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Benzimidazole-loaded Halloysite Nanotube as a Smart Coating Application

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Abstract

Smart coating has been developed for the corrosion control of surfaces exposed to corrosive environment. An important step in development of a smart coating is the successful impregnation of corrosion inhibitor into the nanocontainer as a coating pigment. In this study, halloysite was used as nanocontainer to encapsulate benzimidazole as corrosion inhibitor by vacuum method. FESEM, TEM, FTIR and TGA characterization techniques were used to confirm the loading of halloysite with benzimidazole. FESEM results indicated differences between the morphology of the unloaded-halloysite and benzimidazole loaded-halloysite. TEM results confirmed that benzimidazole molecules are loaded into halloysite. FTIR result revealed there are differences in the absorbance characteristic of peaks between peak number 1000-4000 cm^{-1} for loaded and unloaded samples. It is seen that the absorbance in the loaded-halloysite is higher than unloaded-halloysite, which confirms quantity/specific functional group of molecules. TGA result showed the temperature of degradation of benzimidazole-loaded HNT was higher than pure HNT. EIS was conducted to examine the protection characteristic of the developed smart coating. From EIS results, of 1, 3, and 6 days of experimental duration, it is seen that the value of coating impedance (Z') after exposure to 3.5% NaCl environment is very high, 2.460E+07 Ω, which confirms a very good anti corrosion protection characteristic for the developed smart coating.

Keywords: benzimidazole, halloysite nanotube, nanocontainer, smart coating

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