

Hydrogen Embrittlement Susceptibility of Materials Used for High Strength Steel Bolting
S. V. Brahimi, S. Yue, K. R. Sriraman (Canada)

Short Crack Growth of a Metastable Austenitic Stainless Steel (304L) in the Low and High Cycle Fatigue Regime under Hydrogen Influence
S. Brück, H.-J. Christ, V. Schippl, C.-P. Fritzen (Germany)

Hydrogen Effect on Short Crack Growth in Microalloyed High Strength Steel
E. López-Martínez, O. Vásquez-Gómez, J. Mayen-Chaires, O. Flores, *B. Campillo* (México)

Atom Probe Characterization of Hydrogen Trapping in Hydrogen-Resistant Steels via Electrolytic Route
Y. Chen, D. Haley, P. A. J. Bagot, M. P. Moody (UK)

Hydrogen - Microstructure Interactions in Super Duplex Stainless Steel Components
P. S. Craidy, D. S. Santos, L. Briottet (Brazil, France)

Hydrogen Permeation and TDS Quantification Following Corrosion of Sacrificial Coatings
E. B. De Melo, P. Behera, K. R. Sriraman, S. Brahimi, S. Yue (Canada)

Effect of Hydrogen Isotopes on Cracking Threshold in 7075 Aluminum
M. J. Morgan, *A. J. Duncan* (USA)

Influence of Hydrogen on Magnetic and Defect Properties of $Fe_{60}Al_{40}$ Films
J. Ehrler, R. Bali, C. Otalora, O. Yildirim, W. Anwand, M. O. Liedke, T. T. Trinh, R. Böttger, R. Heller, T. G. Woodcock, S. Cornelius, Y. Yuan, K. Potzger (Germany, The Netherlands)

Cathodic Hydrogen Charging of IN718 – Evaluation and Simulation
N. Ehrlin, C. Bjerkén, M. Fisk (Sweden)

Simulating Hydrogen Embrittlement and Fast Pathways for Diffusion
J. W. Foulk III, J. T. Ostien, A. Mota (USA)

Fatigue Behavior of Austenitic Steels with Hydrogen
P. J. Gibbs, K. A. Nibur, C. San Marchi (USA)

Hydrogen Environment Assisted Cracking in Hot Dip Galvanized Fe-Mn-Al-C Austenitic Steels
X. Guo, D. Wang, Q. Gao, S. Kim, W. Bleck (Germany, Korea)

Micromechanical Modeling of Hydrogen Embrittlement in Martensitic Steel
P. Schwittek, *A. Hartmaier* (Germany)

Interaction of Hydrogen with Precipitates in Steels: a Combined DFT and kMC Study
T. Hickel, E. McEniry, P. Dey, T. Schablitzki, J. Rogal, J. Neugebauer (Germany)

Trapping Against Hydrogen Embrittlement
Z. Hosseini, M. Dadfarnia, K. Nibur, B. P. Somerday, R. P. Gangloff, P. Sofronis (USA, Japan)

Quantitative In Situ TEM Study of α-Fe in Hydrogen Atmosphere
L.-C. Huang, Z.-J. Wang, D.-G. Xie, Z.-W. Shan (China)

Effect of Hydrogen Pressure on Fatigue Crack Growth and Hydrogen Accumulation Behavior of High Strength Steel

N. Ishikawa, A. Nagao, T. Ohmi, A. T. Yokobori (Japan)

Hydrogen Permeation Susceptibility and Behavior Related to Applying Pre-Strain on Ultra-High Strength Steels for Automotive Car-Body

H. J. Kim, W. S. Yang, H. Y. Jeong, Y. D. Jeong, S. J. Kim, J. M. Han (Korea)

Development of New Measurement Method Applying MEMS Technology for Relative Slip Range during Fretting Fatigue Test in Hydrogen

