Abstract

Project Code : TRG 5780172

Project Title : Electroactive Epoxy/SiO_2/Perfluorooctyl Triethoxysilane Hybrid Nanocomposites for Self-Healing Anticorrosive Coating

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Abstract:

Self-healing hybrid nanocomposite was successfully prepared from epoxy resin containing self-healing microcapsules and modified nano-silica as a reinforcement to enhance anticorrosion performance of epoxy coating. 3-Glycidoxypropyl-trimethoxysilane (GPTMS) and 3-aminopropyl-trimethoxysilane (APTES) were used to modify nano-silica surface in order to accomplish proper dispersion of nanoparticles in polymer matrix. Perfluorooctyl triethoxysilane (POTS), Ethanolamine (ETA) and Diethanolamine (DEA) as self-healing agents were encapsulated by polymer shell and incorporated into the epoxy coating along with modified nano-silica to form anticorrosion barrier of organic and inorganic coating on a cold-rolled steel (CRS) substrate. The effect of epoxy curing agents, modified silica and self-healing loading on the anticorrosion properties were studied. The modified silica nanoparticles and the self-healing agents were characterized using Fourier transform infrared spectroscopy (FTIR). Optical microscope (OM) was used to observe the microstructure and dispersion of nanoparticles. Anticorrosion performance of the coated CRS specimens was investigated by Tafel plot, cyclic voltammetry (CV) and salt spray test. The epoxy/3wt%GMS/20wt%POT nanocomposite possessed the best corrosion performance (I_{corr} = 0.012 mA/cm2 and corrosion rate of 0.139 mm/year). Electrochemical results were in agreement with the morphological results obtained from optical microscopy and scanning electron microscopy (SEM)

Keywords : anticorrosion, self-healing, hybrid nanocomposite, epoxy coating