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Study on Microbial Corrosion Resistance of Ni-P-Ag Coatings in Artificial Marine Environments Containing Sulphate-reducing Bacteria

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In this paper, silver was electroless-plated onto nickel-phosphorus (Ni-P) to improve its microbial corrosion resistance. The microbial corrosion behaviour of nickel-phosphorus-silver (Ni-P-Ag) in artificial marine environments with *Desulfovibrio desulfuricans* was experimentally investigated. Fluorescence microscopy (FM), scanning electron microscopy (SEM), and X-ray fluorescence (XRF) were used to analyse the colonization of sulphate-reducing bacteria (SRB). The results indicate that Ni-P-Ag could not inhibit the growth of SRB, which were still able to proliferate wihin a short period. Based on the electrochemical impedance spectroscopy (EIS) results, the potentiodynamic curves of Ni-P-Ag were concentrated from 1 d to 31 d with almost no shift in the negative direction. The corrosion potentials and lgI_{corr} of the Ni-P-Ag potentiodynamic curves changed slowly. The Nyquist and Bode plots of Ni-P-Ag coating in seawater containing SRB were both relatively stable. According to the equivalent circuits, the R_{ct} of Ni-P-Ag decreased slowly from 5.75 kΩ·cm^{-2} to 2.35 kΩ·cm^{-2}. The results showed that the microbial corrosion resistance of silver coating is obvious. Although silver coating could not inhibit SRB reproduction, Ni-P-Ag can effectively resist SRB corrosion.

Keywords: Sulphate-reducing bacteria, Microbial corrosion, Silver, Seawater

FULL TEXT