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Processing and Evaluation of Jute Fiber Reinforced Hybrid Composites

Authors : Mohammad W. Dewan, Jahangir Alam, Khurshida Sharmin

Abstract : Synthetic fibers (carbon, glass, aramid, etc.) are generally utilized to make composite materials for better mechanical and thermal properties. However, they are expensive and non-biodegradable. In the perspective of Bangladesh, jute fibers are available, inexpensive, and comprising good mechanical properties. The improved properties (i.e., low cost, low density, eco-friendly) of natural fibers have made them a promising reinforcement in hybrid composites without sacrificing mechanical properties. In this study, jute and e-glass fiber reinforced hybrid composite materials are fabricated utilizing hand lay-up followed by a compression molding technique. Room temperature cured two-part epoxy resin is used as a matrix. Approximate 6-7 mm thick composite panels are fabricated utilizing 17 layers of woven glass and jute fibers with different fiber layering sequences- only jute, only glass, glass, and jute alternatively (g/j/g/j---) and 4 glass - 9 jute – 4 glass (4g-9j-4g). The fabricated composite panels are analyzed through fiber volume calculation, tensile test, bending test, and water absorption test. The hybridization of jute and glass fiber results in better tensile, bending, and water absorption properties than only jute fiber-reinforced composites, but inferior properties as compared to only glass fiber reinforced composites. Among different fiber layering sequences, 4g-9j-4g fibers layering sequence resulted in better tensile, bending, and water absorption properties. The effect of chemical treatment on the woven jute fiber and chopped glass microfiber infusion are also investigated in this study. Chemically treated jute fiber and 2 wt. % chopped glass microfiber infused hybrid composite shows about 12% improvements in flexural strength as compared to untreated and no micro-fiber infused hybrid composite panel. However, fiber chemical treatment and micro-filler do not have a significant effect on tensile strength.

Keywords : compression molding, chemical treatment, hybrid composites, mechanical properties
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