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Enhanced Corrosion Resistance of TA2 Titanium via Anodic Oxidation in Mixed Acid System

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Anodic oxidation has been successfully used for surface modification of the titanium alloys. TiO_2 layers formed by anodization were modified the structure, apatite-forming ability and corrosion resistance of TA2 titanium alloy, in tartaric-sulfuric-oxalic acid system. Effects of different anodizing voltages and duration on the microstructure and performances of titania surface were investigated for anodizing TA2 titanium. The results showed that the TA2 titanium surface was covered with porous anatase and rutile after anodization which the thickness of the oxide layer achieved about 500nm. The corrosion resistance has been largely improved because the corrosion current density ($2.044\times10^{-5}A/cm^2$ and $2.725\times10^{-5}A/cm^2$) decreased a magnitude compared with untreated TA2 titanium ($2.725\times10^{-4}A/cm^2$), when the TA2 titanium was anodized under the condition of 40V for 40 min. After soaking in SBF, apatite formed on the TiO_2 layers and it covered the most parts of the surface when anodized at 40V for 10 min. Also, the EDS results revealed that Ca/P of the apatite films which demonstrated that the TiO_2 layers were short of calcium compared to hydroxyapatite.

Keywords: apatite formation; corrosion resistance; TA2 titanium alloy; anodic oxidation

FULL TEXT