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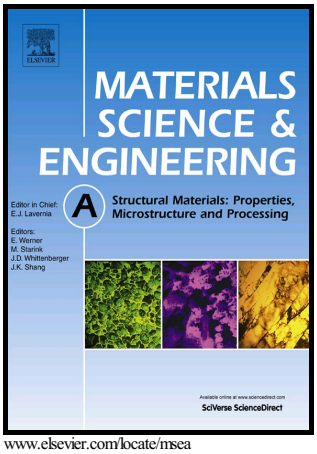

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Shear softening of Ta-containing metallic glass matrix composites upon dynamic loading

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Abstract

The deformation behaviors of in-situ $Ti_{50}Zr_{18}Ni_5Ta_{15}Be_{12}$ bulk metallic glass matrix composites (MGMCs) were investigated upon quasi-static and dynamic loadings. The present MGMCs exhibit good quasi-static mechanical properties, combining high fracture strength (2460 MPa) with remarkable plasticity (20 %) at the strain rate of 5×10^{-4} s^{-1}. When the strain rate is higher than 3080 s^{-1}, the strain rate effect of the yielding strength has an apparent negative strain rate sensitivity (SRS), which can be ascribed to the deteriorated ability of dendrites to impede the propagation of shear bands and the matrix-dominated fracture related to thermal softening at higher strain rates. Based on their deformation mechanisms, a constitutive relationship is obtained by cooperative shear model (CSM), which is employed to model the dynamic yielding stress behavior. The constitutive equations are established for describing the present

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