



	Experiment title: Thermal behavior of a semicrystalline polymer on the local scale	Experiment number: MA-1233
Beamline: ID13	Date of experiment: from: 25/06/2011 to: 28/06/2011	Date of report:
Shifts: 9	Local contact(s): Emanuela Di Cola	<i>Received at ESRF:</i>
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Report:

Article abstract:

The microstructure of banded spherulites of a typical semirigid-chain polymer, poly(trimethylene terephthalate), PTT, has been explored with microbeam X-ray diffraction. It is shown that during microbeam scans along the spherulite radius, different diffraction peaks exhibit oscillations with the same periodicity, which means that the lamellar twist is strictly uniform and regular. The twisted PTT crystals formed from the melt at 170 °C reveal a one-to-one correlation between the handedness and growth axis polarity. Thus, the lamellae are right-handed for the growth along the negative growth direction (−a) while they are left-handed for the positive growth direction (+a). This is in line with predictions of the KP-model, although the original model cannot explain why, for example left-handed crystals have to grow along (−a). The direction of the chain tilt in the lamellar crystal correlates with the lamellar handedness as postulated by the KP-model. However, the measured chain tilt in the crystal (4°) is too faint to be the primary source of the surface stresses required for twisted lamellar growth.

“Exploring the Origin of Crystalline Lamella Twist in Semi-Rigid Chain Polymers: the Model of Keith and Padden revisited”

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