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**Interfacial and fatigue-resistant synergetic enhancement of carbon fiber/epoxy hierarchical composites via an electrophoresis deposited carbon nanotube-toughened transition layer**

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**Abstract:**

To synergistically improve interfacial and fatigue-resistant performance of carbon fiber/epoxy composites, a transition layer reinforced by oxidized multiwall carbon nanotubes (OCNTs) was built. OCNTs were integrated onto carbon fibers using a continuous electrophoretic deposition method. Results of static and fatigue tests showed that compared with composites without OCNTs, the hierarchical composites not only showed increases of 33.3% in interfacial shear strength, 10.5% in interlaminar shear strength and 9.5% in flexural strength but also acquired 4.5% improvement in residual bending strength retention after fatigue tests. The transition layer detected by energy dispersive X-ray spectroscopy and atomic force microscope in force mode might be responsible for the above improvements. Combined with scanning electron microscopy analysis and ultrasonic C-scan detection, the functions of modified interfacial microstructure were discussed. The enhanced interface could help to reduce stress concentration and lead destructive cracks to spread along

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