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Effect of polyurethane dispersion as surface treatment for carbon fabrics on mechanical properties of carbon/Nylon composites

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Abstract

This study addresses the effects of two types of polyurethane dispersions as an interfacial treatment, on the mechanical behavior of CF/Nylon laminates. Five types of CF/Nylon laminates with different surface treatments are tested and evaluated by quasi-static mechanical tests (including the on-/off-axial tensile, 3-point bending, and short beam tests) and low velocity impact tests (including Izod impact and drop weight impact tests). The resin impregnation condition of CF/Nylon laminates is evaluated through digital microscope observation. Dynamic mechanical analysis (DMA) and Fourier transform infrared spectroscopy were employed to check the surface treatment effects and interfacial interaction properties. In addition to the above mentioned mechanical tests, the knee point method and acoustic emission test were employed to look for the initial fracture and check the fracture variation of CF/Nylon laminates. Furthermore, scanning electric microscope images of single fiber and fractured carbon fiber bundles confirmed the interfacial properties evaluated by DMA analysis. Finally, a correlation between interfacial interaction and various mechanical properties of composites was successfully observed.

Keywords

A. Laminates; B. Mechanical properties; B. Fiber/matrix bond; B. Interface/interphase
D. thermal analysis; E. Surface treatments.

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