	Experiment title: Deformation-Induced Structural and Morphological Transformations in Random Polypropylene copolymers with Delta-type Crystallinity	**Experiment number**: 26-02 491
Beamline: BM26B	**Date(s) of experiment**: From 14/02/2010 at 08:00 to 19/02/2010	**Date of report:** *12/03/2010*
Shifts: 9	**Local contact(s)**: Dr. G. Portale	

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Report:

On-line synchrotron WAXD during tensile deformation

At Beamline B26 DUBBLE of the European Synchrotron Radiation Facility (ESRF) in Grenoble a series of experiments was conducted in which WAXD patterns were acquired during tensile tests. These tests were performed in a Linkam Tensile Testing System TST350 aligned to the beam. Film specimens about 25mm long, 5mm large and 0.2 mm thick were clamped in the instrument, which is properly built in order to keep the observation point at the centre of the deformation, i.e. one always irradiates the same area in the sample during the whole test. In Figure 1, pictures of the Linkam instrument aligned with the bean and of a sample are reported.

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Figure 1: Top, Linkam instrument mounted in the X-beam; bottom, example of specimen positioned in the Linkam tensile device

The set-up of Figure 1 was used to analyze the deformation behavior of propylene-based random copolymers with delta-type of crystallinity. An example is provided in Figure 2, here the sample is a propylene-pentene (C3/C5) random copolymer with 5.4% of C5. The applied tensile stress promoted orientation of the crystals. The first diffraction pattern in which crystal orientation is detected occurs at about 20-30% deformation, from this moment onwards orientation increases with increasing elongation.

For all the investigated samples, no change in the crystalline structure upon deformation is evidenced. The initially present crystalline form, either alpha or delta, is preserved up to breakage (not sown in Figure 2); tensile deformation only changes the state of orientation of the crystalline lamellae. The only exception to this rule is the sample of Figure 2. From about 35% elongation, it is noticeable the presence of two wide reflections superposed to the alpha-form rings, probably corresponding to an oriented smectic phase that forms due to mechanical destruction of alpha crystals and re-organization of molecules with low later order.

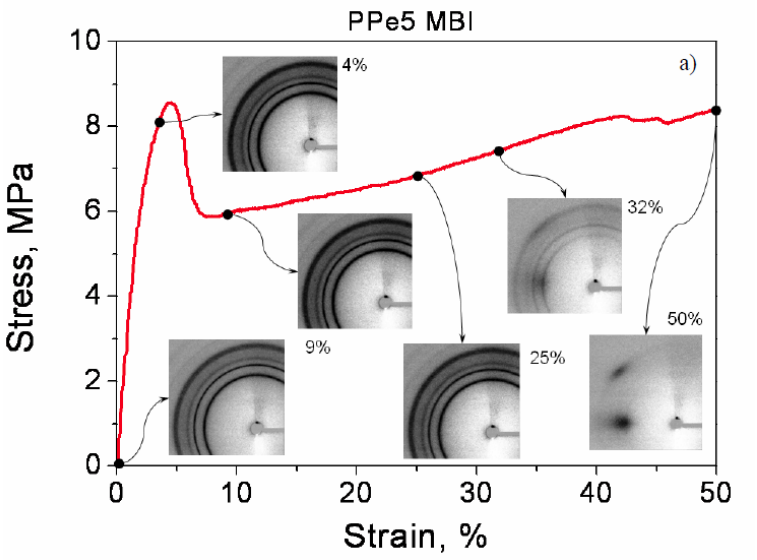

Figure 2 Stress strain curves for the sample C3/C5 5.4 mol%

Further data analysis and interpretation is ongoing.