

Mechanical Properties of Graphene Nano-Platelets Coated Carbon-Fiber Composites

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Abstract : Carbon-fiber epoxy composites show extremely high modulus and strength in the uniaxial direction. However, they are prone to fail under low load in transverse direction due to the weak nature of the interface between the carbon-fiber and epoxy. In the current study, we have coated graphene nano-platelets (GNPs) on the carbon-fibers in an attempt to strengthen the interface/interphase between the fiber and the matrix. Vacuum Assisted Resin Transfer Moulding (VARTM) has been used to make the laminates of eight cross-woven fabrics. Tensile, flexural and fracture toughness tests have been performed on pristine carbon-fiber composite (P-CF), GNP coated carbon-fiber composite (GNP-CF) and functionalized-GNP coated carbon-fiber composite (F-GNP-CF). The tensile strength and flexural strength values are pretty similar for P-CF and GNP-CF. The micro-structural examination of the GNP coated carbon-fibers, as well as the fracture surfaces, have been carried out using scanning electron microscopy (SEM). The micrographs reveal the deposition of GNPs onto the carbon fibers in transverse and longitudinal direction. Fracture surfaces show the debonding and pull outs of the carbon fibers in P-CF and GNP-CF samples.

Keywords : carbon fiber, graphene nanoplatelets, strength, VARTM, Vacuum Assisted Resin Transfer Moulding

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