R. Komoda, N. Morita, F. Nakashima, M. Kubota, R. Sawada (Japan)

Computational Analysis of Hydrogen Long-Range Diffusion in Steel Accounting for the Presence of Various Traps

S. Zamberger, *E. Kozeschnik* (Austria)

Systematic Investigation of Hydrogen Embrittlement in Long Term Exposure Under Various Load and Activity, Using Dedicated Model Samples

W. Krieger, S. Merzlikin, A. Bashir, H. Springer, M. Rohwerder (Germany)

Constitutive Equations of Hydrogen-Enhanced Plasticity for Quantitative Understanding of the Mechanisms of Hydrogen-Assisted Fracture

M. Kubota, A. Nagao, M. L. Martin, N. Vasios, M. Dadfarnia, N. Aravas, B. P. Somerday, P. Sofronis (Japan, Germany Greece, USA)

EBSD Characterization of Hydrogen Induced Cracking in Generic Fe-C-Ti and Fe-C-V Alloys

A. Laureys, T. Depover, T. Deseranmo, L. Claeys, R. Petrov, K. Verbeken (Belgium, The Netherlands)

Defects Formation in Ti-6Al-4V Alloy with Different Defect Structure after Hydrogenation

A. A. Mikhaylov, R. S. Laptev, V. N. Kudiiarov, A. M. Lider (Russia)

Forging Strain Rate and Deformation Temperature Effects on the Fracture Toughness Properties of Type 304L Stainless Steel Pre-charged with Tritium

M. J. Morgan (USA)

Effects of Molybdenum Carbide on Hydrogen Desorption of HSLA Steel

E. J. Song, D.-W. Suh, U. B. Baek, S.-W. Baek, *S.-H. Nahm* (Korea)

Kinetics of Crack-Induced Hydride Formation in Hexagonal Close-Packed Metals

C. F. Nigro, C. Bjerkén (Sweden)

Design and Life Prediction of Cr-Mo Steel Pressure Vessel for Next Generation Fuel-Cell Forklift Truck

J. Yamabe, H. Suzuki, *Y. Ogawa*, H. Matsunaga, S. Matsuoka (Japan)

Effect of Microstructure and Strength Level on Fatigue Life Properties of Low Alloy Steels in High-Pressure Hydrogen Gas

H. Matsunaga, *S. Okazaki*, J. Yamabe, Y. Ogawa, M. Yoshikawa, S. Matsuoka (Japan)

Diffusion and Segregation of Hydrogen at Grain-Boundary Scale: Numerical and Experimental Approaches on Nickel Bi-Crystals
J. Li, M. Hallil, *A. Oudriss*, A. Metsue, J. Bouhattate, X. Feaugas (France)

The Investigation of the Uptake Mechanism of Hydrogen in Steel By Cyclic Voltammetry (CV)
B. Ozdirik, K. Baert, L. Vecchi, H. Terryn, J. Vereecken, K. Verbeken, I. De Graeve (Belgium)

Quantum Theory of Diffusion of Hydrogen in Iron and Its Trapping by Defects
M. Ceriotti, I. H. Katzarov, D. L. Pashov, *A. T. Paxton* (Switzerland, UK)

Analysis of Plasma Driven Permeation Through Vanadium with Non-Metal Surface Layers
B. J. Peters, C. Day (Germany)

Assessment of Delayed Fracture (DF) Resistance in Commercially Produced Martensitic Steels
N. Ramisetti, S. Bhat, N. Pottore, R. Song, B. Oxley, J. Coryell (USA)

Mechanical Behavior of Ni Alloys 945X and 718 Under Hydrogen Environment via Quantitative Fracture Surface Analysis
D. Sampath, D. F. Martelo, R. Morana, R. Akid, M. Preuss (UK)

3D/4D Hydrogen Embrittlement Behavior in Al-8.4Zn-1.0Mg Alloys
K. Shimizu, H. Toda, K. Sasaki, K. Uesugi, A. Takeuchi (Japan)

