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Impact of size-controlled p-phenylenediamine (PPDA)-functionalized graphene oxide nanosheets on the GO-PPDA/Epoxy anti-corrosion, interfacial interactions and mechanical properties enhancement: Experimental and quantum mechanics investigations

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Abstract: In this study, the graphene oxide nanosheets (GONs) with three lateral sizes (small area GO (SAGO):0.85 μm, medium area GO (MAGO):8.2 μm and large area GO (LAGO): 38 μm) were synthesized through modified Hummer's method, covalently functionalized by p-phenylenediamine (PPDA), introduced into a polyamine cured epoxy composite and characterized by experimental and theoretical approaches. The GONs size distribution was investigated by a scanning electron microscopy (SEM). The GONs-PPDA nanosheets were characterized by X-ray diffraction (XRD), Fourier transform infrared spectroscopy (FT-IR) and thermal gravimetric analysis (TGA). The GONs-PPDA/epoxy composites were characterized by dynamic mechanical thermal analysis (DMTA), tensile test and electrochemical impedance spectroscopy. The fracture surface morphology and GONs-PPDA distribution in the epoxy matrix were studied by field emission-scanning electron microscopy (FE-SEM). Results revealed that incorporation of the GONs with lateral particle size less than 1000 nm into the epoxy matrix

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