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Organoclay – Polyester nanocomposites: Structure-property relationship between organic additives to the clay and mechanical properties of the composites

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The organoclays with variety of quaternary ammonium substituents (QAS) were successfully synthesized and studied for their hydrophilic/hydrophobic behavior. These organic surfactants get accommodated in the inter-layer galleries of clay via cation exchange process. Modified clays were used as filler in unsaturated polyester (UPE) resin to yield organoclay nano-composites with altered mechanical properties. The organoclay-BQASMMT18 (octadecyldimethylbenzylammonium bromide modified montmorillonite) with only 3 wt% in the UPE enhanced tensile strength, tensile modulus, flexural strength and elongation at break by the order of 4.6, 2.4, 2 and 2.4, respectively, compared to the same properties of pristine UPE. The tensile strength and hardness of the UPE-organoclay nanocomposites was increased with increase in organoclay content in the nanocomposites. However, the tensile and flexural strength decreased with increased loading of BQASMMT18 from 3% to 5 wt% due to increased non-uniformity in dispersibility of organoclay in polymer matrix. Moreover, dispersibility of hydrophobic organoclays in UPE nanocomposite is higher when compared to that of hydrophilic and pristine clay. In summary, the hydrophilic or hydrophobic character of the organically modified clay significantly affected its dispersion in the polymer matrix, which in turn affected the mechanical properties of the resultant nanocomposites.

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