Program

SIXTH INTERNATIONAL WORKSHOP ON ENVIRONMENTALLY-ASSISTED CRACKING

July 16 - 21, 2023

Sheraton Reston Hotel
Reston, Virginia, USA

Conference Chairs

A.K. Vasudevan
Office of Naval Research (retired)

Ron Latanision
Exponent, Inc

Henry Holroyd
Luxfer (retired)

Fritz Friedersdorf
Luna Labs USA, LLC

Mehdi Amiri
George Mason University

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Engineering Conferences International (ECI) is a not-for-profit global engineering conferences program, originally established in 1962, that provides opportunities for the exploration of problems and issues of concern to engineers and scientists from many disciplines.

Previous conferences in this series:

Stress Corrosion Cracking in Structural Materials at Ambient Temperatures
August 30 – September 4, 2009
Padova, Italy
Conference Chairs:
A.K. Vasudevan, ONR, USA
Henry Holroyd, Luxfer, Inc., UK
Richard Ricker, NIST, USA
Neville Moody, Sandia National Laboratories, USA

Environmental Damage in Structural Materials Under Static Cyclic Loads at Ambient Temperatures II
August 14-19, 2011
Krakow, Poland
Conference Chairs:
A.K. Vasudevan, ONR, USA
Henry Holroyd, Luxfer, Inc., USA
Richard Ricker, NIST, USA
Neville Moody, Sandia National Laboratories, USA

Environmental Damage in Structural Materials Under Static/Cyclic Loads at Ambient Temperatures III
June 15-20, 2014
Bergamo, Italy
Conference Chairs:
A.K. Vasudevan, ONR, USA
Henry Holroyd, Luxfer, Inc., USA
Richard Ricker, NIST, USA
Neville Moody, Sandia National Laboratories, USA

Environmental Damage in Structural Materials Under Static Load/Cyclic Loads at Ambient Temperatures IV
May 29-June 3, 2016
Cork, Ireland
Conference Chairs:
A.K. Vasudevan, ONR, USA
Ronald Latanision, Exponent, Inc., USA
Henry Holroyd, Luxfer, Inc., USA
Neville Moody, Sandia National Laboratories, USA

Environmental Damage in Structural Materials Under Static Load/Cyclic Loads at Ambient Temperatures V
July 15-20, 2018
Hernstein, Austria
Conference Chairs:
A.K. Vasudevan, ONR, USA
Ronald Latanision, Exponent, Inc., USA
Henry Holroyd, Luxfer, Inc., USA

The conference organizers gratefully acknowledge support from the U.S. Office of Naval Research.

Sunday, July 16, 2023

17:30 – 18:00 Conference check-in (Magnolia Foyer)

18:00 – 18:30 Opening Reception (Magnolia Room)

18:30 – 20:00 Dinner

NOTES

- *Technical Sessions will be held in the Oak and Spruce Rooms.*
- *Meals will be in the Magnolia Room.*
- *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, July 17, 2023

08:00 – 09:00	Breakfast
09:00 – 09:10	**Opening Remarks** Fritz Friedersdorf, Conference Co-Chair Ron Latanision, ECI Technical Liaison
	Session 1 Chair: Dave Rusk, Naval Air Warfare Center Aircraft Division, USA
09:10 – 10:00	**Keynote** **Environment-induced crack initiation in metals - experimental studies** Henry Holroyd, Consultant, USA
10:00 – 10:30	**Characterizing environmentally assisted crack initiation and short crack growth** Tim L. Burnett, The University of Manchester, United Kingdom
10:30 – 11:00	Coffee Break
11:00 – 11:30	**Effect of laser surface treatment on the corrosion and fatigue performance of aa5456-h116 alloys** Rajaguru Jeyamohan, University of Virginia, USA
11:30 – 12:00	**Evaluation of chloride stress corrosion susceptibility of stainless steels** Earl Johns, Naval Nuclear Laboratory; Fluor Marine Propulsion, USA
12:00 – 13:30	Lunch
	Session 2 Chair: Siddiq Qidwai, National Science Foundation, USA
13:30 – 14:20	**Keynote** **Modeling electrochemically assisted hydrogen adsorption on alloy surfaces** Chris Taylor, DNV GL and Ohio State University, USA
14:20 – 14:50	**Advances in peridynamic modeling of environmentally- assisted cracking** Florin Bobaru, University of Nebraska-Lincoln, USA
14:50 – 15:20	**Combined damage-fracture model for corrosion fatigue crack growth in 3D parts** Alexander Staroselsky, Raytheon Technologies Research Center, USA
15:20 – 16:00	Coffee Break
16:00 – 16:30	**Electrochemical activities at the crack tip: A localized approach** Leila Saberi, George Mason University, USA
16:30 – 17:00	**Electrochemical-mechanical phase field model for electroplating process** Jung Ho Yang, Technical Data Analysis, Inc., USA
	Dinner on your own

Tuesday, July 18, 2023

08:00 – 09:00	Breakfast
	Session 3 Chair: Rick Ricker, University of Maryland, USA
09:00 – 09:30	**A computational framework for prediction of atmospheric** Mehdi Amiri, George Mason University, USA
09:30 – 10:00	**Correlating nature of precipitates with environmental degradation in aluminum alloys** Ramasis Goswami, US Naval Research Laboratory, USA
10:00 – 10:30	Coffee Break
10:30 – 11:00	**Unusual behavior of long cracks at low dk: Marci effect** Daniel Kujawski, Western Michigan University, USA
11:00 – 11:30	**New aluminum alloy design** Asuri Vasudevan, Office of Naval Research (Retired), USA
11:30 – 13:00	Lunch
13:15	Board bus for excursion
13:30 – 16:30	Excursion - National Air and Space Museum - The Steven F. Udvar-Hazy Center VA ***Note: The bus will depart from the hotel promptly at 13:30***

