Insight into potential dependent mechanism of the composition and electrochemical property of oxide films of Ti-6Al-3Nb-2Zr-1Mo

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Abstract Potential dependent mechanism of the composition and electrochemical properties of oxide films formed on Ti-6Al-3Nb-2Zr-1Mo in 0.5 M H_2SO_4 at the potential ranging within − 0.80–5.00 V was studied through electrochemical and surface characterization tests. The quantitative calculation and qualitative analysis of the effective thickness of the oxide film and valence state of the alloying elements Ti, Al, Nb, Mo increase with potential increasing to 3.00 V, whereas surface roughness illustrates the opposite trend. The corrosion resistances and semiconductor properties results obtaining from the NaCl solution indicate better protection effect and uniformity of oxide film at higher potential in passive region. Higher applied potential promotes crystallization and hydration effect of the titanium/ aluminum hydroxide within the oxide film, and the formation of flat surface can account for the excellent corrosion behavior at the applied potential of 3.00 V. A schematic considering alloying elements effect within oxide films formed at different applied potential on Ti-6Al-3Nb-2Zr-1Mo is established.

Keywords Ti-6Al-3Nb-2Zr-1Mo, quantitative analysis, effects of alloying elements, potential dependent mechanism

Reference

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