



STUDY ON NANOCCLAY PARTICLES DISPERSION IN A POLYMER NANOCOMPOSITE BY HIGH-RESOLUTION ELECTRON MICROSCOPY COMBINED WITH ELECTRON TOMOGRAPHY

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In this study, we choose poly[(butylene succinate)-co-adipate] (PBSA) as a model polymer. PBSA is a random copolymer of poly(butylene succinate) (PBS); which shows a variety of interesting physical properties, including biodegradability. The nanocomposite of PBSA with methyl tallow bis(2-hydroxyethyl) quaternary ammonium modified montmorillonite (MMT) (commercially known as C30B) were prepared by melt-mixing in a batch mixer. The nature of the silicate layers' dispersion in the PBSA/C30B (4 wt.%) nanocomposite was characterized by X-ray diffraction, high-annular-angle-dark-field scanning transmission electron microscopy (HAADF-STEM), and finally, by 3-D electron tomography. STEM images show that most of the silicate layers are homogeneously dispersed in the PBSA matrix; however, the stacking of some silicate layers is still observable and this is more discernible at a high magnification STEM image. Another interesting observation is that most of the dispersed silicate layers are bended. To have clearer picture on the degree of dispersion of silicate layers in the PBSA matrix, electron tomography technique was also used. From the 3-D images of nanocomposite from various directions, many aggregates of silicate layers are clearly seen. This observation again supports previous experimental observations that it is very difficult to get true exfoliation of silicate layers in the polymer matrix although there are strong favorable interactions between the polymer matrix and the clay surface.