	Experiment title:	Experiment number:
	Unexpected higher crystal orientation at higher temperature in flow induced crystallization of polymers	**26-02- 467**
Beamline: BM26B	**Date(s) of experiment**: 06/03/2009 *to* 09/03/2009	**Date of report**: *16/04/2009*
Shifts: 12	**Local contact(s)**: **Dr. Lucia FERNANDEZ-BALLESTER**	

Names and affiliations of applicants (* indicates expermentalists):

Dr. Luigi BALZANO*[1] Dr Richard GRAHAM[3] Dr. Lucia FERNANDEZ-BALLESTER*[2]

[1] *Department of Mechanical Engineering, Technische Universiteit Eindhoven, P.O.Box 513, 5600 MB Eindhoven, the Netherlands.*

[2] *ESRF*

[3] *School of Mathematical Sciences, University of Nottingham, Nottingham UK*

Report:

During flow induced crystallization of polymers, crystals with varying degrees of anisotropy are formed as a consequence of molecular deformation. In this beamtime, we have investigated the effect of temperature on the crystalline orientation in sheared isotactic polypropylene (iPP). The sample were prepared out of a commercial homopolymer grade (HD120M0) received from Borealis (Linz, Austria) and widely investigated in our group.

Samples were sheared by means of a modified Multi-Pass-Rheometer (MPR) and the crystalline orientation was assessed by means of WAXD.

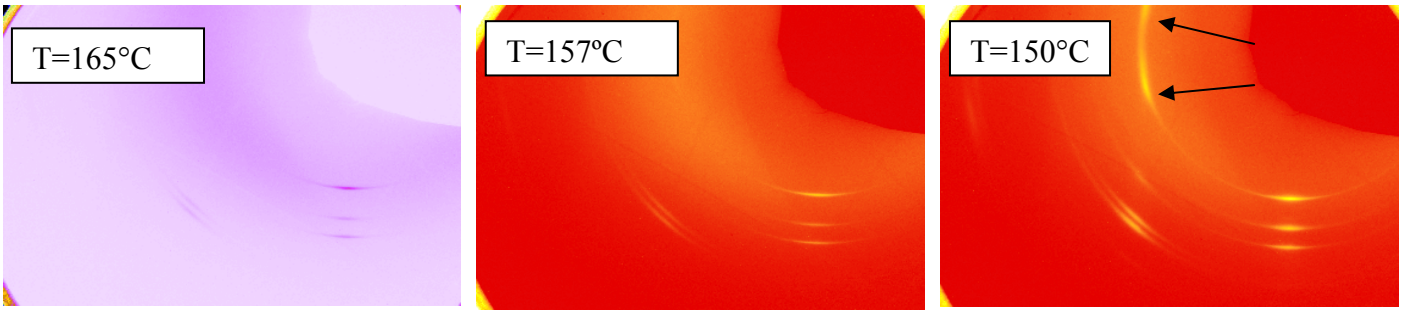

Figure 1: *Two dimensional WAXD pattern of iPP sheared at the temperature indicated on the picture with a shear stress of 0.14 MPa.*

As it can be seen in Figure 1, decreasing the shear temperature (going from left to right in the Figure), very specific changes can be detected in the scattering patterns. First of all, the azimuthal breadth of the peaks increases. This suggests that the degree of orientation of the crystals (for instance, calculated by means of the Hermans' orientation factor) decreases. Moreover When T=150°C, new arches appear at the 2θ of the

innermost reflection (110). In polypropylene, this circumstance has been associated to the formation of lamellar branching (schematic drawing in Figure 2).

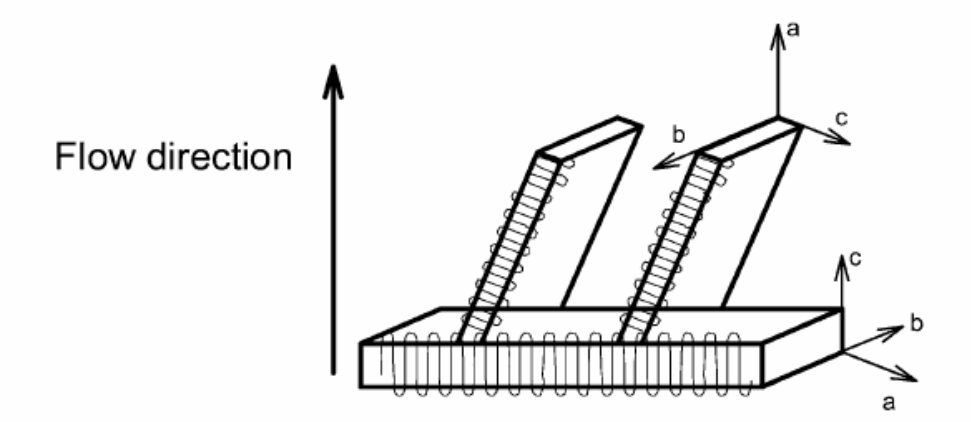

Figure 2: *Lamellar branching.*

Diffraction patterns are still being investigated to generate sufficient information to build a physical picture of structure formation in flow induced crystallization of iPP.