Petrochemistry-2013

OMICS Group Conferences
Accelerating Scientific Discovery

World Congress on
Petrochemistry and Chemical Engineering

November 18-20, 2013 Hilton San Antonio Airport, USA

Biodegradable polyester nanocomposites: Phase miscibility and properties

Vikas Mittal

Department of Chemical Engineering, The Petroleum Institute, Abu Dhabi, UAE.

Abstract

Melt mixing of poly(butylene adipate-co-terephthalate) based biopolymer was performed with synthetic silica and silicate reinforcements in order to attain nanocomposites with superior properties so as to enhance the spectrum of applications of the biopolymers. The addition of 5% of fillers enhanced the modulus of the polymer by 20% and also enhanced or retained the elongation and yield stress. The thermal properties of the polymer were unaffected by the addition of fillers and did not show any decrease in the degradation temperatures occasionally observed due to the acceleration of the degradation by heat accumulated in the filler aggregates. The morphological characterization of the composites confirmed good dispersion of filler particles in the polymer matrix, however, the magnitude of large sized aggregates increased with increasing filler fraction. The addition of filler also nucleated the polymer(peak crystallization temperature increased from 15-30^{o}C) but the overall melt enthalpy was a function of filler dispersion. The dynamic properties of the composites enhanced gradually, however, significantly higher properties were observed for composites with 20% filler due to the presence of aggregates. An increase of storage modulus by 400% was observed for silica composites containing 20% filler, whereas same amount of silicate enhanced the storage modulus of the polymer by 300%. The composites with lower filler fractions maintained the similar flow characteristics as pure polymer. The filler phase was observed to be miscible with polymer in all composites except those with 20% filler content.