Michael Nastasi, J Nanomater Mol Nanotechnol 2019, Volume 8
DOI: 10.4172/2324-8777-C3-061

Michael Nastasi

University of Nebraska, USA

Extreme Irradiation Tolerant Materials for Nuclear Energy Applications via Atomic Scale Design of Interfaces in Nanostructured Materials

A major challenge to developing materials with radically extended performance limits at irradiation extremes for nuclear energy applications will require designing and perfecting atom- and energy- efficient synthesis of revolutionary new materials that maintain their desired properties while being driven very far from equilibrium. A primary aspect associated with this challenge is to develop a fundamental understanding of how atomic structure and energetics of interfaces and surfaces contribute to defect and damage evolution in materials. To this end, recent experimental and modeling work has shown that interface structure in nanomaterials influences hydrogen absorption as well as point defect recombination. This presentation will focus on these results and their implications.

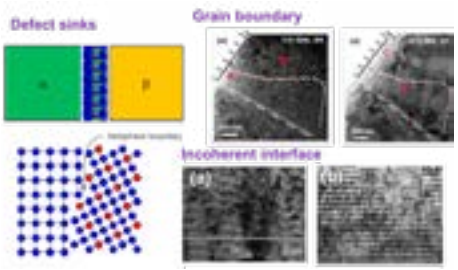

Figure 1. Images on the left show schematically the nature of interfaces at phase boundaries (top) and grain boundaries (bottom), which are abundant in nanomaterials. Transmission electron microscope images on the right show how grain boundaries (top) and phase boundaries (bottom) can mediate and reduce defect formation in nanomaterials subjected to ion irradiation and He ion implantation. After: A. Misra, et al., JOM, 59 (2007) 62 and C. Sun et al., Sci. Rep., 5, (2014) 7801.

Biography

Dr. Michael Nastasi is the Director of the Nebraska Center for Energy Sciences Research at the University of Nebraska-Lincoln. He is also the Elmer Koch Professor of Mechanical and Materials Engineering. Mike's personal research interests include ion-solid interactions, irradiation induced phase transformations, nanomaterials for extreme irradiation environments, ion irradiation and plasma modification of materials, ion beam analysis of materials, synthesis and properties of high strength nanolayered composites, and surface mechanical properties. He has co-authored more than 550 refereed publications, authored the books entitled Ion-Solid Interactions: Fundamentals and Applications, published by Cambridge University Press in 1996, Ion Implantation and Synthesis of Materials, published by Springer-Verlag in 2006, and Ion Beam Analysis: Fundamentals and Applications, published by CRC Press in 2015, and edited several volumes including the MRS best seller, the Handbook of Modern Ion Beam Materials Analysis.

mnastasi2@unl.edu