

Characterization of Ultrasound-Treated Oil Palm Empty Fruit Bunch-Glass Fiber-Recycled Polypropylene Hybrid Composites

Muhammad R. Islam, Makson Rivai Arun Gupta, Mohammad Dalour H. Beg

Faculty of Chemical and Natural Resources Engineering, Univerisiti Malaysia Pahang, Lebuhraya Tun Razak, Gambang-26300, Kuantan, Malaysia

ABSTRACT

Glass fiber (GF) and ultrasound-treated oil palm empty fruit bunch (EFB) were used to prepare recycled polypropylene (RPP)-based hybrid composites through the extrusion and injection molding technique. The ultrasound technique was used to remove the lignin and other surface impurities from the EFB fiber by varying the treatment conditions (treatment time and temperature). A fixed concentration (10%) of NaOH solution was used as the treatment medium. Fiber loading was considered as 40%, while EFB and GF ratio was maintained as 70:30. Two types of coupling agents of maleic anhydride grafted PP (MAPP), Polybond and Fusabond, were used, each of an amount 2.5% (of the total fiber content), to improve the interfacial adhesion between fibers and matrix. Composites were characterized through density, melt flow index (MFI), tensile, flexural and Izod impact testing. In addition, thermogravimetric analysis (TGA), differential scanning calorimetry (DSC) and scanning electron microscopy (SEM) were also performed to evaluate the thermal and morphological properties, respectively. X-ray diffraction (XRD) analysis was performed to evaluate the crystalline structure of the samples. Finally, water uptake (WU) measurement was performed for 180 days of soaking period. Result analyses revealed improved mechanical, thermal and crystalline properties, with reduced WU as the outcome of treatment and coupling agent effects.

KEYWORDS: glass fibers; hybridization; oil palm fibers; polymer-matrix composites (PMCs); ultrasonics

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