Springer

Volume Part IV, 2013, Pages 509-516

Experimental and Numerical Study of Polypropylene Composite Reinforced with Jute Fibers

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Abstract: This paper is devoted to the study of the mechanical response of polypropylene (PP) thermoplastic composite reinforced with jute fibers. In order to use these composites in structural applications it is necessary to understand the mechanisms governing their mechanical behavior and damage. For this purpose, we have fabricated two kinds of PP/jute laminates: [0°/90°]2S and [+45/-45°]2S with the fibers direction, using the molding technique under compression. The mechanical properties of the material are then characterized by tensile and compressive tests. The numerical part of this work concerns the incorporation of the Matzenmiller, Lubliner, and Taylor (MLT) damage model to take into account the post-elastic-peak and the post-peak strain softening responses observed in the PP/jute composite. This is possible by using formulation with two criterions. The 3D constitutive law has been implemented into the finite code Abaqus using an explicit scheme. In order to assess the capability of this model to describe the material behavior, comparisons are made between numerical and experimental results. Excellent agreements are found between numerical predictions and experimental observations. The model also captures correctly the zones where damage occurs in the two kinds of laminates.

Keywords : PP/jute, mechanical behavior, damage, laminate, modeling