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Poly(ethylene-oxide)/clay/silica nanocomposites: Morphology and thermomechanical properties ENGIN BURGAZ, Materials Sci. and Eng., Ondokuz Mayis Univ. Samsun, Turkey — Poly(ethylene oxide) PEO/clay/silica nanocomposites were prepared via solution intercalation by exploiting phase separation based on the bridging of particles by polymer chains. The intercalated morphology of nanocomposites was confirmed by XRD. Vibrational modes of the ether oxygen of PEO in the hybrids are shifted due to the coordination of the ether oxygen with the sodium cations of clay and the H-bonding interactions of the ether oxygen with the surface silanols of hydrophilic fumed silica. Based on SEM, the overall density of nanoparticle aggregates in the interspherulitic region was observed to be higher compared to that inside spherulites. PEO/clay/silica hybrids show significant property improvements compared to PEO/clay hybrids and pure PEO. The system containing 10 wt.% clay and 5 wt.% silica has substantially higher modulus and much lower crystallinity compared to the 15 wt.% clay system. The physics behind the reinforcement effect and the reduction of crystallinity as a function of fumed silica loading is discussed based on the morphological characterization of the hybrids. Lastly, PEO/clay/silica hybrids display good thermal stability and are much stiffer compared to pure PEO and PEO/clay nanocomposites.

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