



	Experiment title: Optimal pressure histories for crystallization of lactic acid-based polymers used in medical applications	Experiment number: 26-02 555
Beamline: BM26B	Date(s) of experiment: 10 Apr 2011 to 15 Apr 2011	Date of report: 02/05/2011
Shifts: 9	Local contact(s): Dr. G. Portale	
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Report:

In this beamtime, we studied the pressure induced crystallization of medical grades of PLA. PLA is a relatively slow crystallizing polymer. As it can be seen in the time-temperature transformation diagram (TTT) of Figure 1, the maximum crystallization temperature (shortest crystallization times) takes place around 100°C and cooling rates just faster than 10°C/min (green line on the plot) yield an amorphous material.

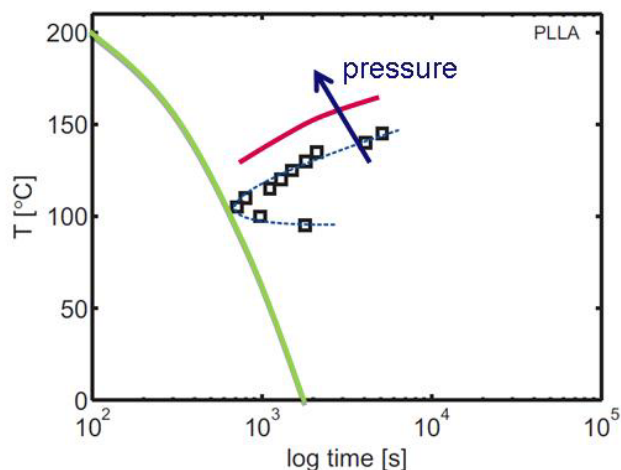


Figure 1

Pressure enhances crystallization rate and increases crystallization temperature. For these reasons, the transformation lines shifts towards higher temperatures and shorter times (red line in Figure 1).

In the course of the beamtime, we -briefly- looked at the effect of L and D stereocomplexation on the crystallization of PLA. Figure 2 shows WAXD data of pure PLA during heating and cooling at a rate of 10°C/min. As expected (see Figure 1), without pressure, the material hardly crystallizes during cooling.

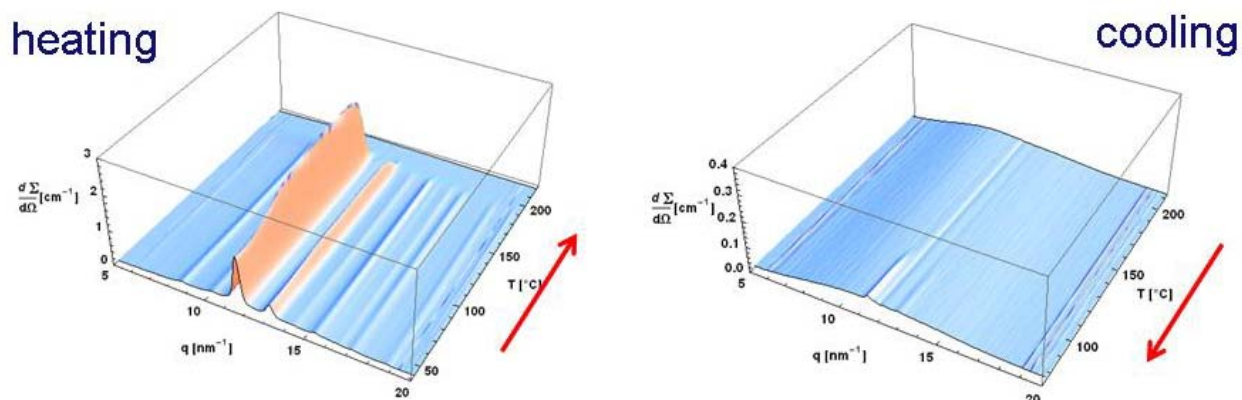


Figure 2

Nevertheless, when some of the D- stereoisomer is blended-in, the material crystallizes on cooling already at very high temperatures (around 200°C), see Figure 3. The crystalline form obtained with co-crystallization of L and D types of poly(lactic acid) is different than the homo-crystals.

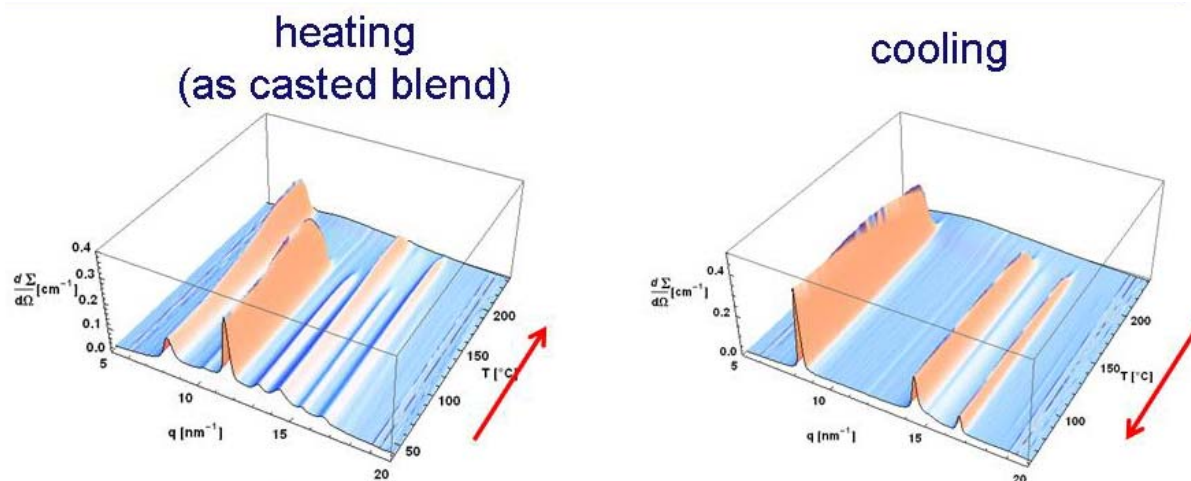


Figure 3