

Effects of Fiber-Surface Treatment On The Properties Of Hybrid Composites Prepared From Oil Palm Empty Fruit Bunch Fibers, Glass Fibers, And Recycled Polypropylene

Muhammad Remanul Islam^a, Arun Gupta^a, Makson Rivai^a, Mohammad Dalour Hossen Beg^a, Md. Forhad Mina^b

^aFaculty of Chemical and Natural Resources Engineering, Univerisiti Malaysia Pahang, Gambang, Kuantan, Malaysia

^bDepartment of Physics, Bangladesh University of Engineering and Technology, Dhaka, Bangladesh

ABSTRACT

In this article, we report the effects of hybridization and fiber-surface modification on the properties of hybrid composites prepared from recycled polypropylene (RPP), coupling agents, oil palm empty fruit bunch (EFB), and glass fibers through a twin-screw extruder and an injection-molding machine. The surface of the EFB fibers was modified with different concentrations (10–15 wt %) and temperatures (60–90°C) of alkali solutions. The structure and morphology of the fibers were observed with the help of Fourier transform infrared spectroscopy and scanning electron microscopy. Different types of composites were fabricated with untreated, alkali-treated, and heat-alkali-treated fibers. Comparative analysis of the mechanical, structural, morphological, and thermal properties of the composites was carried out to reveal the effects of treatment and hybridization. The analysis results reveal that composites prepared from the alkali-treated (in the presence of heat) fibers show improved mechanical, thermal, and morphological properties with a remarkably reduced water absorption. Additionally, the crystallinity of RPP also increased with the development of biaxial crystals. The improvement of various properties in relation to the structures and morphologies of the composites is discussed.

KEYWORDS: composites; crystallization; fibers; thermogravimetric analysis (TGA); thermoplastics

DOI: 10.1002/app.43049