ESRF	**Experiment title:** Mechanisms of Electric Field Induced Orientation of Cylindrical Block Copolymers	**Experiment number:** SC-1392
Beamline: ID 2	**Date of experiment:** from: 30.7.2004 to: 2.8.2004	**Date of report:** 24. Aug. 2004
Shifts: 9	**Local contact(s):** Thomas Weiss	*Received at ESRF:*

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Report:

Based on our previous investigations on the orientation behavior of block copolymer microdomains subjected to an external electric field[12,3,4], we studied the mechnism of reorientation of cylindrical block copolymer microdomains.

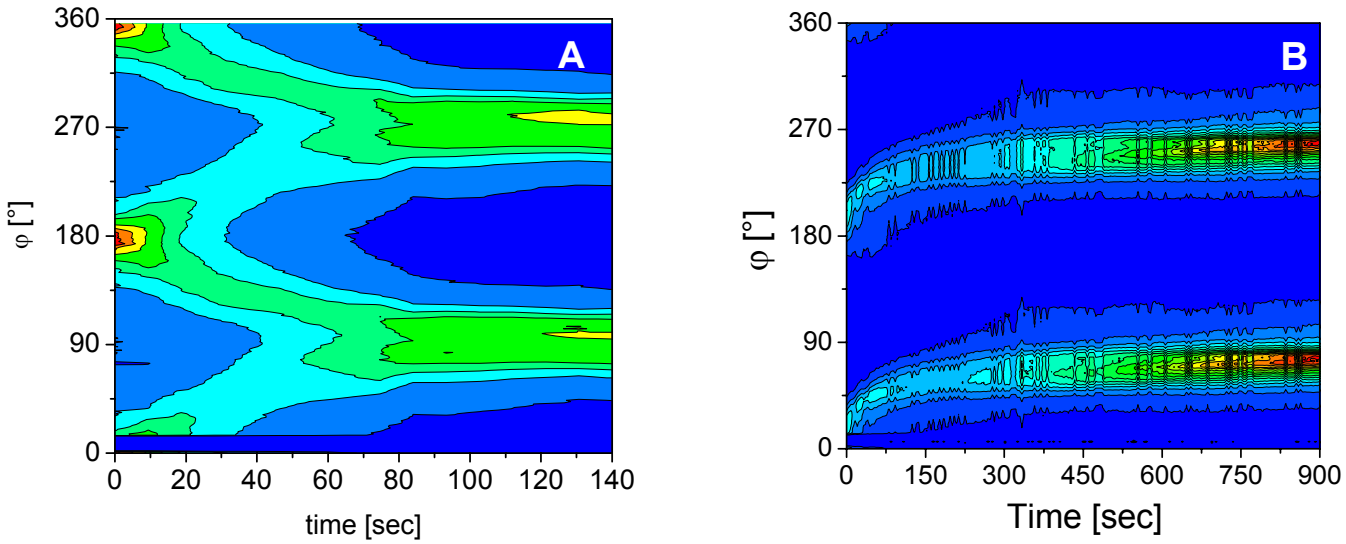

Figure 1: PS-b-PI in toluene (A) cylindrical (B) lamellar microstructure at 2 kV/mm.

For a certain concentration range, we find rotation of the cylinders from an orientation parallel to the electrodes (signals at φ = 180° and 360°) to orientation parallel to the electric field vector. In contrast to the

lamellar system, this is not a cooperative process where the dielectric bodies rotate along a common direction. The cylinders seem to break up and one fraction rotates clock- and the other one counter clock wise. The corresponding azimuthal SAXS profiles are shown in Figure 1.

In addition, with our substantially improved high voltage high frequency AC field setup, we succeeded to study the reorientation kinetics of our block copolymer system between 10 and 200 Hz.

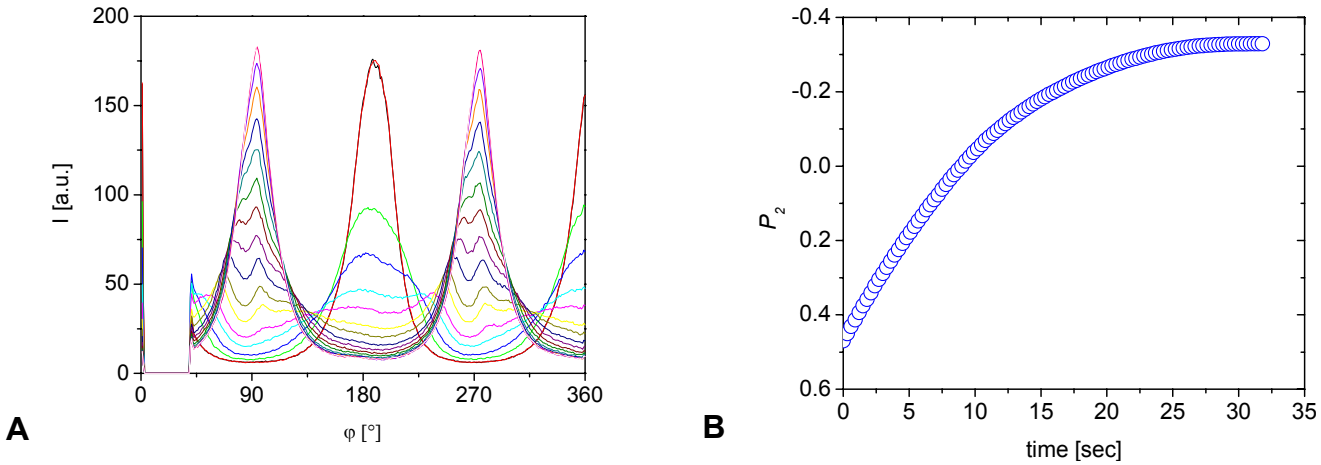

Figure 2: *(A) Evolution of azimuthal intensity scan with time of a lamellar PS-b-PI (Mw = 100kg/mol; 35 wt.-% in toluene) at 1.3 kV/mm and 150Hz in a 2mm capacitor. (B) Evolution of orientational order parameter, P_2, with time constant, τ = 10 sec.*

Figure 2 shows the time dependence of the azimuthal intensity scan at the first order reflexion and the evolution of the respective orientational order parameter for a reorientation process at 150 Hz. At this frequency, we can exclude any influence of migration of residual ions in the block copolymer solution on the orientation process.[5]

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