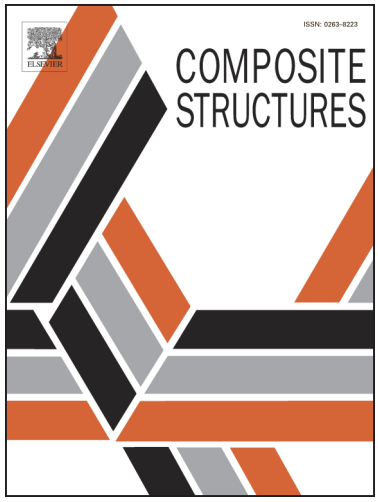

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Mechanical properties and piezoresistive sensing capabilities of FRP composites incorporating CNT fibers

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Abstract

The present study investigates the mechanical properties and piezoresistive sensing capabilities of glass and carbon fiber-reinforced plastic (GFRP and CFRP) composites incorporating solid state spun-carbon nanotube (CNT) fibers. The FRP composite specimens were fabricated by stacking in layer-by-layer sequence in a resin matrix via vacuum infusion process. The mechanical properties were examined by tensile strength tests, while piezoresistive sensing characteristics were explored by measuring the electrical resistance change during loading. The maximum electrical resistance change rate of CNT fiber-incorporated GFRP composites was 3.15%, corresponding to a value 10 times higher than those obtained in previous studies using wet spinning method for the fabrication of CNT fibers. Moreover, continuous sensing characteristics of the CNT fiber-incorporated GFRP composite subjected to cyclic tensile loadings were verified, thereby assessing the feasibility of CNT fibers in practical applications as a piezoresistive sensor.

Keywords: Fiber-reinforced polymer composites; CNT fiber; Mechanical properties; Piezoresistive sensing

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