Short Communication

Electrochemical Behavior of Nb₂O₅ Films Produced by Magnetron Sputtering

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Metallic engineering materials generally form passive films on their surfaces and therefore are prone to localized corrosion, usually characterized by the occurrence of pits. The improvement of surface properties is a requirement for the metallic components used, for example, in petrochemical industry, in fuel cells, and in nuclear plants. The goal of this paper is to investigate the influence of Nb₂O₅ coatings on the electrochemical behavior of AISI 316 stainless steel. The films were deposited for 15, 30 and 50 minutes by using DC magnetron sputtering technique. The corrosion resistance was evaluated by monitoring the open circuit potential (OCP), the electrochemical impedance spectroscopy (EIS) and the linear potentiodynamic polarization (LP) in an aqueous 0.1 M H₂SO₄ electrolyte at 25 °C. Electrochemical tests revealed a more capacitive behavior of the Nb₂O₅-coated specimens when compared to the uncoated one. This fact indicates that the coated samples are less susceptible to corrosion. The deposited films show a protective character and can be used to avoid the degradation of the AISI 316 austenitic stainless steel in aggressive environments containing sulfur ions.

Keywords: stainless steel, Nb₂O₅, magnetron sputtering, corrosion resistance, niobium oxide.

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