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Effects of natural weathering on properties of recycled newspaper-filled polypropylene (PP)/natural rubber (NR) composites

Abstract

Natural weathering has been applied to investigate the properties of recycled newspaper (RNP)-filled polypropylene (PP)/natural rubber (NR) composites. Three sizes of RNP (11 mm, 23 mm, and 53 mm) were used in this study. These composites were subjected to natural weathering conditions; i.e, tropical climate in Penang, Malaysia, for 3 and 6 months. Different techniques including mechanical tests, Fourier transform infrared spectrometry (FTIR), differential scanning calorimetry (DSC), and scanning electron microscopy (SEM) were used in order to obtain a comprehensive view of degradation occurring during the natural weathering of the composites. Results of mechanical tests show that an increasing content of RNP in composites decreased the tensile strength and elongation at break (EB), while increasing the Young's modulus after exposure of 3 and 6 months. Scanning electron microscopy on surfaces after weathering shows that the filler was poorly wetted by the matrix. This explains the reduction in tensile strength and elongation at break after weathering. The Fourier transform infrared spectrometry results on the composites after exposure to natural weathering indicate the presence of carbonyl, vinyl, and hydroxyl groups, which formed from various chemical reactions taking place during weathering.

Keywords — Composites, natural rubber, natural weathering, polypropylene, recycled newspaper.