Poly (ethylene terephthalate) Nanocomposites Based On Turkish Organo-bentonites Treated with Thermally Stable Phosphonium and Imidazolium Salts

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Purification of bentonite clays mined from Resadiye (Turkey) and their modification with two phosphonium and two imidazolium organic salts were investigated. The organo-bentonites were subsequently melt compounded with Amorphous Poly (ethylene terephthalate), with and without the use of an elastomeric compatibilizer. The thermal stability, morphology and mechanical properties of the binary and ternary nanocomposites were studied. Purification of bentonite clays mined from Resadiye (Turkey) and their modification with two phosphonium and two imidazolium organic salts were investigated. The organo-bentonites were subsequently melt compounded with amorphous Poly (ethylene terephthalate), with and without the use of an elastomeric compatibilizer. The thermal stability, morphology and mechanical properties of the binary and ternary nanocomposites were studied. The onset decomposition temperature (5 %wt. loss) of the unpurified clay and purified clay were determined as 666°C and 769°C respectively. Inorganic minerals present in the raw clays were removed upon purification, and the clay cation exchange capacity was increased. The phosphonium and imidazolium treated organo-bentonites exhibited maximum onset decomposition temperature of 380°C and 454°C, respectively. The onset decomposition temperature of pure PET was measured as 400°C. Upon compounding PET with phosphonium and imidazolium salts, the onset decomposition temperature increased to a maximum value of 408°C and 411°C, respectively. The basal spacing of the purified bentonite is 1.1 nm, and those of the two phosphonium organo-bentonites used were measured as 2.6 nm and 1.8 nm. The interlayer spacing of the imidazolium-bentonites was between 1.34 nm and 1.43 nm indicating a more compact structure. These interlayer spacings did not change significantly upon compounding with PET. The tensile strength and Young's modulus of pure PET were 47 MPa and 1750 MPa respectively. The tensile strength and Young's modulus reached a maximum of 57.8 MPa and 2064 MPa respectively for binary imidazolium-nanocomposites with organo-bentonites only, and 53 MPa and 1810 MPa for ternary nanocomposites with organo-bentonites and e