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Investigating the Effect of SiO_2-Graphene Oxide Hybrid as Inorganic Nanofiller on Corrosion Protection Properties of Epoxy Coatings

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Abstract: In this research, tetraethyl orthosilicate (TEOS) is used as organosilane to decorate the surface of graphene oxide (GO) nanosheets by SiO_2 nanospheres via a facile method. Results of X-ray diffraction analysis, Raman spectroscopy, Fourier transform infrared spectroscopy, field emission scanning electron microscopy, and atomic force microscopy reveal that SiO_2 nanospheres have covered the surface of GO sheets through covalent bonding and SiO_2-GO nanohybrids are successfully synthesized. Further, the effect of incorporating 0.1 wt.% GO nanosheets and/or SiO_2-GO nanohybrids on properties of epoxy coatings is investigated. The results show that the pull-off adhesion strength of epoxy coatings to mild steel substrates and the water contact angle on coatings significantly increase via adding SiO_2-GO nanohybrids. The potentiodynamic polarization test, electrochemical impedance spectroscopy (EIS) and salt spray test results demonstrate that corrosion protection performance of epoxy coatings remarkably enhances by embedding well-distributed SiO_2-GO nanohybrids compared to GO nanosheets.

Keywords: SiO_2; Graphene Oxide; Nanohybrids; Epoxy; Corrosion.

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