Preparation and Characterization of Polyamide6/Organic Clay Nanocomposite as protective coating for Carbon Steel

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In this work Polyamide/organic clay nanocomposite (PCN) was successfully prepared. The raw clay was collected from Khulays area north of Jeddah in Saudi Arabia. After grinding, it was washed with water, thereafter it was saturated with 0.5M NaCl solution to obtain the sodium clay (NaC). To obtain the organoclay (OC), the NaC was modified with Cetylpyridinium chloride (CPC). Polyamide6/organoclay nanocomposites (PA6/OC NCs) were prepared at 1,2,3,4 and 5 wt% of OC. The PA6/OC nanocomposites were characterized using Fourier transform infrared spectroscopy (FTIR), X-ray Diffraction (XRD), Scanning electron microscope (SEM) as well as transmission electron microscope (TEM). The FT-IR spectra of OC show the appearance of new bands of the constituents of CPC which gives an evidence for the presence of the organic component CPC in the OC structure. The XRD results for OC showed a shift in d_{001} spacing from 10.93 Å for NaC to 20.63 Å for OC. The XRD results for PA6/OC nanocomposites showed the loss of the clay crystalline structure at the low clay loading of 1-3 wt%. From TEM results, the PA6/OC nanocomposites at 1, 2, and 3wt% of OC showed exfoliated structures while the 4 and 5wt% showed small portion of intercalated structure. The SEM results for the OC and PA6/OC showed a good homogeneous mixture in the PA6/OC nanocomposites. The anticorrosive properties of PA6/OC nanocomposites coatings on C-Steel were investigated using electrochemical impedance spectroscopy (EIS) and Potentiodynamic polarization in 3.5 wt% NaCl electrolyte. Results showed that the PA6/OC nanocomposite coatings have better corrosion protection of C-Steel than pure PA6. The PA6/OC nanocomposite coatings containing 5wt% of the OC exhibited the best corrosion protection which reached about 75%.

Keywords: Polyamide6; Organic clay; Nanocomposite; XRD; EIS; Potentiodynamic polarization

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