Influence of Hydrogen on Nanohardness of Pure Fe with Different Dislocation Densities Investigated by Electrochemical Nanoindentation
K. Tomatsu, T. Omura, Y. Todaka (Japan)

$Mg_2FexSi1-x$ Hydride: The Interplay between the Defects and Magnetic Structure Properties
T. T. Trinh, O. Liedke, K. Potzger, O. Yildirim, S. Zhou, A. Wagner, B. Dam, K. Asano (Germany, The Netherlands, Japan)

Mechanical Behavior of Copper Helium-Bubble-Superlattice Composite
Z.-J. Wang, F. I. Allen, I. S. Winter, D. Chrzan, Z.-W. Shan, P. Hosemann (China, USA)

The Role of Grain Boundary on the Resistance to Crack Propagation in H-Charged Ni
K. Zhao, I. G. Ringdalen, J. He, *Z. Zhang* (Norway)

Role of Alloying Elements on Hydrogen Embrittlement at Grain Boundaries in Nickel Alloys
X. Zhou, J. Song (Canada)

Modeling and Simulation II

11:00-11:20 AM	Mechanisms of Embrittlement in the Presence of Hydrogen *A. C. F. Cocks*, O. Barrera, E. Tarleton (UK)
11:20-11:40 AM	A Multiscale Modelling and Experimental Approach for the Prediction of Grain Boundary Hydrogen Induced Fracture in Fe3%Si. I. T. Jensen, A. Alvaro, T. Hajilou, N. Kheradmand, S. Dumoulin, *V. Olden* (Norway)
11:40-12:00 PM	Mitigation of Hydrogen Dissociation on Iron Surface by Impurities in the Hydrogen Gas: Insights from the Theory *A. Staykov* (Japan)
12:00-12:20 PM	Hydrogen Uptake of Iron Surfaces in a Sour Gas Environment *M. Todorova*, M. Ilhan, J. Neugebauer (Germany)

Hydrogen Effects in Steels III

7:00-7:30 PM **Invited*	Local Approach of Plasticity and Hydrogen Embrittlement In Martensitic Steel: on the Impact of Hydrogen Flux D. Guedes, F. Thiebault, A. Oudriss, J. Bouhattate, J. Creus, *X. Feaugas* (France)
7:30-7:50 PM	Hydrogen-Related Fracture Under Deformation at Various Strain Rates in Low-Carbon Martensitic Steel *A. Shibata*, Y. Momotani, T. Yonemura, N. Tsuji (Japan)
7:50-8:10 PM	The Role of VC Precipitates in Hydrogen Assisted Cracking of Vanadium Modified 2¼Cr1Mo Steel *K. A. Nibur*, B. P. Somerday, S. Pillot, R. P. Gangloff (USA, France)
8:10-8:30 PM	Effect of Segregated Solutes on Mobile Hydrogen Decohesion Along Iron Grain Boundary: First-Principles Calculations *M. Yamaguchi*, K. Ebihara, M. Itakura (Japan)
8:30-8:50 PM	*Break*

Hydrogen-Deformation Interactions

8:50-9:20 PM **Invited*	Hydrogen Effects on the Plasticity of FCC and BCC Fe-Ni-Cr alloys *D. Delafosse* (France)
9:20-9:40 PM	The Role of Hydrogen in Deformation Mechanisms Near Grain Boundaries Under Applied Stresses *D. F. Bahr*, C. E. Kim, S. K. Lawrence (USA)
9:40-10:00 PM	Hydrogen Effects on Strain Localization in FCC Metals at the Initial Stage of Plastic Deformation *Y. Yagodzinskyy*, E. Malitckii, T. Sarikka, H. Hänninen (Finland)
10:00-10:20 PM	Hydrogen Effects on Dislocation Motion Revisited by Quantitative Mechanical Tests Inside TEM *D. Xie*, E. Ma, J. Li, Z. Shan (China, USA)