

عنوان مقاله:

A Study on the Effect of Adhesion Durability on the Protective Performance of Epoxy Coatings Using EIS

محل انتشار:

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خلاصه مقاله:

Organic coatings are the single most widely applied materials to protect metallic substrates against corrosion. Therefore, coating researchers need to understand how a coating can guarantee protective performance during service life. This study it is tried to find how adhesion durability can affect the protective performance of a coating. An epoxy resin (Araldite GY ۷۸۳) was cured with a mixture of two types of hardeners (a polyether polyamine and a cycloaliphatic polyamine) in four different mixing ratios (i.e. ۲۰-۸۰, ۵۰-۵۰, ۷۰-۳۰, ۹۰-۱۰) to achieve various adhesion behaviors, water permeability, and viscoelastic properties. Samples were exposed to humidity in the testing chamber for ۳۰۰ days and adhesion was measured at wet and dry conditions over time. After drying, adhesion loss and recovery were evaluated by a pull-off test. The electrochemical behavior of coatings was studied by electrochemical impedance spectroscopy (EIS). A series of impedance spectra of coatings during exposure to humidity were recorded and their protective properties were compared. The results showed a correlation between protective properties and viscoelastic behavior of coatings. It was found that a sample with a cycloaliphatic hardener has a higher elastic modulus (۱۲۷۵ MPa) and a sample with a polyether polyamine hardener has a lower elastic modulus (۴۶۵ MPa). Additionally, it was found that a sample with excellent initial protective properties ($|Z| = ۱۰۱۰ \Omega \text{ cm}^2$), higher elastic modulus, and low initial water permeability ($۰.۳۰۸ \text{ g/m}^2\text{hr}$) may quickly fail because of the adhesion failure after wet cycles.

کلمات کلیدی:

,Protective coatings, Adhesion durability, EIS, Epoxy coatings, Equivalent electric circuits, Breakpoint frequency

پوشش محافظ خوردگی، EIS، دوام چسبندگی، پوشش اپوکسی، مدار معادل

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