POS-A06

PD en Química Aplicada y Materiales Poliméricos

MORPHOLOGY AND CRYSTALLIZATION OF ISODIMORPHIC POLY (BUTYLENE SUCCINATE-RAN-BUTYLENE ADIPATE) RANDOM COPOLYMERS.

Ricardo A Pérez-Camargo*1, Borja Fernández-d´Arlas1, Alejandro J Müller1,2, Dario Cavallo3,Thibaud Debuissy4, Eric Pollet4, Luc Avérous4

1 POLYMAT and Polymer Science and Technology Department, Faculty of Chemistry, University of the Basque Country UPV/EHU, Paseo Manuel Lardizabal 3, 20018. Donostia, San Sebastián, Spain. 2 IKERBASQUE, Basque Foundation for Science, Bilbao, Spain. 3 Department of Chemistry and Industrial Chemistry, University of Genova, Genova, Italy. 4 BioTeam/ICPEES-ECPM, UMR CNRS 7515, Université de Strasbourg, 25 rue Becquerel, Strasbourg Cedex 2 67087, France.

Thermal properties and morphology of random copolymers of poly (butylene succinate) (PBS) and poly (butylene adipate) (PBS-ran-PBA or PBSA)) at 80:20, 60:40, 50:50, 40:60 and 20:80 compositions have been studied. The morphological characterization is carried out by polarized light optical microscopy (PLOM) and atomic force microscopy (AFM). Structural analysis is performed by differential scanning calorimetry (DSC) and X-ray diffraction (WAXS and SAXS). DSC reveals that thermal parameters, such as crystallization (Tc) and melting temperatures (Tm), crystallization (ΔHc) and melting enthalpies (ΔHm) present a pseudo-eutectic point in the composition-dependent thermal properties (Tc, Tm, ΔH) curve between 40 and 60 wt% of PBA content. On each side of the pseudo-eutectic point the copolymers could crystallize solely in the PBS or PBA lattice. This kind of behavior is characteristic of isodimorphic behavior (i.e., PBA units are partially included in the PBA lattice and viceversa). For PBS-rich compositions a decrease in thermal properties was found and it is related to a diluent effect of molten PBA units on PBS units along with the inclusion of small amounts of PBA in the PBS crystal lattice (verified by WAXS). A similar behavior occurs for PBA-rich compositions. The morphological study performed by PLOM and AFM reveals spherulitic structures with and without ring-band patterns. The neat materials and PBA rich-compositions display negative spherulites without ring-band patterns. In contrast, negative spherulites with ring-band patterns are obtained at PBS-rich compositions. Finally, the crystallization of the composition near the eutectic that is double crystalline is found to be highly rate-dependent. When fast cooling rates are used, the crystallization is inhibited. However, during a subsequent heating scan, both PBS-rich and PBA-rich phases are able to undergo cold-crystallization.