Kolan Madhav Reddy, Nano Res Appl 2018, Volume 4
DOI: 10.21767/2471-9838-C5-020

Kolan Madhav Reddy

Shanghai Jiao Tong University, China

Nanoscale deformation characterization of light-weight ceramics

Lightweight ceramics often composes of oxides, nitrides, carbides and borides have recently gained technological importance or even still at the development stage with regard to future applications. Therefore experimental observations of the atomic structure and their deformation mechanisms of lightweight ceramics are of extreme importance in understanding and tailoring the materials properties. In this presentation, author will demonstrate the atomic imaging of boron-rich solids (i.e., B_4C and B_6O) using newly developed annular bright field scanning transmission electron microscopy (ABF-STEM) technique. The atomistic observations upon deformation provide the direct evidence for the intragranular amorphous shear bands in both these brittle ceramics. To reduce the brittleness, nano-crystalline B_4C (n-B_4C) microstructure with a homogenous distribution of nano-sized pores and amorphous carbon at grain boundaries (GBs) was synthesized at relatively low temperatures. Transmission electron microscopy (TEM) of n-B_4C reveals that the unusual nanosize effect arises from the deformation reduced elimination of nano-porosity mediated by grain boundary sliding with the assistance of the soft boundary phases. Finally, our recent observations combined with computer simulations reveals GB sliding leads to the amorphous band formation at pre-distorted icosahedral GB regions with initiation of cavitation within the amorphous bands. These theoretical and experimental results provide an atomistic explanation for the influence of GBs on the deformation behavior of nano-crystalline ceramics. .

Biography

Kolan Madhav Reddy has completed his PhD in Materials Science and Engineering at Tohoku University, Japan and Postdoctoral research at Johns Hopkins University, USA. He is currently an Associate Professor in School of Materials and Engineering at Shanghai Jiao Tong University, China. He has authored and co-authored more than 25 peer-reviewed papers and filed a patent.

kmreddy@sjtu.edu.cn

Notes: