Electrochemical evaluation of the AISI 316 stainless steel coated by Nb_2O_5 thin films

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Great number of metallic engineering materials form passive films on their surfaces and, therefore, are prone to localized corrosion, usually characterized by the occurrence of pits [1,2]. 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 work was to investigate the influence of Nb_2O_5 films deposited by DC magnetron sputtering during 15, 30 and 50 minutes on the electrochemical behavior of the AISI 316 austenitic stainless steel. The corrosion resistance was evaluated by monitoring the open circuit potential (OCP), electrochemical impedance spectroscopy (EIS) and linear potentiodynamic polarization (LP) on an electrolyte composed of 0.1 M H_2SO_4 in water at 25 °C. Electrochemical tests showed that the coated specimens presented a more capacitive behavior, and were less susceptible to corrosion than specimens without Nb_2O_5 coatings. The OCP for coated samples at 50 min had the most inferior values. Similar results were obtained by Pillis *et al*. [3] for Nb_2O_5 coatings at 15 min and 30 min in NaCl solution. These results suggest that the obtained films have a protective behavior and can be used to avoid the degradation of the AISI 316 austenitic stainless steel in aggressive environments containing sulfur ions.

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References:

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