Reduced Shrinkage Polyester by using Montmorillonite Nano composite

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ABSTRACT

Fiber-reinforced polymer composites are becoming a major player in advanced material technologies.

Unsaturated Polyester (UP) resin is widely used for many applications such as reinforced plastic (FRP) and polymer composites. However, these materials suffer from their low mechanical and thermal properties. For enhancing their performance, researchers have used montmorillonite (MMT) for manufacturing of unsaturated polyester montmorillonite (UP-MMT) nanocomposite synthesized by dispersing the UP resin into the silicate layers of MMT. The MMT has been modified ammonium quaternary as organic cation (OMMT). A new approach is described for utilizing the swelling characteristics of montmorillonite (MMT) to compensate for polymerization-induced shrinkage in unsaturated polyester. The naturally sorbed sodium cation, at the lamellar interface of the mineral, was exchanged with the onium salt of 12-aminolauric acid to produce organophilic MMT, which was compatible with the host resin. The latter, boosted by a small amount of dimethylformamide, swelled into a polymerizing polyester resin, thus reducing polymerization shrinkage.

Unsaturated polyester resin /organo modified montmorillonite (OMMT) nanocomposites were prepared by in-situ polymerization method due to organic modified montmorillonite into unsaturated polyester to form an advanced montmorillonite / unsaturated polyester (MMT /UP) nanocomposites. Using of the blasting force generated in situ polymerization patterns show the formation of clay layers is exfoliation structure in polymer and improving of mechanical properties. The d-spacing of organic modified clay could be determined whether the modifier was intercalated into the gallery of clay by applying the wide-angle X-ray diffraction (WXRD). The dispersion morphologies of MMT / UP nanocomposites were characterized by the wide-angle X-ray diffraction (WXRD) and transmission electron microscopy (TEM).

Test results, supported by mechanical testing, X-ray diffraction, and microscopy. Indicated that the mechanical properties of unsaturated polyester with OMMT nanocomposite (UP/OMMT) are better than those of pure UP.