



Experiment title:
Influence of pressure on phase transitions in diblock copolymers

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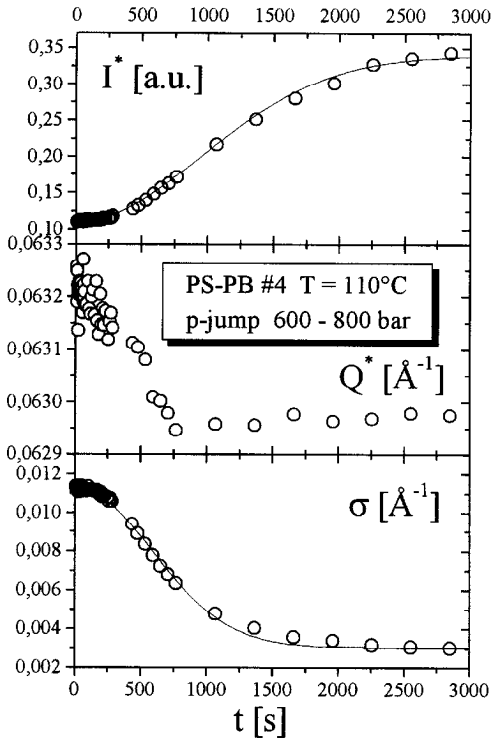
& Manfred Stamm, MPI-P, Mainz

Report:

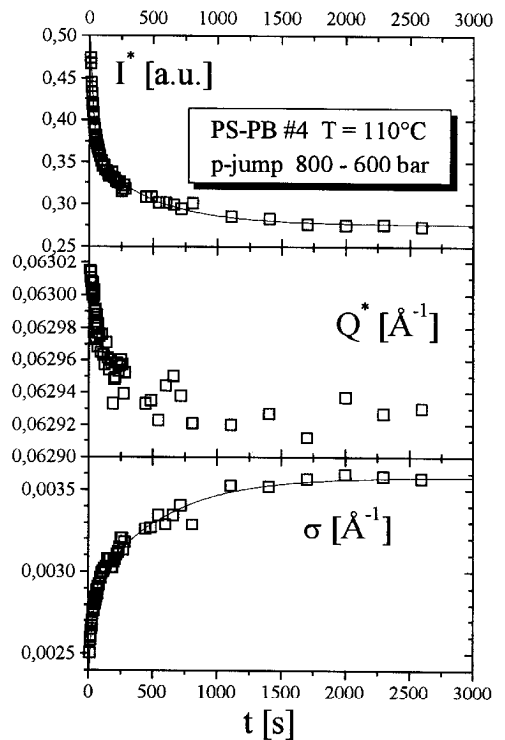
The microphase separation transition (MST) in diblock copolymers has been object of many investigations within the last years. It has been found to be controlled by the degree of polymerisation N , the composition f , and the strength of monomer interaction between components, described by the Flory-Huggins segment interaction parameter χ [1,2].

Recently now we were able to establish and to investigate in detail the pressure driven MST in a symmetric diblock copolymer consisting of polystyrene and polybutadiene, P(S-b-B) [3]. Aim of this experiment was to measure the kinetics of the MST on application and after release of pressure.

For that purpose we measured the structure factor of our system in time intervalls of 2 seconds in the vicinity of the MST. At a constant temperature of 110°C pressure jumps of 200 bar were carried out, leading from the disordered via an intermediate to the ordered phase state and vice versa. As indication for the MST we analysed the scattering peak intensity, width and position by fitting a Lorentz function to the data points [1]. A detailed analysis is in progress, but a significant difference between pressure release and increase experiments in various aspects is already obvious from the preliminary data analysis.



(a)



(b)

figure 1: Morphology peak -maximum (I^*), -position (Q^*) and -width (σ) as received by fitting a Lorentz function to the Q dependent scattering intensity.

(a) Nucleation and growth of morphology after a jump from 600 to 800 bar. The MST of the system is suited at approximately 700 bar within a „transition range“ of 400 bar. The lines are Avrami fits with an exponent of two.

(b) **Structural** relaxation after release of pressure. The lines are two exponential fits with relaxation times of 30 respectively 500 seconds.

References

- [1] BATES F.S. & FREDRICKSON G.H., Ann. Rev. of Phys. Chem., 41(1990) 525
- [2] BATES F.S., Science, 251 (1991) 898
- [3] LADYNSKI H., STAMM. M., DEODORICO W. & DIAT O., in preparation