XRD investigations of *α*-polyamide 6 films: orientation of nano-crystallites and structural changes upon uni- and biaxial drawing

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Abstract

We have investigated the influence of drawing on orientation, crystallinity, and structural properties of polyamide 6 films using X-ray diffraction (XRD). The samples were uniaxially and biaxially stretched resulting in the formation of monoclinic nano- crystallites (α-form) in the size range of 8–10 nm. Depending on the drawing ratio, a degree of crystallinity of up to 60% is obtained. The average orientation of the crystallite axes was evaluated using the pole figure technique. The b*-axis, which corresponds to the chain direction of the polyamide molecules, lies in the film plane and shows a preferred orientation upon drawing. For uniaxial drawing, b* aligns with the drawing direction. For biaxially drawn films, which were prepared using the sequential stretching method, the second drawing determines the orientation of b*, at least at the
center of the films. At the sides, b* is located between the two drawing directions reflecting the inhomogeneous distribution of mechanical stress during stretching.