

Effects of kenaf fiber orientation on mechanical properties and fatigue life of glass/kenaf hybrid composites

ABSTRACT

The objectives of this work were to investigate the effect of kenaf fiber alignment on the mechanical and fatigue properties of kenaf/glass hybrid sandwich composites. Three types of kenaf fibers were used, namely, non-woven random mat, unidirectional twisted yarn, and plain-woven kenaf. A symmetric sandwich configuration was constructed with glass as the shell and kenaf as the core with a constant kenaf/glass weight ratio of 30/70% and a volume fraction of 35%. Tensile, compression, flexural, and fully reversed fatigue tests were conducted, and a morphological study of the tensile failure surface of each hybrid composite was carried out. The non-woven mat kenaf hybrid had poor properties for all tests, while the unidirectional kenaf hybrid composite possessed higher tensile strength and similar compressive properties compared with the woven kenaf. Hybridization with kenaf fibers improved the fatigue degradation coefficient of the final composites to 6.2% and 6.4% for woven and unidirectional kenaf, respectively, compared with 7.9% for non-woven. Because woven kenaf hybrid composite is lightweight, environment friendly, and has a considerable balance in static and fatigue strengths with low fatigue sensitivity in bidirectional planes compared to glass, it is strongly recommended for structural applications.

Keyword: Glass; Woven; Non-woven; Unidirectional kenaf; Natural fibers; Hybrid composites; Mechanical properties