Short Communication

Electrodeposition of Ni-Mo/TiO₂ Nanocomposite Coatings on Low-Carbon Steels for Improving Corrosion Resistance

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doi: 10.20964/2020.07.35

Received: 10 November 2019 / Accepted: 20 December 2019 / Published: 10 June 2020

In this paper, Ni-Mo/TiO₂ nanocomposite coatings were successfully deposited from a modified ammonia-citrate bath containing TiO₂ nanoparticles. Phase identifications and microstructural characterizations of the as-prepared coatings were obtained by X-ray diffraction (XRD) and scanning electron microscopy (SEM). The corrosion behaviour was evaluated by a potentiodynamic polarization test and electrochemical impedance spectroscopy (EIS). It is established that the compact, crack-free Ni-Mo/TiO₂ nanocomposite coatings are composed of a Ni-Mo alloy matrix and a TiO₂ phase, and both the content of Mo and TiO₂ in the obtained composite coatings increase with an increased addition of TiO₂ in the plating bath. The Ni-Mo/TiO₂ nanocomposite coatings exhibit much nobler E_{corr} , lower i_{corr} and larger R_{ct} values than those of the Ni-Mo alloy coating. Among all Ni-Mo/TiO₂ nanocomposite coatings, the Ni-Mo/TiO₂ IV coating, deposited from a bath containing 40 mg/L TiO₂ nanoparticles, shows the best corrosion resistance.

Keywords: Nanocomposite coatings; Electrodeposition; Corrosion resistance; Ni-Mo alloy; TiO₂

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