

Investigating morphological and performance deterioration of injection-molded rice husk–polypropylene composites due to various liquid uptakes

ABSTRACT

Systematic investigations for the tensile strengths, tensile moduli, flexural strengths, flexural moduli, and impact strengths of various reinforced conditions of rice husk/polypropylene composites under the effect of different liquids uptakes were carried out. Three different liquids, i.e., lubricant oil, sea water, and distilled water, were utilized in this work to investigate their effects on the composites' mechanical performance. Moreover, morphological analysis of the designed composites was also carried out. Various fiber loadings at 35, 40, 45, 50, and 55 wt% have been designed and investigated. The rice husk/polypropylene composites have been prepared by injection molding, and Struktol was used as an additive. The composites were immersed in three different liquids: lubricant oil, sea water, and distilled water for 4 weeks. The water uptake of rice husk/polypropylene composites for distilled water was the highest compared to lubricant oil and sea water. Moreover, results have demonstrated that mechanical properties of composites immersed in sea water were the best, followed by those immersed in lubricant oil, and then those immersed in distilled water. In addition, it was observed that more voids and pull-out existed in composites immersed in lubricant oil, followed by those immersed in distilled water, and then those immersed in sea water. Tensile moduli showed a reduction trend for all composites with increasing filler loading. However, flexural moduli improved as the filler loading increased. Also, results here demonstrated an optimum filler loading condition for each particular mechanical property of rice husk/polypropylene composites.

Keyword: Bio-composites; Liquid absorption; Mechanical properties; Polypropylene; Rice husk