

Structural Materials in Nuclear Environments: Challenges and Opportunities

Peter Hosemann

Department for Nuclear Engineering, University of California Berkeley

Abstract

Nuclear engineering provides some of the most interesting materials science challenges combining physical, chemical and nuclear properties of matter driving materials selection to multi-dimensional space. These requirements combined with new manufacturing techniques (Additive Manufacturing) enable us to envision novel processing routes taking advantage of shape and material. We introduce 4D manufacturing of components enabling new designs overcoming challenges for extreme applications such as nuclear. Of course any new materials concept must be tested and evaluated in the desired environment requiring the accumulation of radiation damage and materials testing at reactor operating condition. Ion beam irradiation and implantation does provide a fast method to evaluate the scientific processes behind radiation induced property changes. Advanced small scale mechanical testing in combination with nano sized ion implantation enables to uncover the deformation processes taking place in an efficient fashion. This presentation takes you on a tour from manufacturing to nano mechanical testing highlighting novel methods and materials concepts intended to foster innovative discussions.

Brief Bio

Peter Hosemann is associate professor in the Department for Nuclear Engineering at the University of California Berkeley and current vice chair, head graduate adviser and UC Berkeley's radiation safety chair. Professor Hosemann received his PhD in Material Science from the Montanuniversitaet Leoben, Austria in 2008 while he conducted the research on lead bismuth eutectic corrosion, ion beam irradiations and microscale mechanical testing was carried out at Los Alamos National Laboratory. He continued his research at Los Alamos National Laboratory and joined the UC Berkeley faculty in 2010. Professor Hosemann has authored more than 120 peer reviewed publications since 2008. In 2014 he won the best reviewer of the journal of nuclear materials award, the ANS literature award and in 2015 he won the TMS early career faculty fellow award and the AIME Robert Lansing Hardy award. While being dedicated to his research and teaching he also leads the UC Berkeley Bladesmithing team which won the title of "best example of a traditional blade" for UC Berkeley and is the lead faculty for the CalSol solar car racing team which won the American Solar challenge for Berkeley in 2017.