Effect of *Bacillus flexus* on the Degradation of Epoxy Resin Varnish Coating in Seawater

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Protective coatings have been being widely applied on the surface of metallic materials to protect against corrosion. However, there is still little known about the degradation of coatings caused by microbiological attack in seawater. As one of the most widespread species, *Bacillus* species are of great importance in the deterioration and degradation of materials. In this paper, the effect of *Bacillus flexus* on the degradation of an epoxy resin varnish coating in seawater was investigated. All the experiments were conducted in either sterile seawater or seawater containing *Bacillus flexus*. The electrochemical characteristics of the coatings in both kinds of seawater were monitored with electrochemical impedance spectroscopy (EIS). The reduction of the corrosion resistance of the coating exposed to seawater containing *Bacillus flexus* between 1 day of immersion and 19 days of immersion was evidently larger when compared with that in sterile seawater, which indicated that *Bacillus flexus* could remarkably decrease the corrosion resistance of the coating and potentially result in degradation of the coating. In addition, scanning electron microscopy (SEM) was employed for characterizing the surface morphology of the coatings before and after immersion. After 30 days of immersion, chalking traces and some tiny holes emerged on the surface of the coatings exposed to seawater containing *Bacillus flexus*, which was mainly ascribed to the biofilm formed by *Bacillus flexus* and their metabolic activities. The results demonstrated that the epoxy resin varnish coating was degraded by *Bacillus flexus*, which was further confirmed by the results obtained from Fourier transform infrared spectroscopy (FTIR).

Keywords: Epoxy resin varnish coating; *Bacillus flexus*; Degradation; Electrochemical impedance spectroscopy; Corrosion

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