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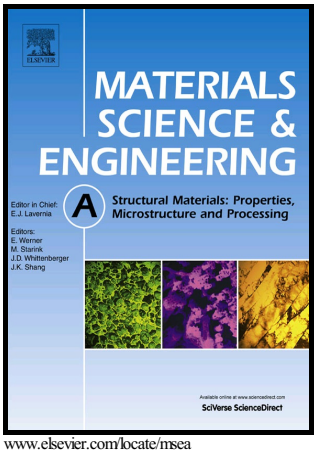

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Measuring notch toughness of thin film metallic glasses using focused ion beam-based microcantilever method: Comparison with Ti and TiN crystalline films

Chia-Lin Li[1], Jinn P. Chu[2*], Jyh-Wei Lee[3,4]

[1]Graduate Institute of Applied Science and Technology, National Taiwan University of Science and Technology, Taipei 10607, Taiwan

[2]Department of Materials Science and Engineering, National Taiwan University of Science and Technology, Taipei 10607, Taiwan

[3]Department of Materials Engineering, Ming Chi University of Technology, New Taipei 24301, Taiwan

[4]Center for Thin Films Technologies and Applications, Ming Chi University of Technology, New Taipei 24301, Taiwan

[*]Corresponding author, e-mail address: jpchu@mail.ntust.edu.tw

Abstract

This study measured the notch toughness of Zr- and W-based thin film metallic glasses (TFMGs), and compared the results with those data obtained from crystalline Ti and TiN thin films as well as bulk metallic glass (BMG). Deflection testing was conducted using microcantilevers fabricated by focused ion beam machining. The resulting load vs. deflection curves revealed that Zr-based TFMG, BMG, and Ti films exhibited non-linear curves after yielding, which represented the ductile deformation characteristics. Higher notch toughness values of 3.84 and 5.13 MPa$\sqrt{m}$ for Zr- and W-based TFMGs, respectively, than TiN (2.15 MPa$\sqrt{m}$) and Ti (0.74 MPa$\sqrt{m}$) films were obtained. Thus, at micro-scales, metallic glasses present relatively better fracture behavior than do crystalline materials. This paper presents a direct comparison of works related to the notch toughness of amorphous and crystalline materials.

Keywords: metallic glass; thin film; notch toughness; microcantilever