

Synthesis of Nano Composite of Polyurethane-Epoxy Interpenetrating Polymer Networks and Investigation of Mechanical, Morphological and Thermal Properties

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Interpenetrating polymer networks (IPNs) are special polymer blends consisting of at least two polymers in a network, which is held together by permanent entanglement that have synergetic effect induced by the forced compatibility of the individual components. Polyurethane-Epoxy interpenetrating polymer networks(IPN) was prepared by simultaneous method as explained and after the formation of IPN was proved by Fourier Transform Infrared Spectroscopy (FT-IR) and Differential Scanning Calorimetric (DSC), different weight ratios of Polyurethane-Epoxy(PU-EP) were investigated by mechanical, morphological and thermal experiments. Results of mechanical experiments showed that PU-EP IPN in 25/75 weight ratio has the most tensile strength and elongation at break in comparing with other weight ratios. It is an evidence for better penetration of two phases and more compatibility between them. In other hand Scanning Electron Microscopy (SEM) that used to study morphological properties of samples of different weight ratio IPNs indicated a finely dispersion of Polyurethane phase in Epoxy matrix, also it's fracture surface consisted of fine crazes that was observed beside shear yielding mechanism. Thermal Gravimetric Analysis (TGA) were used to observe thermal resistance of prepared IPNs. The most degradation temperature was related to 25/75 PU-EP IPN. Synthesis of nano composite of PU-EP were done in a similar manner and the effect of adding 1,3,5 wt% of closite 30B were studied by mechanical, morphological , thermal an X-Ray Diffraction (XRD) analysis. Exfoliated structure were found by addition of 1 wt% closite 30B while intercalated and agglomerated structure were obtained by using 3 wt% and 5 wt%. More toughness of IPN 1(1 wt% of closite 30B in IPN) was the result of better dispersion and miscibility of final system that arises from the formation of hydrogen banding between polymer chain and closite 30B and higher cross linking density. These observations were acc