Structural evaluation of graphene oxide/Zinc oxide nanocomposite for corrosion mitigation

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ABSTRACT

Owing to the impermeability, high hardness, and hydrophobicity of graphene oxide, there is a growing demand for the development of graphene oxide-based nanocomposite. In this research, GO/ZnO nanocomposite is prepared through a sol-gel route and further spin-coated onto copper to study its potential in corrosion mitigation. This research aims to investigate the structural properties of the nanocomposite formed by various GO sheet sizes and correlate them to the corrosion mitigation mechanism. The different GO sheet sizes were obtained by ultrasonication at 1 h, 3 h and 5 h and the samples were termed as 1 h-GO/ZnO, 3 h-GO/ZnO and 5 h-GO/ZnO, respectively. The X-ray diffraction (XRD) analysis of all samples showed the diffraction peaks at 31.8°, 34.5°, and 36.3° due to the nucleation of ZnO into the graphene structure. The crystallite size of the nanocomposite has decreased with decreasing GO sheet sizes. The Fourier transform infrared (FTIR) spectrometer revealed a strong new peak at 443 cm^{-1}due to Zn-O characteristic vibrations as compared to as-synthesized GO. The Brunauer-Emmett-Teller (BET) analysis showed that the GO/ZnO nanocomposites exhibited a larger surface area when the GO sheet sizes decreased. The spin-coated sample of 5 h-GO/ZnO showed a higher potential for corrosion protection at 0.017 mm/yr corrosion rate.

KEYWORDS

Sol-gel; Coatings; Graphene size; Copper

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