Designing Metallic Nanocomposites for High Strength and Damage Tolerance

Metallic nano-composites with constituent immiscible elements such as Cu-Nb, Cu-Mo are synthesized using “bottom-up” nano-layering or self-organization during magnetron sputtering and used as model systems to explore the interaction of interphase boundaries with defects introduced via plastic deformation or ion irradiation. The results of these experimental studies are integrated with atomistic modeling and dislocation theory to provide insight into the unprecedented combination of properties achieved in certain nanolayered composites such as ultra-high flow strengths, high plastic flow stability, high fatigue strength, high thermal stability, high sink strength for radiation-induced point defects and trapping of helium in the form of stable clusters at interfaces. A quantification of the defect-interface interactions as well as the processing-interface structure relationship allows the development of materials design concepts with controlled interface structures in nanocomposites to achieve tailored response in engineering applications.

Biography: Amit Misra is Professor and Chair of the Department of Materials Science and Engineering (MSE) at the University of Michigan, Ann Arbor since 2014. Prior to that he worked at Los Alamos National Laboratory, New Mexico (LANL) from 1996 to 2014. At LANL, his most recent appointment was as the Director of a US Department of Energy, Office of Basic Energy Sciences (DOE/BES) funded Energy Frontier Research Center (EFRC) titled Center for Materials at Irradiation and Mechanical Extremes. Professor Misra has a PhD in Materials Science and Engineering from University of Michigan (1994) and BS in Metallurgical Engineering (1989) from IIT-BHU, India.

His primary research expertise is in processing-structure-property relations in advanced structural metallic materials for tailored response in extreme environments for next-generation of automotive, aerospace, defense and nuclear energy technologies. He has mentored over 40 early career scientists and engineers (postdocs and graduate students) and has co-authored over 300 peer-reviewed publications (http://scholar.google.com/citations?user=bMNusccAAAAJ&hl=en). Prof. Misra is a fellow of the Materials Research Society (MRS), a fellow of the American Association for Advancement of Science (AAAS), a fellow of the American Society of Metals (ASM) International, and a fellow of Los Alamos National Laboratory. Among the honors he has received are the Brimacombe Medalist award from The Minerals, Metals and Materials Society (TMS) in 2017, the Distinguished Service Award from TMS - Materials Processing and Manufacturing Division in 2016, the Distinguished Scientist/Engineer Award from TMS - Materials Processing and Manufacturing Division in 2011, the Distinguished Postdoctoral Mentor award from LANL in 2013, and the LANL Fellows’ Prize for outstanding research in nanomechanics in 2008. He is an editor of Materials Research Letters, and the Chair of editorial board member of MRS Bulletin.

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