Preparation of TiO₂ Thin Film by Two-Step Anodization and Investigation of Its Corrosion Resistance

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doi; 10.20964/2018.10.25

Received: 7 May 2018 / Accepted: 18 July 2018 / Published: 1 September 2018

A TiO₂ thin film was prepared by two-step anodic oxidation and its morphology and corrosion resistance were compared with those of a TiO₂ thin film prepared by a one-step anodization process. The micro-morphology was observed by scanning electron microscopy (SEM) and atomic force microscopy (AFM). The phase composition and valence state of the films were studied by X-ray diffraction (XRD) and X-ray photoelectron spectroscopy (XPS). In addition, the corrosion resistance behavior of the film was assessed using an electrochemical workstation. The results show that the two-step anodic oxidation effectively reduced the porosity and roughness of the film. The thickness of the film was 1.33 times higher than that of the pre-processed film, and its compactness and stability also increased. Furthermore, this process yielded a reduction in the number of channels available to Cl⁻ ion transport in the film. Moreover, the self-corrosion potential increased by 10.16% (from -1.28 V to -1.15 V) and the self-corrosion current density decreased by 57.86% (from 0.0513 A/cm² to 0.0216 A/cm²) in a 3.5 wt.% NaCl solution.

Keywords: TA2 pure titanium; two-step anodic oxidation; micro morphology; corrosion resistance

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