CRYSTALLIZATION AND MELTING BEHAVIOR OF POLY(ETHYLENE OXIDE) AND ITS BLEND WITH STYRENE-BASED IONOMER USING TIME-RESOLVED SAXS/WAXS EXPERIMENTS

Cz. Ślusarczyk *

Institute of Textile Engineering and Polymer Materials, University of Bielsko-Biała, 2, Willowa Str, 43-309 Bielsko-Biała, Poland

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e-mail: cslusarczyk@ath.bielsko.pl

Polymer blends of a crystallizable polymer and a noncrystallizable polymer have gained significant interests because of the rich morphology offered by these systems [1]. When such blend is crystallized quiescently, the noncrystallizable component can be redistributed to any of the following places: between lamellae, between growth lamellar bundles, or between spherulites. These morphological patterns show the dispersion of an amorphous component from the nanoscopic scale to the micrometer scale. Different scales of dispersion may lead to different properties. The type of segregation is determined by the interplay between the diffusion coefficent of an amorphous component molecules and the crystal growth rate. Intermolecular interactions are well known to influence both of these factors and taking them into account is important to understanding the blend crystallization.

In the earlier works [2,3] we used "static" SAXS, WAXS experiments as well as differential scanning calorimetry (DSC) to determine the miscibility and morphology of blends of poly(ethylene-oxide) (PEO) and styrene-acrylic acid (S-AA) copolymers neutralized with alkali metals (Na^+, Li^+). In these studies, we investigated the effects of blend composition and the content of ionic groups in amorphous ionomers on the segregation of amorphous component. It was found that PEO is partially miscible with styrene based ionomers due to ion-dipole interactions and that ionomers segregated interfibrillarly.

In the present study we focus on non-isothermal crystallization and melting (via time-resolved small- and wide-angle X-ray scattering experiments) of neat PEO and its 50/50 blend with ionomer containing 6.4 mol% of sodium acrylate (ANa). During crystalization of the blend we have observed a modest increase of the lamellar layer thickness at temperatures below 20°C, *i.e.* below the glass temperature of the ionomer (Fig. 1). This indicates on separation of the blend components and crystalization of those PEO crystallizable segments which, due to strong interactions with the ionomer, remained amorphous.

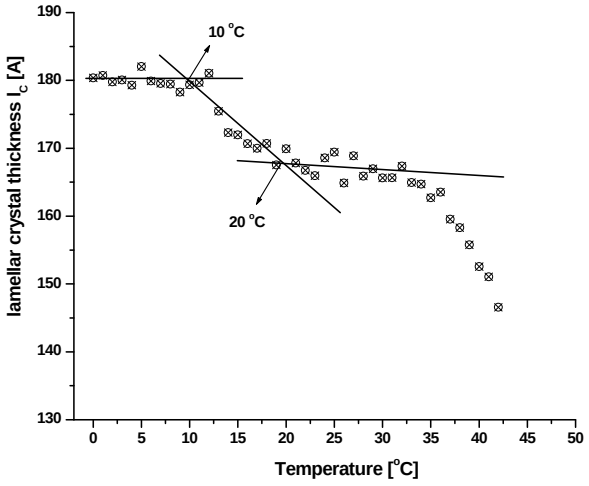

Figure 1. Temperature dependence of the lamellar crystal thickness during the crystallization process for 50/50 PEO/S-ANa(6.4) blend.

References

[1] J.P. Runt, in: *Polymer Blends,* edited by D.R. Paul, C.B. Bucknall (Wiley, NewYork, 2000).

[2] Cz. Ślusarczyk, K. Suchocka-Gałaś, J. Fabia, A. Włochowicz, "Small-angle X-ray scattering study of poly(ethylene-oxide) and styrene based ionomers blends",*J. Appl. Cryst.* **36** (2003) 698-701.

[3] Cz. Ślusarczyk, K. Suchocka-Gałaś, "Poly(ethylene-oxide)/styrene ionomers blends: crystallization of poly(ethylene-oxide) component studied by wide-angle X-ray diffraction", *Solid State Phenom.* **130** (2007) 251-256.