

**Gerald Frankel**

DNV Designated Chair

Professor,  
Materials Science & Engineering

Director, WastePD

Director, Fontana Corrosion Ctr.

The Ohio State University  
Columbus, OH

Thursday,

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171 Durham Center

Iowa State University

## A New Paradigm for Designing Corrosion Resistant Materials

Corrosion, the environmental degradation of materials, is a complex process that depends on details of the material and the environment. Metals, glasses and ceramics all undergo corrosion processes, and predicting the degradation of all three of these material classes is important for the design of a mined geologic nuclear waste repository that should prevent the release of dangerous radionuclides for a performance period of  $>10^5$  y. Decades of study of corrosion processes has led to considerable fundamental understanding of various effects of the environment and material structure and composition. However, the design process of new materials for corrosion resistance has been largely trial and error. This talk will present an Integrated Computational Materials Engineering (ICME) approach to the design of corrosion-resistant metal alloys, glasses and ceramics as part of a DoE Energy Frontier Research Center (EFRC). Some results from the glass and ceramics teams will be reviewed, and then new concepts for the stabilization of corrosion pits in metals will be presented.

Gerald S. Frankel is the DNV Designated Chair in Corrosion, Professor of Materials Science and Engineering, and Director of the Fontana Corrosion Center at the Ohio State University. He earned the Sc.B. degree in Materials Science Engineering from Brown University and the Sc.D. degree in Materials Science and Engineering from MIT. Prior to joining OSU in 1995, he was a post-doctoral researcher at the Swiss Federal Technical Institute in Zurich and then a Research Staff Member at the IBM Watson Research Center in Yorktown Heights, NY. His primary research interests are in the passivation and localized corrosion of metals and alloys, corrosion inhibition, protective coatings and atmospheric corrosion. He is a member of the editorial board of *The Journal of the Electrochemical Society* and *Corrosion* and a fellow of NACE International, The Electrochemical Society, and ASM International. He received the W.R. Whitney Award from NACE International in 2015, the U.R. Evans Award from the UK Institute of Corrosion in 2011, OSU Distinguished Scholar Award in 2010, the 2010 ECS Corrosion Division H.H. Uhlig Award, and the Alexander von Humboldt Foundation Research Award for Senior US Scientists in 2004. From 2012-2016, he served as a member of the Nuclear Waste Technical Review Board after being appointed by President Obama. In 2016, he became the director of a DOE-funded Engineering Frontier Research Center focused on the performance of nuclear waste forms.

The Graduate Seminar Series events are part of the required curriculum for chemical engineering graduate students, but open to all Iowa State University graduate students, post-doctoral researchers, scientists, faculty and staff. See the full seminar schedule at [cbe.iastate.edu/seminar-series/](http://cbe.iastate.edu/seminar-series/)