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Enhanced interfacial interactions of carbon fiber reinforced PEEK composites by regulating PEI and graphene oxide complex sizing at the interface

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ABSTRACT: The interfacial interactions and bonding of carbon fiber (CF) reinforced poly(ether-ether-ketone) (PEEK) composites is improved by applying polyether imide (PEI) and graphene oxide (GO) complex sizing at different ratios at the interface. The thermally stable polyether imide (PEI) and graphene oxide (GO) complex sizing is prepared and then coated on carbon fiber surfaces homogeneously. The sizing layer forms on the fiber surfaces, and multiple GO sheets are introduced successfully surrounding the carbon fibers. The surface morphologies of carbon fibers change distinctly with different GO contents. The interfacial shear strength (IFSS) increases from 43.4 MPa for bare fiber reinforced PEEK composites to 49.4 MPa for composites reinforced by carbon fibers coated with PEI only. However, a significant improvement is achieved when GO sheets are introduced to the CF surfaces, making the IFSS grow up to 63.4 MPa. Furthermore, the dynamic mechanical tests show that the normalized damping area results of carbon fibers coated with complex sizing decrease remarkably by about 50%. DMA results, interlaminar shear strength (ILSS) test and flexural test results are in agreement with each other, suggesting better interface bonding of composites by applying PEI and GO complex sizing. Besides, the interfacial interaction mechanism in modified composites is proposed. The enhanced interfacial performance is caused by the positive effect of complex interface layer.

Keywords：A. Carbon fibers; A. Polymer-matrix composites (PMCs); B. Interface; B. Mechanical properties