

On the notch sensitivity of CuZr metallic glasses

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We perform molecular dynamics simulations to study the effect of notch size, shape and location on the strength and failure mechanism of CuZr metallic glass (MG) under tensile loading. Results show that the plastic deformation occurred at the notch root reduces the stress concentration at the notch root, leading to a notch-insensitive normalized tensile strength. The notch, however, dictates the failure location as the plastic zone at the notch root serves as a nucleation site for shear band (SB) formation. We further show that when the plastic zone size reaches the inherent SB width, SB starts to propagate from the notch root plastic zone across the entire sample, causing catastrophic failure. These results provide useful guidelines for the design, testing and engineering of MG for structural applications.

Keywords: Metallic glasses, flaw insensitive, fracture strength, stress concentration.