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Study of mechanical deformation of Zr-Cu-based bulk metallic glasses: Experiment and numerical simulation

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Bulk metallic glasses (BMGs) have received much scientific and technological attention due to their unique combination of physical, chemical and mechanical properties. This is due to the absence of a long-range order in atomic structure and lack of defects such as dislocations, which control ductility in traditional metallic materials. Some recent experiments on sub-micron and nano-sized metallic glass specimens have shown that a process of shear localisation became more stable and less catastrophic when compared to the response exhibited by large-size samples [1].

There is a considerable interest in understanding of the mechanisms underlying deformation in such unique materials. In this study, a Zr-Cu-based BMG is characterised across several length scales. A preliminary macroscopic continuum model of BMG deformation is proposed, which has been shown to capture the initiation and propagation of shear banding under indentation as well as uniaxial tension and compression. Results of numerical simulations based on the developed model are compared with the corresponding experimental results.

REFERENCES

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