Nanovoids induced homogeneous superplastic in metallic metal

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Abstract

In this paper, we simulate the tension properties of $Cu_{50}Zr_{50}$ metallic glass films with regularly distributed nanovoids by molecular dynamics. A deformation mode transition from localized shear banding to homogeneous flow was found in $Cu_{50}Zr_{50}$ metallic glass with a critical void volume in range of 2.5% and 5%. Further analysis on atomic scale reveals that this failure mode change is realized by multiple shear banding induced by energetic and liquid-like void surface atoms. The simulation results suggested a new strategy on the fabrication of ductile metallic glasses by introducing nanovoids with appropriate volume fraction and average size

Keywords: Metallic metal, Molecular dynamic simulation; Tensile behavior; Shear localization