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MECHANICAL AND MORPHOLOGICAL PROPERTIES OF CELLULOSE-REINFORCED THERMOPLASTIC COMPOSITES: EFFECT OF RECYCLING

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Abstract

In this study, the effect of low microcrystalline cellulose (MCC) content on the mechanical properties of polypropylene (PP) composites when recycled was investigated. The PP/MCC composites were recycled six consecutive times using an injection moulding (IM) machine. Then, the mechanical properties of the composites were examined using tensile and impact testing, Fourier transform infrared (FTIR) spectroscopy, and scanning electron microscopy (SEM). All the mechanical properties of PP/MCC composites, especially the tensile strength (TS), were improved irrespective of recycling rounds. The modulus and impact resistance of the composites were differed slightly after two and four rounds of recycling. The low fibre content and micron-sized fibres did not significantly change the fibre aspect ratio after multiple rounds of recycling. The fracture surface analysis using SEM also reveals that after multiple rounds of recycling, the composites have better cellulose fibre dispersion and good interfacial fibre-matrix adhesion. The results show that the PP composites with low MCC content have good mechanical behaviour. Therefore, recycling PP composites can reduce plastic waste and preserve the environment as well as generate new economic opportunities. © School of Engineering, Taylor's University.

Author Keywords

Cellulose; Coupling agent; Polypropylene; Recycling; Surface adhesion

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