Wednesday, July 19, 2023

08:00 – 09:00	Breakfast
	Session 4 Chairs: Victor Rodriquez-Santiago, NAWCAD, USA
09:00 – 09:50	**Keynote** **Quantification of environmentally-assisted cracking mechanisms with high-resolution characterisation** Sergio Lozano-Perez, University of Oxford, United Kingdom
09:50 – 10:20	**Preferred EAC initiation sites in 7xxx aluminum** Matthew Curd, University of Manchester, UK
10:20 – 11:00	Coffee Break
11:00 – 11:30	**Atomic mechanism of near threshold fatigue crack growth in vacuum as a basis for understanding environmental effects** Mingjie Zhao, Exponent, Inc., USA
11:30 – 12:00	**Microstructural crack path prediction using graph theory** Veera Sundararaghavan, University of Michigan, USA
12:00 – 13:30	Lunch
	Session 5 Chairs: Nagaraja Iyyer, Technical Data Analysis, Inc., USA
13:30 – 14:20	**Keynote** **Dynamic fracture in dealloying induced stress-corrosion cracking** Karl Sieradzki, Arizona State University, USA
14:20 – 14:50	**Surface stress in metals induced by organic monolayer films** Srinivasan Chandrasekar, Purdue University, USA
14:50 – 15:20	**Modeling hydrogen diffusion in precipitation hardened nickel alloy** Attilio Arcari, Naval Research Laboratory, USA
15:20 – 15:50	Coffee Break
15:50 – 16:20	**Development of a lifetime prediction model for evaluating the sensitivities of aiscc susceptibility in stainless-steel nuclear waste storage canisters** Sarah Blust, University of Virginia, USA
16:20 – 17:00	**Use of an inverse life plot for fatigue endurance/limit estimation** Daniel Kujawski, Western Michigan University, USA
17:00 – 18:00	Reception
	Dinner on your own

Thursday, July 20, 2023

08:00 – 09:00	Breakfast
	Session 6 Chairs: Earl Johns, Naval Nuclear Laboratory, USA
09:00 – 09:50	**Keynote** **Is laboratory testing of SCC susceptibility fit for purpose?** Alan Turnbull, NPL, United Kingdom
09:50 – 10:20	**Assessing the loading rate dependence of hydrogen environment-assisted cracking behavior in a wide-range of engineering alloys** James Burns, University of Virginia, USA
10:20 – 10:50	**Environment-assisted fracture, my friend: The cutting of gummy metals** Ronald M. Latanision, Exponent Inc.; Massachusetts Institute of Technology, USA
10:50 – 11:30	Coffee Break
11:30 – 12:00	**The influence of additive manufacturing (3D printing) on susceptibility to environmentally induced fracture** Rick Ricker, University of Maryland, USA
12:00 – 12:30	**Environmental effects on the fatigue crack growth of low carbon nitrogen alloyed stainless steel** Asuri Vasudevan, TDA, Inc., USA
12:30 – 14:00	Lunch
	Session 7 Chairs: Alexander Staroselsky, Raytheon Technologies Research Center, USA
14:00 – 14:30	**Environmentally-assisted degradation and erosion of polymers for attritable metamaterials** Nicole Apetre, U.S. Naval Research Laboratory, USA
14:30 – 15:00	**Fracture toughnes K_{1c} affecting static threshold K_{1scc}** Asuri Vasudevan, TDA, Inc., USA
15:00 – 15:30	**Fatigue threshold $K_{max,th}$ affected by static threshold K_{1scc}** Asuri Vasudevan, TDA, Inc, USA
15:30 – 16:00	**Atmospheric laboratory and outdoor testing of aluminum alloy environment assisted cracking** Fritz Friedersdorf, Luna Labs USA, LLC, USA
16:00 – 16:30	Coffee Break
19:00 – 21:00	Conference Banquet

Friday, July 21, 2023

07:30 – 08:30	Breakfast
08:30 – 09:00	**Needs and path forward for EAC** William Nickerson, Office of Naval Research, USA
09:00 – 09:20	**Needs and path forward for EAC** Dave Rusk, Siddiq Qidwai, Earl Johns
09:20 – 09:35	Coffee Break
09:35 – 12:00	**Panel Discussion: The path forward: The convergence of modeling and experiment in EAC** Moderator: Ron Latanision, Exponent Inc, USA. Panelists: Alan Turnbull, Chris Taylor, Henry Holroyd, Karl Sieradzki, Sergio Lozano-Perez
12:00 – 12:10	**Workshop Closing**
12:10 – 13:30	Lunch

Panel Discussion: The path forward: The convergence of modeling and experiment in EAC

Engineering systems of all kinds are constructed from materials that meet design specifications. Those engineering systems are assembled and then operated, inspected and maintained during performance in service environments. The environmental degradation of materials is well known phenomenologically. Mechanistic understanding is often the subject of intense research and concurrent debate. This is true of Environmentally Assisted Cracking, EAC. Debate is in part a reflection of the complexity of EAC. In order to develop an understanding of any EAC phenomenon researchers must take into account the microstructural characteristics of the materials, chemical interactions with the service environment and mechanical forces that are imposed as the system performs. This ongoing series of conferences has assembled researchers who have experience in all of these areas. Our goal is to develop a core of understanding in which appreciation of materials, chemistry and mechanics essentials are common to all EAC researchers. Looking to the future, the convergence of experimental tools which allow atom scale observations and simulation and modeling tools for characterizing materials as well as chemical and mechanical interactions provides room for optimism that mechanistic fundamentals will become elucidated and with such advances EAC will become better understood and better managed.