

# Thermal behaviour of graphene nanoplatelets and multiwalled carbon nanotubes filled-glass fibre-reinforced epoxy composites

## **Abstract**

The effects of thermal behaviour on graphene nanoplatelets (GP) and multiwalled carbon nanotube (CN) nanofillers of glass fibre (GL)-reinforced epoxy composites were investigated. The paper aims at evaluating, through a single and hybrid carbon-based nanofiller on the thermal stability, mechanical properties, electromechanical properties at elevated temperature, and morphologies of the composites. The nanofillers were dispersed using a mechanical stirrer, Thinky mixer, and ultrasonic probe. Hand lay-up and vacuum bagging techniques were used in the manufacturing of composites. Real-time self-monitoring of the structural damage to the specimens under tensile and flexural tests was performed through electromechanical measurements. Using the GP–CN hybrid in the composite improved the adhesion between the hybrid nanofillers and matrix. The thermal properties of GP–GL, CN–GL, and GP–CN–GL hybrid composites increased with the hybrid nanofiller addition. Mechanical testing at elevated temperatures revealed a higher rate of strength degradation for the 1.5-mass% GP–CN–GL hybrid composite than for a single nanofiller composite. The GP–CN–GL hybrid composites exhibited a more pronounced nonlinear behaviour and lower resistance.

## **Keywords**

Fibres; Graphene; Magnetic properties; Nanocomposites; Thermal analysis