

Mechanical and moisture diffusion behaviour of hybrid Kevlar/Cocos nucifera sheath reinforced epoxy composites

ABSTRACT

The aim of this research is partial replacement of plain woven Kevlar 29(K) with naturally woven cocous nucifera sheath (CS) waste. Laminated K/CS reinforced epoxy hybrid composites were fabricated by hand lay-up method followed by hot compression moulding with 105 °C temperature at 275 bar pressure for 1 h. The total fibre loading of the hybrid composite was maintained 45 wt.% and the ratio of Kevlar and Cocous nucifera sheath varies in weight fraction of 100/0, 75/25, 50/50, 25/75, and 0/100. Mechanical (tensile, flexural, impact), moisture diffusion and morphological behaviour of the laminated composites were evaluated. The results showed that the hybrid composites (75/25) declined the tensile strength by 19% compared to Kevlar fabric reinforced epoxy composites. But, the hybrid composites (75/25) exhibited highest flexural strength (175 MPa) and flexural modulus (18 GPa) than pure Kevlar reinforced epoxy composites. Moreover, the impact toughness of hybrid composites (86 kJ/m²) at 75/25 wt.% showed good agreement with the pure Kevlar fabric reinforced polymer composites (90 kJ/m²). From the moisture diffusion analysis, hybrid composites (75/25) exhibited better moisture resistance. Statistical analysis of the results has been carried out using one way-ANOVA (analysis of variance) and it shows that there is a statically significant difference between the obtained mechanical properties of the laminated composites. Morphology of the tensile fractured laminates showed the delamination's, matrix cracking and fibre/matrix adhesion. From the results, it has been concluded that naturally woven Cocos nucifera sheath has the potential to replace Kevlar fabric in the polymer composites exclusively for defence applications.

Keyword: Hybrid composites; Laminated composites; Kevlar fibre; Cocos nucifera sheath; ANOVA