

Corrosion properties of duplex treated Ti-6Al-4V alloy in chloride media using electrochemical and positron annihilation spectroscopy techniques.

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Abstract

The corrosion properties of duplex-treated and nitrided Ti-6Al-4V have been investigated in 0.025, 0.25 and 2.5 M NaCl using electrochem. techniques, Positron Annihilation Spectroscopy (PAS), X-ray diffraction (XRD), SEM, and Energy Dispersive Spectrometry (EDS). The electrochem. results showed a three-fold increase in corrosion rate for every ten-fold increase in chloride concn. The morphol. and surface compn. studied by XRD showed the presence of TiN and Ti₂N layers. SEM and EDS showed the presence of pitting and the presence of oxide and chloride products. At the lowest concn. of NaCl, no aluminum was detected in the surface layers while at the highest concn. no chloride byproducts were detected. PAS indicated that the damage caused by the NaCl changes in nature and becomes shallower as the concn. increases.