

Characterization of Microwave-Treated Oil Palm Empty Fruit Bunch/Glass Fibre/Polypropylene Composites

MR Islam, A Gupta, M Rivai, MDH Beg

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

ABSTRACT

Composites were prepared from recycled polypropylene (RPP), oil palm empty fruit bunch (EFB) and/or glass fibre (GF) using extrusion and injection moulding techniques. Two types of maleic anhydride-grafted polypropylene such as Polybond 3200 and Fusabond P 613 were used to improve the interfacial adhesion between fibres and matrix. The EFB: GF ratio was fixed as 70:30 and fibre loading was considered as 40 wt%. Microwave was used to treat the EFB fibre, which was soaked in a fixed mass concentration (12.5%) of alkali solution at different temperatures (70, 80 and 90°C) for a fixed period of time (60 min) and for different times (60, 90 and 120 min) at a fixed temperature (90°C). A magnetron controller was developed to control the time and temperature accurately for the treatment of fibre. Various characterization techniques such as density, melt flow index, tensile, Izod impact, flexural, field-emission scanning electron microscopy and water uptake testing were performed for the composites. Besides, thermogravimetric analysis and differential scanning calorimetry were also used to evaluate the thermal and crystalline properties of the composites, respectively. Result analyses revealed that microwave-treated fibre-based composites showed improved mechanical and thermal properties. EFB fibres treated at 90°C for 90 min were found to be suitable for better reinforcement into the composite in terms of mechanical, thermal and crystalline properties. Moreover, onset degradation temperature and water absorption properties were also found to be changed apparently due to treatment.

DOI: 10.1177/0892705715614078