

Research Seminar

Dr. M. Grace Burke

Materials Performance Center, University of Manchester

“Using Microscopy to Address Key Issues in Material Performance in Demanding Environments”

Abstract

Structural materials used in energy generation applications, chemical industries, transportation and general infrastructure applications require long-term dependable performance in challenging environments. Thus, environment-sensitive behavior of materials remains an important area for materials research and development. By understanding the degradation phenomena, it can then be possible to develop predictive models, thereby improving safety, reliability and efficiency. Advanced microscopy techniques play a crucial role in identifying the bulk and nanoscale changes induced by these environments in service. Such data are critical in developing a mechanistic understanding of the degradation phenomena that can then feed into the development of predictive models. The examples to be discussed include stress corrosion cracking in pressurized water reactor nuclear power plants, with emphasis on the importance of advanced microstructural analysis in elucidating the mechanism of degradation. In addition, some examples of advanced *in situ* analytical S/TEM will be used to illustrate the applicability of dynamic S/TEM observations concerning grain boundary migration in H₂-H₂O (vapor), carbide stability, and the localized dissolution of inclusions in steel in H₂O.

Biography

Prof. M. Grace Burke is the Director of the Materials Performance Centre (MPC) at the University of Manchester, where she leads investigations of materials' behavior in nuclear power systems, with particular emphasis on the role of microstructure. In addition to her MPC role, she was also Director of the Electron Microscopy Centre at the University of Manchester from 2012 through 2016. Prior to joining the University in late 2011, she acquired extensive experience in materials for power generation during her career in the US nuclear industry with research positions at the Westinghouse Science and Technology Center, and the Bettis Atomic Power Laboratory in Pittsburgh, where she was Consultant Scientist in Materials Technology. Including prior research experience at the US Steel Research Laboratory, she has over 35 years of expertise in steels, materials of construction for nuclear power plants, irradiation damage, SCC, and hydrogen embrittlement of structural alloys. She is particularly known for her application of advanced microscopy/ microanalysis techniques to understand the environment-sensitive behavior of materials in nuclear and power generation systems, and to the microstructural characterisation of complex materials. Her current research continues to involve the application of advanced analytical TEM and *in situ* ATEM in liquids and gases to study the nanoscale phenomena leading to environment-sensitive degradation of structural alloys. Grace has authored or co-authored over 200 publications and is a Fellow of ASM International, TMS, MSA (Inaugural Class), MAS (Legends Class), RMS, and IOMMM (UK). She was the 2005 President of the Microscopy Society of America and is the 2019-2022 President of the Royal Microscopical Society.



Monday, March 30, 2020

10:45 a.m. – 12:00 p.m., via Zoom: <https://psu.zoom.us/j/6939352840>

For additional details call Diane K. Bierly 863-6491