Mechanical properties and fracture morphological observation of recycled polypropylene (*rPP*) filled dried banana leaves fibre (DBLF) composites : effects of sodium hydroxide (NaOH) surface treatment

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ABSTRACT

Disposal of after-used plastic based product has created worldwide problems on environmental pollution. This scenario has initiated the inventiveness to develop eco-friendly bio composites products. In this research, recycled waste polypropylene (*rPP*) was loaded with dried banana leaves fibre (DBLF), for *rPP*/DBLF composites fabrication. The effects of sodium hydroxide (NaOH) treatment on DBLF has studied based on the resulted mechanical and fracture morphological properties of produced rPP/DBLF composites. Dried banana leaves have been grounded into 30 µm of fibre length, and *rPP* was taken from injection moulding scrap and crushed into finer *rPP* particles. The *rPP*/DBLF composites are prepared through double steps compounding method by using a melting device (230 °C, 95 rpm, 60 min) followed by an injection moulding process (210 °C, 30 s of residence time) for various amount of treated and untreated DBLF fibre loading at 0, 10, 20, 30 and 40 wt%. It was found that the tensile strength (TS) of treated NaOH-*rPP*/DBLF composite has significantly increased into about + 45.20% with 30 wt% of DBLF-NaOH loadings, in comparison to unfilled *rPP* sample. Loading of NaOH treated DBLF into *rPP* was enhanced the strength result which indicates successful reinforcement effects introduced by DBLF-NaOH filler. This could be explained by finer DBLF particle morphology as observed by SEM and presence of OH group from the successful NaOH treatment, which responsibly encouraged the mechanical interlocking and chemical bridging with *rPP,* for improved matrix-filler interaction, that significantly increased the TS. In overall, this study has successfully highlighted the potential of DBLF filler to enhance the properties of *rPP*, as an additional choice of degradable plastic based composite for various promising applications.

KEYWORDS

rPP; DBLF; Degradable plastics; Tensile; Fracture surfaces; NaOH; Surface treatment

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