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NANOMECHANICAL AND ELECTROCHEMICAL PROPERTIES OF ZrN COATED NiTi SHAPE MEMORY ALLOY

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Zirconium nitride (ZrN) thin films were deposited on NiTi, C and Si substrates in the 23-570 ºC temperature range. The deposition processes were carried out by direct current reactive magnetron sputtering using N_2/Ar gas mixture, during one hour for all temperature range, maintaining fixed all the others deposition parameters. The film hardness, corrosion behavior, phase composition, and texture were studied. It was used nanoindentation techniques, electrochemical analysis, X-ray diffraction, scanning electron microscopy, Rutherford backscattering spectrometry and X-ray photo-electron spectroscopy. The results showed that deposited films were composed mainly by the cubic ZrN phase, whose texture varies with substrate temperature, changing progressively from (111) to (200) texture as the temperature increases. Also, the hardness of the films is influenced by the texture with higher hardness obtained for ZrN thin films with (200) texture. Furthermore, the film thickness increases with temperature up to 400 ºC and the texture is mainly (111). Above this temperature, the orientation changes to (200) and the thickness decreases. Electrochemical tests show that NiTi coated with (200)-oriented ZrN films has higher tendency to passivation and greater stability of the passive film as compared to (111)-oriented ZrN films.

Keywords
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