Effects of layering sequence and gamma radiation on mechanical properties and morphology of Kevlar/oil palm EFB/epoxy hybrid composites

ABSTRACT

The present study evaluates the tensile and flexural properties, including the morphological features of gamma radiated Kevlar/oil palm empty fruit bunch (EFB)/epoxy hybrid composites fabricated using hand lay-up method with different layering sequences. The fabricated hybrid composites were exposed to different gamma radiation doses: 25 kGy, 50 kGy and 150 kGy. Mechanical (tensile and flexural) and morphological properties were evaluated by using universal testing machine and scanning electron microscopy, respectively. Results obtained indicated that tensile strength of hybrid composites were effected by layering sequence. The layering sequence involving the use of EFB as core material yielded better mechanical performance compared to the layering pattern when Kevlar served as the core material. The tensile and flexural properties of hybrid composites showed an improvement for irradiated samples at a low radiation level. Hybrid composites displayed decrease in tensile strength at 50 kGy whereas flexural strength still showed an improvement. However, at 150 kGy, the tensile and flexural properties exhibited significant degradation. FESEM of tensile fracture composites showed the exist of fibre pull out and voids. However, at 150 kV bigger and ruptured voids were observed. It can be concluded from this finding that mechanical performance of Kevlar/EFB/Kevlar hybrid composites after Gamma radiation, has made it as promising material for automotive, aerospace and construction applications.

Keyword: Oil palm; Kevlar fabric; Tensile strength; Flexural properties; Morphological features; Gamma radiation