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HARDNESS AND CORROSION RESISTANCE OF ZrN DEPOSITED ON PLASMA NITRIDED NiTi SHAPE MEMORY ALLOY.

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Zirconium nitride (ZrN) thin films were deposited onto plasma nitrided NiTi shape memory alloy. The plasma nitriding process was made in the 100-500 °C temperature range, during 5 hours and after that, the samples were all coated with a ZrN thin film deposited at 500 °C during 90 minutes, maintaining fixed, all other deposition parameters. The deposition processes were carried out by direct current reactive magnetron sputtering using N₂/Ar gas mixture. The film hardness, corrosion behavior, roughness, phase composition, and texture were studied, using nanoindentation techniques, electrochemical analysis, X-ray diffraction, scanning electron microscopy, Rutherford backscattering spectrometry, X-ray photo-electron spectroscopy and atomic force microscopy. The results showed that nitriding process leads to the formation of Ni₃Ti and TiN on NiTi surface. Also, the nitriding process influenced indirectly the deposition process, once the nanomechanical and electrochemical properties of ZrN thin films were influenced by the nitriding temperature. Furthermore, the color of the ZrN films deposited onto plasma nitrided NiTi alloy also changed with nitriding temperature. These results are discussed in terms of the diffusion of nitrogen and oxygen from NiTi nitrided layer to the ZrN thin film. The roughness of the nitride NiTi surface also seems to play an important role on the microstructure of the ZrN deposited films.

Keywords

Zirconium Nitride
nanomechanics
electrochemistry
corrosion
crystallographic texture