MULTI-PHASE MATRIX NANNOCOMPOSITES: COMPLEX EFFECT OF INORGANIC NANOPLATELETS ON BEHAVIOUR

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Abstract

Polymer nanocomposites containing well dispersed layered nanofiller represent new class of unique lightweight materials by combining the flexibility of polymers with the high modulus inorganic component bringing many synergetic effects, e.g., significantly enhanced inflammability. At the same time, the high surface area offers significant structure-directing potential for multiphase polymer systems. In blends of immiscible thermoplastics clay influences dynamic phase behaviour, the compatibilizing effect is affected predominantly by clay localization and degree of its dispersion. Moreover, clay may also influence morphology of dispersed inclusions by formation of complex structures. We present a study of PA 6 and PET nanocomposites containing polymeric impact modifiers with clay-refined dimensions of elastomeric inclusions and core-shell structure. The mechanisms leading to the formation of structures consisting of polymeric core and outer shell formed by stacks of clay platelets, are discussed. Due to enhanced toughening efficiency of these complex particles and simultaneous influencing of polymer constituents parameters by dispersed clay, well balanced mechanical behaviour can be achieved. In analogous epoxy nanocomposites, complex effect of clay on structure and mechanical behaviour consist of influencing phase separation of initially dissolved polymeric modifiers in the course of curing by influencing of reaction kinetics, nucleation of phase separation, diffusion/viscosity and of component compatibility. The corresponding mechanical properties indicate that suitable nanofiller-polymer combination may lead to upgrading of epoxy systems. Best results were found in case of some complex (blended) organic inorganic structures formation and applicaton of clay-polymer adduct forming self assembled lamellar structures.