ESRF

Experiment title: WAXS Investigations of the Microstructure and Interfaces in Liquid Crystalline Copolyesters and their Blends

Experiment number: SC-123

Beamline: ID 13: BL1

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The microfocus camera at beamline ID 13 with a focus of 1 μm fwhm was used to investigate the microstructure of polymer blends consisting of the liquid crystalline polymer oxybenzoate-co-oxy-naphthoate (Vectra A) with either PET or isotactic PP. Such blends of flexible and rod-like molecules tend to phase separate due to entropic reasons. Previous microscopical studies showed that the phase separation remains even after extended annealing in the melt. However, ^{13}C-NMR-measurements in solution on ^{13}C-labeled samples proved transesterification reactions of PET and Vectra molecules upon annealing in the melt, resulting in the formation of copolyester molecules of the blend components. Moreover, solid-state NMR experiments (*H, ^{13}C) on such-like samples revealed a highly flexible component attributed to the transesterification products. From these preliminary results the question arises as to how the microstructure of the blends has changed, either in the domains and at the interface.

With the microfocus camera thin sheets of the blends were scanned in steps of 2 pm. Since the scattering patterns of Vectra, PET and iso-PP are markedly different the domains of the blend components and the interface region could readily be assigned. In blends of Vectra/PET the blend components show only slight changes of their molecular order when scanning from the center of a domain to its edge. A pronounced interphase between two adjacent domains was not found. The transreactions upon annealing lead to a decrease in the degree of molecular orientation (Vectra) and crystallinity (PET) within the domains and also to the formation of an interphase with further reduced orientation and crystallinity (see figure 1).

Vectra and iso-PP have a very poor adhesion and, therefore, show phase separation on a macroscopic scale. No mutual influences of the polymers with respect to their orientation, crystallinity or dynamics were found. Neither, an interphase with modified molecular properties was revealed.

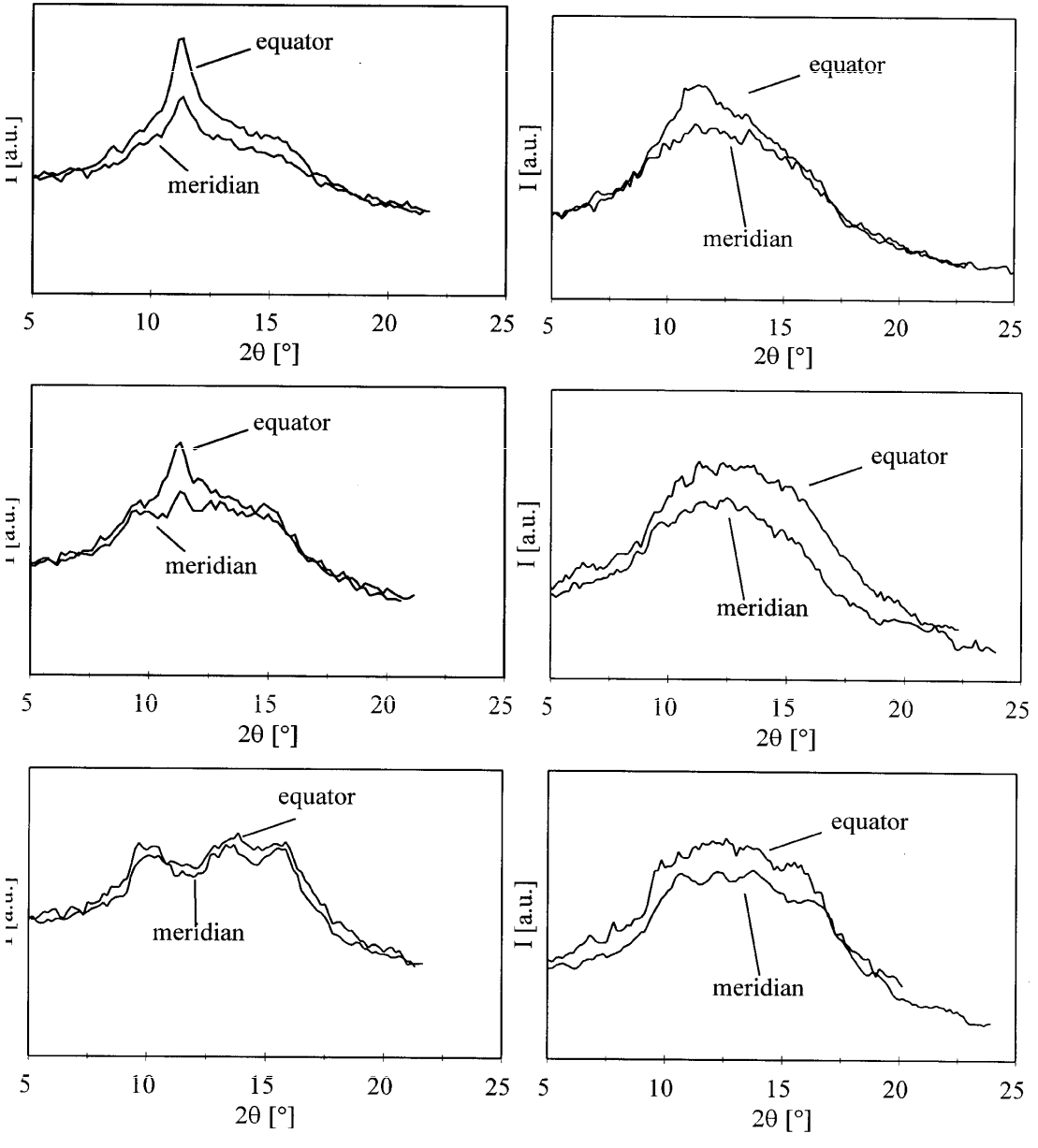

Figure 1: Scattering curves of the Vectra/PET blends before (left column) and after (right column) transesterification in a Vectra domain (top), a PET domain (bottom) and at the interface (center).