Interfacially reinforced carbon fiber composites by grafting modified methylsilicone resin

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Carbon fibers (CFs) reinforced polymer composites have attracted considerable research due to their outstanding features such as superior mechanical properties, light weight, outstanding thermal stability and environmental stability [1-2]. In this study, modified methylsilicone resin ($12EO_{15}$-MA-SiO_2/MSR) containing nano-silica grafted hyperbranched polymer ($12EO_{15}$-MA-SiO_2) was grafted successfully onto carbon fibers surface to enhance the interfacial properties of carbon fiber/methylsilicone resin composites. Fourier transform infrared (FTIR) and X-ray photoelectron spectroscopy (XPS) confirmed the chemical bonding nature between $12EO_{15}$-MA-SiO_2/MSR and CFs. Scanning electron microscopy (SEM) and interfacial shear strength (IFSS) indicated that the surface morphology and interfacial properties of carbon fibers were highly dependent on the concentration of $12EO_{15}$-MA-SiO_2 and $12EO_{15}$-MA-SiO_2/MSR. The results showed that the optimal condition was that the concentration of $12EO_{15}$-MA-SiO_2/MSR was 1%, in which containing 6%-$12EO_{15}$-MA-SiO_2. Furthermore, significant enhancement of interfacial shear strength was achieved in the composites after modified methylsilicone resin introduced on the fiber. In addition, the tensile strength of the carbon fibers remained stable after the grafted treatment. Thus, it is a facile and effective interface design strategy to develop multifunctional fibers with desirable properties in industry applications. The abstract may include equations and figures and should be embedded in the abstract document. Abstracts will be distributed to participants electronically so full colour figures may be included.

References:

[1] B. Demir, L.C. Henderson, T.R. Walsh, , ACS Appl. Mater. Interfaces 9(13) (2017) 11846-11857.

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