	Experiment title: Pressure induced crystallization of lactic acid-based polymeric materials	**Experiment number**: 26-02-547
Beamline: BM26B	**Date(s) of experiment**: From 30 Aug 2010 to 03 Sep 2010	**Date of report:** *22/09/2010*
Shifts: 9	**Local contact(s)**: Dr. G. Portale	

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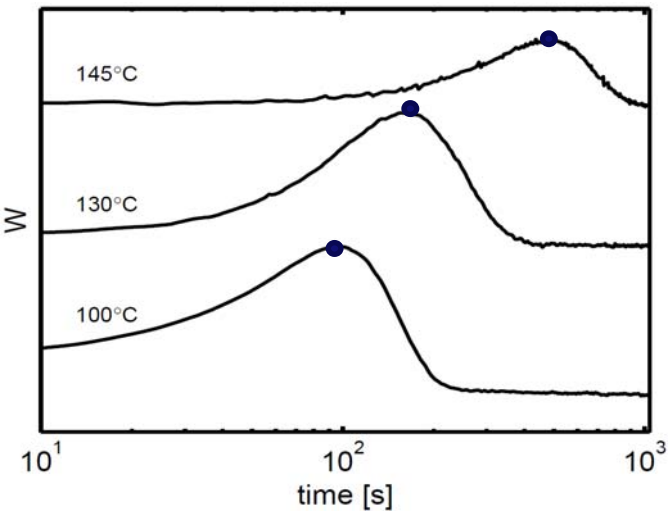
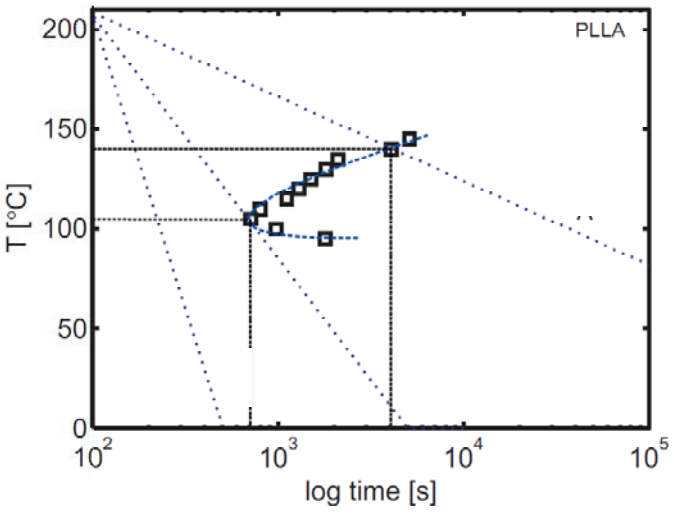
Report:

In this beamtime, we have investigated the effect of processing variables on structure and morphology of poly(lactic acid) (PLA) with SAXS and WAXD.

Prior to this experiment, in house, we have studied the isothermal crystallization behavior of these material with calorimetry (see Figure 1). By performing isothermal crystallization tests at various temperatures in DSC (Figure 1 left), we constructed a so called time-temperature-transformation (TTT) diagram (Figure 1 right).

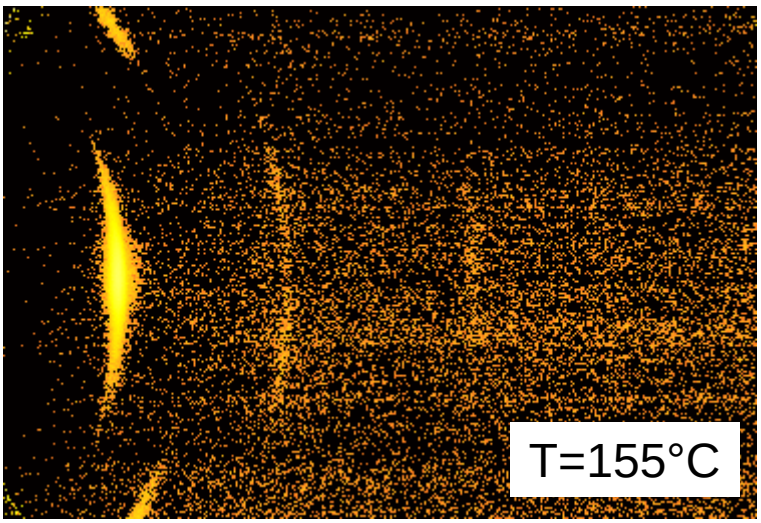




PLA are slowly crystallizing materials and with this diagram at hand, we could establish that starting from the melt at 205°C the material can be quenched amorphous at cooling rates above 8°C/min. With x-rays, we

have found that SAXS/WAXD data nicely correlate the calorimetric data. We have observed that the TTT diagram shifts vertically, that is the crystallization temperatures are increased by pressure.

Furthermore, with the same equipment it is possible to apply shear flow to specimens. In these experiments, we have found that highly oriented shish-kebabs type of crystals can be formed out of molten PLA at very high temperatures, above 150°C (See Figure 2).



These experiments show that nucleation can be controlled tuning the processing parameters also in lactic-acid based polymers.