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Mechanical and Damping Properties of Resin Transfer Moulded Jute-Carbon Hybrid Composites

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Abstract

Hybrid composites with carbon and natural fibres offer high modulus and strength combined with low cost and the ability to damp vibration. This study investigates carbon (CFRP), jute (NFRP) and hybrid (HFRP) fibre reinforced polymers manufactured using the resin transfer moulding process.

Tensile strength reduced with increasing injection pressure for NFRP (72.7 MPa at 4 bar, 45.5 MPa at 8 bar) and HFRP (98.4 MPa at 4 bar, 92.4 MPa at 8 bar). The tensile modulus for HFRP (15.1 GPa) was almost double that for NFRP (8.2 GPa) and one third of CFRP (44.2 GPa).

Loss factor reduced at small strains (10^{-4}) with increasing pressure for NFRP (0.0123 at 4 bar, 0.0112 at 8 bar) and HFRP (0.0048 at 4 bar, 0.0038 at 8 bar) but all were greater than CFRP (0.0024).

Increased injection pressure improved the surface properties and prevented read through of the weave pattern, NFRP (R_a = 2.15 µm at 4 bar, 1.51 µm at 8 bar) and HFRP (R_a = 1.80 µm at 4 bar, 1.42 µm at 8 bar). Hybridisation of low cost, sustainable jute with carbon fibre offers a more sustainable and economic alternative to CFRPs with excellent damping properties.

Keywords

A: Hybrid; B: internal friction/damping; D: mechanical testing; E: Resin transfer moulding.