



Iranian Journal of Physics Research, Vol. 23, No. 1, 2023
DOI: 10.47176/ijpr.23.1.91579

Improving corrosion resistance of aluminum by zirconium carbide thin films

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(Received 23 September 2022 ; in final form 14 March 2023)

Abstract

In this paper, zirconium carbide (ZrC) thin films were deposited on glass and aluminum substrates using DC magnetron sputtering. It was found that different ratios of acetylene gas (C_2H_2 , as a reactive gas) in the gas mixture of acetylene and argon (Ar, as a sputtering gas) affect the microstructural properties, corrosion behavior, and protection efficiency of ZrC thin films. X-ray diffraction (XRD) was used to characterize the microstructural properties of thin films. The corrosion behavior of thin films in a 3.5% NaCl solution was evaluated by potentiodynamic polarization tests and electrochemical impedance spectroscopy (EIS). FESEM was also employed to examine thin films' surface morphology and thickness.

Keywords: corrosion, potentiodynamic polarization test, zirconium carbide, thin film, magnetron sputtering

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