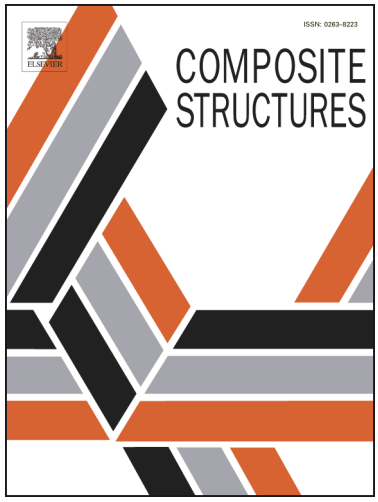

Numerical simulation on the deformation behaviors of bulk metallic glass composites under uniaxial tension and compression

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Numerical simulation on the deformation behaviors of bulk metallic glass composites under uniaxial tension and compression

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Abstract: The free volume model is firstly extended to describe the asymmetry of bulk metallic glass (BMG) presented under the uniaxial tensile and compressive deformations, and then the extended model is implemented into a finite element code as a user material subroutine (UMAT). Based on such a UMAT, a systematic numerical simulation is performed to investigate the deformation behaviors of BMG composites subjected to uniaxial tensile and compressive loadings. The von-Mises equivalent shear plastic strain is adopted to characterize the nucleation and propagation of shear bands in the BMG matrix here. The simulated uniaxial tensile overall stress-strain responses of the BMG composites containing different volume fractions, shapes, orientations and yielding stresses of toughening particles are compared with the compressive ones. It is shown that the initiation and propagation of shear bands in the BMG composites depend on the geometric features and yielding stresses of the toughening particles and present obviously different evolution features under the uniaxial tension and compression. The obtained results are very useful for designing and modeling the BMG composites.