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PROCEEDINGS

The Structure-Vibration-Deformation Correlation in Amorphous Metals

Yunjiang Wang[1,*]

[1]State Key Laboratory of Nonlinear Mechanics, Institute of Mechanics, Chinese Academy of Sciences, Beijing 100190, China

[*]Corresponding Author: Yunjiang Wang. Email: yjwang@imech.ac.cn

ABSTRACT

It is a textbook knowledge that the mechanical properties of crystalline solids are determined by the performances of their defects under certain circumstances of external stress and temperature. However, such a belief in crystals meets difficulty in amorphous solids, in which the concept of defect is hard to define. In this talk, I would like to talk about the unusual structure-property of amorphous metals from three different perspectives – in terms of their structural, vibrational and deformation characteristics. We try to build a super structure-property relationship in the general amorphous solids by machine learning strategy after we realized that their no direct one-to-one correspondence in amorphous metals' functions. Then we study and understand the deformation behaviors of amorphous metal starting from phonon, which present abundant of novel phenomena compared to crystals. Finally, the fracture of amorphous metals via either shear banding or necking after characterized by a new fracture criterion, which is constructed by the geometry and bonding nature of amorphous materials. All the new knowledges are obtained from atomistic simulations, which is targeted to provide a quantitative structure-property relationship in the generic amorphous metals.

KEYWORDS

Atomic structure; phonon; deformation; fracture; amorphous metals

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