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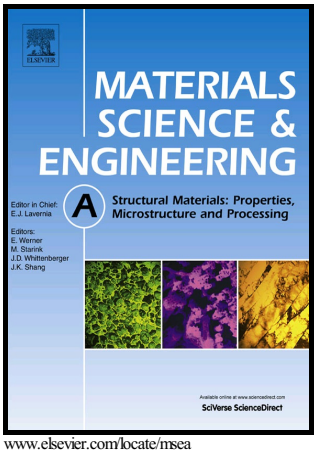

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Clarification on shear transformation zone size and its correlation with plasticity for Zr-based bulk metallic glass in different structural states

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Abstract

To clarify the real size of shear transformation zone (STZ) and its correlation with the plasticity of metallic glass, STZ sizes of a Zr-based bulk metallic glass (BMG) in three different structural states (as-cast, annealed and confining annealed) were examined using both rate-change and statistical methods upon nanoindentation. STZ sizes (less than 24 atoms) obtained by the statistical method approached the real STZ size of very few atoms, and showed no correlation with BMG plasticity. In sharp contrast, STZ sizes (hundreds of atoms) obtained by the rate-change method not only were much larger than the real STZ size but also exhibited a positive correlation with BMG plasticity. These discrepancies were discussed in terms of the structural evolution of BMGs upon nanoindentation.

Keywords: Metallic glass; Nanoindentation; Shear transformation zone; Plasticity;