

On the Mechanisms Leading to Exfoliated Nanocomposites Prepared by Mixing

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Abstract For most industrial applications, exfoliation is much preferred to intercalation in organoclay nanocomposites. Mechanisms leading to exfoliated nanocomposites prepared by mixing are presented with specific examples reported in the literature. It is pointed out that in the preparation, via mixing, of nanocomposites based on thermoplastic polymers or thermoplastic elastomers, exfoliation of the aggregates of layered silicate platelets requires strong attractive interactions between the clay surface (with or without chemical modification) and polymer matrix, giving rise to enhanced compatibility between the two and hence a highly dispersed (nearly exfoliated) nanocomposite. In this chapter, four different specific interactions (ionic, ion–dipole, hydrogen bonding, and coulombic) are illustrated to demonstrate the effectiveness of offering strong attractive interactions between the clay surface (with or without chemical modifications) and the polymer matrix in the preparation of exfoliated nanocomposites based on thermoplastic polymers or thermoplastic elastomers by mixing. It is pointed out further that van der Waals force is not strong enough to exfoliate the aggregates of layered silicate platelets, giving rise to intercalated nanocomposites at best.

Keywords Coulombic interaction · Exfoliation · Hydrogen bonding · Intercalation · Ion–dipole interaction · Ionic interaction · Nanocomposites

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Polymer Materials

Block-Copolymers, Nanocomposites, Organic/Inorganic
Hybrids, Polymethylenes

Lee, K.-S.; Kobayashi, S. (Eds.)

2010, X, 238 p. 184 illus., 5 illus. in color., Hardcover

ISBN: 978-3-642-13626-9