Effects of Nb and Ti on the corrosion and biocompatibility behavior of Zr-based and Fe-based thin film metallic glasses

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ABSTRACT

Recently, thin film metallic glasses (TFMGs) have drawn lots of attention from researchers due to their potential applications in the biomedical fields. In this work, a series of Zr-based and Fe-based TFMGs were prepared by a pulsed DC and RF magnetron co-sputtering system. TFMGs were deposited on 316L stainless steel and P-type (100) Si wafers. For the Zr-based and Fe-based TFMG, Nb and Ti elements were added, respectively. The amorphous structures of coatings were determined by a glancing angle X-ray diffractometer. The surface and cross sectional morphologies of thin films were examined by a scanning electron microscopy (SEM). The surface roughness of thin films was explored by an atomic force microscopy (AFM). A nanoindenter, HRC-DB adhesion test were used to evaluate the hardness and adhesion properties of thin films, respectively. The bio-corrosion properties were tested by an electrochemical polarization measurements. The biocompatibility of TFMGs was examined using MG63 cell and the MTS assay. Effects of Nb and Ti addition on the corrosion resistance and biocompatibility behavior of TFMGs were discussed.

Keywords: Magnetron sputtering, Thin film metallic glasses, corrosion, biocompatibility