



ME Seminar



Mechanics of Heterogeneous Materials

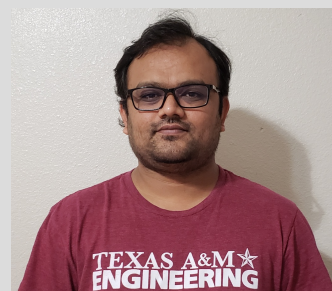
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ABSTRACT

Engineering microstructure is crucial for developing materials with desired characteristics. However, resulting heterogeneous microstructure can induce steep stress gradients that serve as potential nucleation sites for defects that then propagate and lead to failure which limits the utility of materials that otherwise are attractive for their lightweight, high strength and multi-functional capabilities. In this seminar, I will summarize my research work within this broad context and present work on mesoscale mechanics of amorphous solids in more detail. Analogous to dislocations in crystalline solids, shear-transformation-zones (STZs) are the elementary carriers for inelastic deformations in amorphous solids. We use Eshelby inclusion solution to model individual STZ and a thermodynamically consistent framework for such transformations is presented. A general expression for the dissipation rate for solids undergoing inelastic deformation by the collective evolution of STZs is derived. Then, by invoking the Clausius-Duhem inequality, kinetic relation for transformation strain rate is developed. The advantages, disadvantages, and broader implications of this framework will be discussed.

ABOUT THE SPEAKER

Manish Vasoya is a Postdoctoral Fellow at the Texas A&M University, working in Material Science and Engineering (MSEN). His current research work involves modeling of inelastic deformations in amorphous solids. For the same, he received the departmental best postdoc paper from MSEN, Texas A&M. Prior to this position, he worked at the Weizmann Institute of Science in Department of Chemical and Biological Physics where he contributed in developing a fracture model that explains the brittle- to-ductile transition of failure in amorphous solids. He did his PhD work at the Institute d'Alembert, Sorbonne University. His thesis was on studying brittle failure of heterogeneous materials. He holds M.Tech. from IIT Delhi with major in Solid Mechanics and did his masters thesis at the Karlsruhe Institute of Technology, Germany under the DAAD scholarship. He holds B.Tech. in Mechanical Engineering from Nirma University, Ahmedabad.



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