

## **Developments of Deterministic-probabilistic modeling for coating/metallic substrate performance in corrosive/harsh environments**



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### **LECTURE ABSTRACT**

Protective coatings for extreme conditions applications must retain their integrity and function over prolonged operation and ideally should provide a long-lasting lifetime, be able to block aggressive agents, to heal imperfections or damage suffered during operation, and unequivocally signal failure when damage is irreparable. We have proposed a rational characterization and quantification concept of damage/performance evolution that incorporate modular elements corresponding to deterministic and probabilistic modelling approach. Distinctive modes of corrosion inhibition, self-healing, and mass transfer blocking based on different properties of the coatings. The presentation includes a versatile library of multifunctional coatings that each bring about a distinctive mode of corrosion control and deploy an experimental-theoretical-driven approach to rapidly leading to the performance of the systems in different corrosive-harsh environments. The effort seeks to combine distinctive aspects of coating design with deterministic and probabilistic damage/performance modelling in extreme environments and predicting operational lifetime for the design coatings/substrate system.

## **SPEAKER BIOSKETCH**

Homero Castaneda is a Professor and Director at the National Corrosion and Materials Reliability Laboratory within Texas A&M University. He is also Instructor for NACE certifications. He got his Ph.D. in materials science and engineering from Penn State University in 2001. Dr. Castaneda has 21 years of experience using electrochemical and nondestructive techniques to monitor interfacial phenomena in materials and theoretical modeling of corrosion science and engineering, pipelines science and engineering and electrochemical processes for different industries. He has been the PI for multiple projects on corrosion science and engineering for DOE, DOD, DOT and several 1000 fortune companies. Before joining TAMU, he worked for five years at The University of Akron (2011 to 2015) as an assistant professor and before that at Battelle Memorial Institute as a senior scientist (2006-2010) in the Advanced Materials and Energy Systems in Columbus, Ohio. He has authored over 110 peer-reviewed papers in the areas of corrosion science and engineering, pipelines, coatings degradation and reliability, materials characterization and electrochemical impedance spectroscopy. He holds seven patents and four copyrights. He received the H.H. Uhlig award from NACE international in 2018. He was awarded to be NACE Fellow of Class 2019. He is the editor of three journals related to electrochemistry, materials, corrosion and pipelines. He recently was appointed as Adjunct Professor (Professeur Affilie) with Mechanics, Surface and Processing Laboratory at ENSAM, Aux in Province, France. Dr. Castaneda-Lopez has been served on the Corrosion of Buried Steel at New and In-Service Infrastructure committee by the National Academies of Sciences, Engineering and Medicine. He is also the chairman of Publications committee at AMPP (former NACE).

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