EFFECT OF ORGANOCLAY SURFACE COVERAGE ON POLYMER CLAY NANOCOMPOSITES FORMATION

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ABSTRACT

In polymer clay nanocomposite formations by a two-roll mill and twin screw extruder, the adsorption behaviors of surfactant onto clay surface, and the relationship between surface coverage of surfactant and clay dispersion in matrix polymer were investigated by differential thermogravimetry (DTG), contact angle measurement, thermogravimetric analysis (TGA), X-ray diffraction (XRD), scanning electron microscopy (SEM), transmission electron microscopy (TEM), and tensile test etc.

The first system was based on synthesized organoclay with various degrees of surfactant (S18) adsorption. The adsorption behaviors of surfactant (S18) onto clay platelets were divided into three distinct stages. At the third stage of adsorption of surfactant (15mM of S18 loading), the wettability of clay platelets was improved in polypethylene-clay nanocomposites compounded by a two-roll mill, although a submicronmeter size agglomerate was detected. The intercalate-exfoliated was found in the medium coverage organoclay, and a conventional composite was found in the high coverage organoclay. The highest ultimate tensile strength was exhibited by the addition of oxidized polyethylene wax (OWax), where the organoclay can achieve a higher degree of dispersion in the polymeric matrix.

Commercially available clay platelets with different degrees of surface coverage (low; LC, medium; MC, and high; HC) were prepared at polymer clay nanocomposite formations by a twin screw extruder with polypropylene and high density polyethylene with the co-intercalant. Critical surface energy (CSE) greatly depends on the degree of surface coverage of surfactant. Intercalation of compatibilizers and polymer into interlayer of LC and MC was observed on XRD. However, HC did not exhibit intercalation and exfoliation in pre-dispersed organoclay and nanocomposites.

KEY WORDS: BENTONITE / NANOCOMPOSITES / ORGANOCLAY / POLYETHYLENE / POLYPROPYLENE

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