

The effect of stacking sequence and ply orientation on the mechanical properties of pineapple leaf fibre PALF/carbon hybrid laminate composites

ABSTRACT

In this paper, the effects of stacking sequence and ply orientation on the mechanical properties of pineapple leaf fibre (PALF)/carbon hybrid laminate composites were investigated. The hybrid laminates were fabricated using a vacuum infusion technique in which the stacking sequences and ply orientations were varied, which were divided into the categories of cross-ply symmetric, angle-ply symmetric, and symmetric quasi-isotropic. The results of tensile and flexural tests showed that the laminate with interior carbon plies and ply orientation $[0^\circ, 90^\circ]$ exhibited the highest tensile strength (187.67 MPa) and modulus (5.23 GPa). However, the highest flexural strength (289.46 MPa) and modulus (4.82 GPa) were recorded for the laminate with exterior carbon plies and the same ply orientation. The fracture behaviour of the laminates was determined by using scanning electron microscopy, and the results showed that failure usually initiated at the weakest PALF layer. The failure modes included fibre pull-out, fibre breaking, matrix crack, debonding and delamination.

Keyword: PALF; Carbon fibre; Hybrid composite; Tensile properties; Flexural properties