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Fabrication and Mechanical Characterization of Sugarcane Bagasse Fiber-Reinforced Polypropylene Based Composites: Effect of Gamma Radiation

Authors : Kamrun N. Keya, Nasrin A. Kona, Ruhul A. Khan

Abstract : Sugarcane bagasse (SCB)-reinforced Polypropylene (PP) Based matrix composites (25-45 wt% fiber) were fabricated by a compression molding technique. The SCB surface was chemically modified using 5%-10% sodium hydroxide (NaOH), and after that, mechanical properties, water uptake, and soil degradation of the composites were investigated. Tensile strength (TS), tensile modulus (TM), bending strength (BS), bending modulus (BM) and elongation at break (Eb%) of the 30wt% composites were found to be 35.6 MPa, 10.2 GPa, 56 MPa, 5.6 GPa, and 11%, respectively. The SCB/PP based composites were treated with irradiated under gamma radiation (the source strength 50 kCi Cobalt-60) of various doses (2.5 kGy to 10 kGy). The effect of gamma radiation on the composites was also investigated, and it found that the effect of 5.0 kGy (i.e. units for radiation measurement is 'gray', kGy=kilogray) gamma dose showed better mechanical properties than other doses. The results revealed that the combination of the chemical modification of the SCB fibers and irradiation of the composites were more effective in compatibility improvement than chemical modification alone. After flexural testing, fracture sides of the untreated and treated both composites were studied by scanning electron microscope (SEM). SEM results of the treated SCB/PP based composites showed better fiber-matrix adhesion than untreated SCB/PP based composites. However, it was found that the treated SCB/PP composite has better mechanical strength, durability, and more receptivity than untreated SCB/PP based composite.

Keywords : sugarcane bagasse (SCB), polypropylene (PP), mechanical properties, scanning electron microscope (SEM), gamma radiation, water uptake tests and soil degradation
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