



Mechanical Engineering Seminar Series

Design of materials with unique mechanical behavior and radiation responses by tailoring nanoscale defects

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[ME Seminar Zoom link \(QR Code below\)](#)

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Abstract

Metallic and ceramics materials have been increasingly used in extreme environments, such as high temperatures, stresses and radiations. Consequently, the design of new materials with unique mechanical properties and radiation resistance has been intensively documented. In this presentation, I will provide several examples, wherein nanoscale twin boundaries, stacking faults and phase boundaries play important roles in tailoring the mechanical properties and radiation response of metallic and ceramic materials. For instance, through tailoring nanotwins in metallic materials, the mechanical strength of Al alloys can reach a level similar to martensitic steels. Twin boundaries can also prominently improve the radiation resistance of Cu, Ag and their alloys. Nanoscale stacking fault-phase boundary networks have also led to high strength in metallic materials, and can significantly improve the deformability of ceramics and brittle intermetallics. The implications of these findings on the design of advanced materials will be discussed.

Bio

Xinghang Zhang obtained his Ph.D. from North Carolina State University in 2001. He was a Director's postdoc fellow at Los Alamos National Laboratory for 2 years. After spending 12 years at Texas A&M University, he joined Purdue University in 2016. Zhang's team excels at radiation damage and mechanical behavior of nanocrystalline, nanotwinned, and nanolayered metals and nanostructured ceramic materials. Together with his graduate students and colleagues, they have published more than 270 journal articles. He has delivered numerous invited talks internationally. Among more than 20 of his Ph.D. students graduated so far, many have become faculty at university or national laboratories. He is the Chair of the Nanomechanical Behavior of Materials Committee at the TMS, and an associate editor for Science Advances. Zhang has received numerous research awards, including National Science Foundation's Early Career award (2007) and TMS Brimacombe award (2018). Zhang is an ASM Fellow and can be reached at xzhang98@purdue.edu.