



	Experiment title: Towards smart processing of commodity plastics	Experiment number: 26-02-517
Beamline: BM26B	Date(s) of experiment: From 05/03/2010 at 08:00 to 08/03/2010	Date of report: 12/04/2010
Shifts: 9	Local contact(s): Dr. G. Portale	
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Report:

On-line synchrotron SAXS/WAXD during shear induced crystallization

A series of in situ SAXS/WAXD experiments was completed at the beamline BM26B/DUBBLE of the European Synchrotron Radiation Facility (ESRF) in Grenoble, France. The experiments were performed in a custom-made Multi-Pass Rheometer (MPR), which can impose high shear rate and high pressure, in the range of processing condition. In this flow cell (see Figure 1), the sample is confined between two pistons and the barrel. The thicknesses of the sample is 1.5mm. Two diamond windows 0.5mm thick allow for in-situ observation with X-rays.

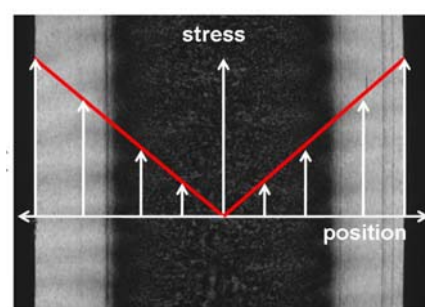
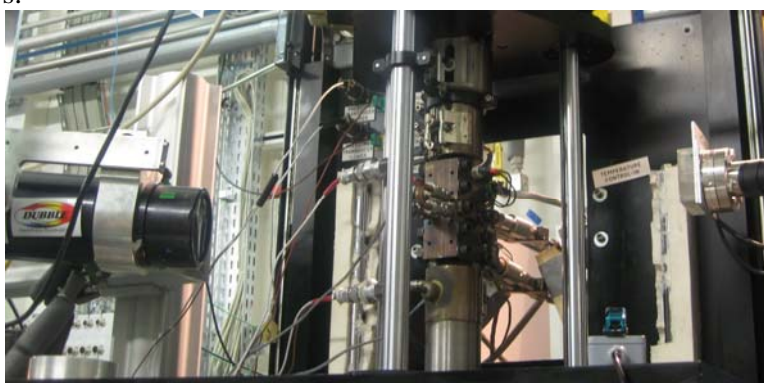


Figure 1: Left, Multi-Pass Rheometer instrument mounted in the X-ray beam; Right, the flow field imposed in the polymer.

In this beamtime, we have investigated the effect of a pressure pulse prior to shear application on the formation of shish-kebab structures. The experiments were performed at 160 °C and flow field was imposed by moving pistons at the piston speed of 120 mm/s for 0.05s. The subsequent evolution of intensities along equatorial direction is shown in the Figure 2(left). The intensity evolution indicates that the pressure has a significant effect on the formation of shish-kebabs. For the performed experiments, the major difference is observed along the meridional direction, as shown in Figure 2(right). This suggests that the pressure pulse favour the growth of oriented lamellae.

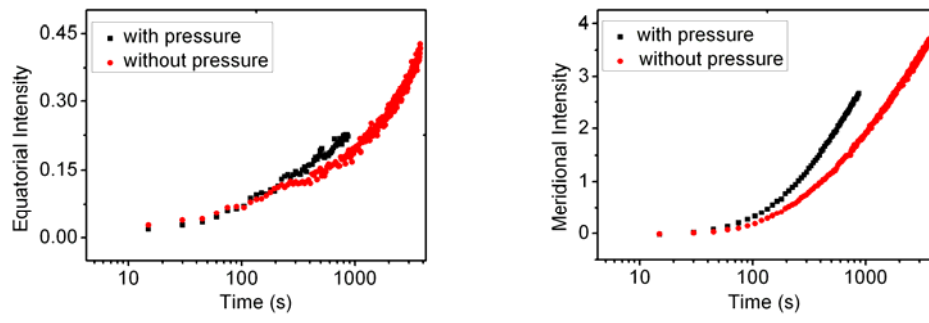


Figure 2. Evolution of intensity integrated along the equatorial (left) and meridional (right) direction.

Further data analysis and interpretation is ongoing.