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Effect of tantalum addition on Cu-Zr binary glass metallic thin films properties.

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Bulk metallic glasses (BMGs) have attracted considerable attention due to their high strength, superior elasticity, and high corrosion resistance. However, the poor room-temperature deformability and fatigue properties of these alloys make their applicability restricted.

Tantalum addition seems to reduce the density of free volume and the formation of shear band which lead to the enhancement of the mechanical properties of metallic glasses thin films [1]. Therefore, the aim of this work is to investigate the effect of tantalum addition on the mechanical properties and thermal stability of Cu-Zr binary metallic glass thin films.

Cu-Zr-Ta ternary metallic glass thin films were successfully deposited by magnetron sputtering. The effects of tantalum addition on the microstructure, morphology and mechanical properties of these coatings are reported. Nanoindentation tests were performed in order to determine hardness and Young modulus. X-ray diffraction XRD and EDS electron dispersive spectroscopy analysis were also used to investigate the chemical composition and structure of coatings. A particular attention has been paid to the ductility of the deposited thin films by carrying out of compressing micro-pillars, obtained by FIB, test.

Keywords

metallic glasses

thin films

PVD

magnetron sputtering