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Enhanced mechanical properties of multiscale carbon fiber/epoxy composites by fiber surface treatment with graphene oxide/polyhedral oligomeric silsesquioxane

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Abstract: Graphene oxide (GO) and polyhedral oligomeric silsesquioxane (POSS) grafted carbon fiber (CF) was demonstrated to reinforce the mechanical properties of fiber composites. Such a fiber composite was prepared by grafting POSS onto the CF surface using GO as the linkage. The presence of GO linkage and POSS could significantly enhance both the area and wettability of fiber surface, leading to an increase in the interfacial strength between fibers and resin. Compared with the desized CF composites, the grafted CF composites fabricated by compression molding method exhibited 53.05% enhancement in the interlaminar shear strength. The changed surface morphology, surface composition and surface energy were supposed to be related with the interfacial performance of unidirectional composites, as revealed by scanning electron microscopy, atomic force microscope, dynamic contact angle test and x-ray photoelectron microscopy charaterizations.

Keywords: Carbon fiber; Mechanical properties; Interphase; Surface modify