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Polypropylene/organically modified Sabah montmorillonite nanocomposites: Surface modification and nanocomposites characterization

Abstract

The aim of the work is to extract, purify, and organically modify montmorillonite (MMT) of Lahad Datu, Sabah bentonite. The octadecylamine treated Sabah MMT (S-OMMT) (2-8 wt%) was then melt blended with polypropylene (PP) and maleated polypropylene (PPgMAH) (10 wt%) via single screw nanomixer extruder followed by injection molding into test samples to examine the mechanical, thermal, and morphological properties of PP/S-OMMT nanocomposites. Unmodified Sabah MMT (S-MMT) and commercial grade MMT (Nanomer 1.30P) filled PP nanocomposites were also characterized for comparison purpose. X-ray diffraction results showed that the interlayer spacing of S-MMT increased after organic modification as Fourier transform infra-red and elemental analysis evidenced the presence of octadecylamine. PP/S-OMMT nanocomposites showed a better dispersion and strength compared to PP/Nanomer 1.30P nanocomposites due to its smaller MMT platelet size. differential scanning calorimetry and Thermogravimetry analysis revealed that the thermal stability and crystallinity of neat PP improved with the addition of all types of MMT. Dynamic mechanical analyzer showed that PP nanocomposites have higher storage modulus (E') values than the neat PP over the whole temperature range. The new PP/S-OMMT nanocomposites showed a comparable performance with PP/Nanomer 1.30P nanocomposites exhibiting promising future applications of S-MMT in polymer/MMT nanocomposites.

Keywords — Commercial grade, crystallinities, maleated polypropylenes, montmorillonite nanocomposites, morphological properties