Elastic properties and glass forming ability of the zr50cu40ag10 metallic alloy

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Abstract

© 2020 Trans Tech Publications Ltd, Switzerland The elastic properties of the Zr50Cu40Ag10 metallic alloy, such as the bulk modulus B, the shear modulus G, the Young's modulus E and the Poisson's ratio σ, are investigated by molecular dynamics simulation in the temperature range T=250–2000 K and at an external pressure of p=1.0 bar. It is shown that the liquid–glass transition is accompanied by a considerable increase in the shear modulus G and the Young's modulus E (by more than 50%). The temperature dependence of the Poisson's ratio exhibits a sharp fall from typical values for metals of approximately 0.32– 0.33 to low values (close to zero), which are characteristic for brittle bulk metallic glasses. Non-monotonic temperature dependence of the longitudinal and transverse sound velocity near the liquid-glass transition is also observed. The glass forming ability of the alloy is evaluated in terms of the fragility index m. As found, its value is m≈64 for the Zr50Cu40Ag10 metallic glass, that is in a good agreement with the experimental data for the Zr-Cu-based metallic glasses.

Keywords

Amorphous metallic alloy, Elastic moduli, Glass forming ability, Molecular dynamics, Structural transformations

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