

Development of New Eco-Composites From Natural Agro-Residues and Recycled Polymers

Abstract

plastic composite materials have shown a remarkable performance in various applications due to its inherent properties like strength, durability, and lightweight over conventional composite materials. However, utilization of wood as an organic filler for polymers poses a serious negative impact to the green areas. Therefore, utilization of agro-residues as organic fillers instead of wood offers a sustainable solution to the aforementioned problem. In this context, this study aims to investigate the potential use of date palm pedicel agro-residues as natural fillers in eco-composites in which recycled post-consumer polypropylene is used as a matrix. Three levels of date palm flour content, namely, 10 v.%, 20 v.% and 30 v.% are used. The influence of the date palm pedicels flour content on the mechanical, physical and thermal behavior of the developed eco-composites is examined. Material properties of the fabricated eco-composites are characterized experimentally according to ASTM standards. Thermogravimetric analysis (TGA) is also performed to assess the thermal decomposition of the developed composites. Moreover, the morphology of fractured regions is captured using Scanning Electron Microscope (SEM). Generally, adding natural fillers to the polymer matrix is a cost effective option. However, it also slightly affects tensile strength, elongation, and flexural strength at break and enhance the Young's modulus compared to the neat polypropylene. Interestingly, it is observed that the recycled polypropylene based composites are more repellent to water absorption in comparison to the virgin polypropylene-based composites. This attribute might be due to the surface quality transformation for the reprocessed plastic polymer.