

Multicomponent Polymeric Materials by High-Shear-Processing: from Macro to Nano

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A growing fraction of plastic resins produced today are multi-components polymer systems, namely, polymer blends of two or more polymers and polymer composites with inorganic fillers dispersed in a polymer matrix. The compounding of different polymers and/or inorganic fillers in a polymer presents the possibility of enhancing the overall properties of a material through the synergistic combination of the desirable properties of each component in one system. However, most commercial blends are immiscible because nearly all polymer pairs cannot be soluble in each other due to the high molecular weight and weak interactions. Therefore, a blend material with big phase size (in the micrometers scale) and weak interface is usually obtained. This type of materials cannot provide expected properties for real application. The same problem occurs for the preparing of polymer composites based on inorganic fillers and a polymer due to the different polarity between the fillers and polymer. Therefore, significant researches on multi-components polymer systems have overwhelmingly focused on decreasing the phase size of polymer blends and improving the dispersion of fillers in a polymeric matrix. In this talk, we will show that the high-shear-processing method is an effective way to fabricate both the nanostructured polymer blends and the polymer nanocomposites. The shear effects on the morphology and properties of multicomponent polymeric materials will be emphasized.