

A Study of Plasma Treatment on Surface Properties of Carbon Fibers

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Atmospheric plasma treatments with He/O₂ were conducted to modify the surface structure of carbon fibers. The influence of plasma surface treatment parameters on the surface free energy and the adhesion strengths of carbon fibers/epoxy resin composites were experimentally investigated with respect to gas flow rate, power intensity, and treatment time. Surface characteristics of the carbon fibers were determined by X-ray photoelectron spectroscopy (XPS), scanning electron microscope (SEM), Fourier transform infrared (FT-IR), and contact angle measurements, respectively. The mechanical adhesion measurements were performed by the interfacial shear stress of the carbon fibers imbedded into the polymer through pull-out testing. Experimental results exhibited the changes occurring on the fiber surface during plasma treatment. These were probably due to the presence of reactive functional groups on the carbon fiber surface, leading to an increment of interfacial binding force between fibers and epoxy resin composites.