

Effect of freezing temperature and stacking sequence on the mechanical properties of hybrid fibre metal laminates made with carbon, flax, and sugar palm fibres

ABSTRACT

Fibre metal laminates (FML) were reinforced with flax and sugar palm fibres in different stacking sequences and exposed to freezing conditions. The effects on the mechanical properties were explored. Both the stacking sequence and freezing condition affected the mechanical properties. The FML with flax fibres showed the highest strength and modulus under tension and bending, while the FML with sugar palm fibres showed the lowest strength and modulus. The FML with flax fibres experienced a fibre bridging effect and showed promising behaviour for aircraft applications by sustaining nearly 40000 cycles of fatigue load. Decreases in the strength, modulus, and fatigue life occurred when the FML specimens were exposed to freezing conditions. Micrographs from the tensile fractured specimens indicated delamination, fibre splitting, fibre breakage, and fibre/matrix de-bonding as the failure pattern for the pristine and conditioned laminates.

Keyword: Fibre metal laminate; Flax; Sugar palm; Freezing temperature; Mechanical properties; Fatigue life