

Effect of Monomers on Basal Spacing of Sodium montmorillonite and Structures of Polymer/sodium montmorillonite Nanocomposites

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Abstract: The basal spacings of sodium montmorillonite (Na-MMT) dispersed in various solvents and monomers were measured via X-ray diffraction. Some liquids with strong hydrogen bonding(δ_h) groups showed little suspended Na-MMT, but liquids with medium or weak hydrogen bonding groups precipitated Na-MMT completely, this indicates that hydrogen component is an important factor for the dispersion state of natural Na-MMT in a liquid. The basal spacing expansion also depends on polar components (δ_p) and hydrogen bonding components (δ_h) of organic materials. Materials with high δ_h values showed expansion in the order of MeOH>EtOH>IPA>hexane>toluene>benzene, and monomers with high δ_p values exhibited expansion in the following order of BA>AN>MMA>ST. Since dipole-dipole interactions involved both δ_h and δ_p , liquid dipole moments were adopted to explain the expansion of Na-MMT in polymer/Na-MMT nanocomposites. Monomers with high dipole moments showed large basal spacings before polymerization and produced exfoliated polymer/Na-MMT nanocomposites, whereas those with low dipole moments showed smaller basal spacings and produced intercalated polymer/Na-MMT nanocomposites.