



	Experiment title: Investigating locally flat surfaces using sub μ m-beams in Grazing Incidence small angle X-ray Scattering (GISAXS) mode	Experiment number: SC 1446
Beamline: ID13	Date of experiment: from: 14.03.2004 to: 17.03.2004	Date of report: 16.03.2005
Shifts: 9	Local contact(s): Stephan V. Roth	<i>Received at ESRF:</i>

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Report:

Micro-cracks induced by evaporation-assisted flow of a polymeric blend solution are investigated. After evaporation of the solvent toluene, the blend film of polystyrene and poly-n-butylacrylate exhibits small cracks aligned perpendicular to the original flow direction. The local defect in the elsewhere rather continuous blend film is probed with atomic force microscopy, see fig. 1. With scanning sub-microbeam grazing incidence small angle X-ray scattering a position sensitive surface scattering experiment is presented. Due to the beam diameter of 0.9 μ m the local micrometer sized defect structure is resolved, see fig. 2.

Reference:

P. Müller-Buschbaum, S.V. Roth, M. Burghammer, E. Bauer, S. Pfister, C. David, C. Riekkel, Physica B **357** (2005) 148

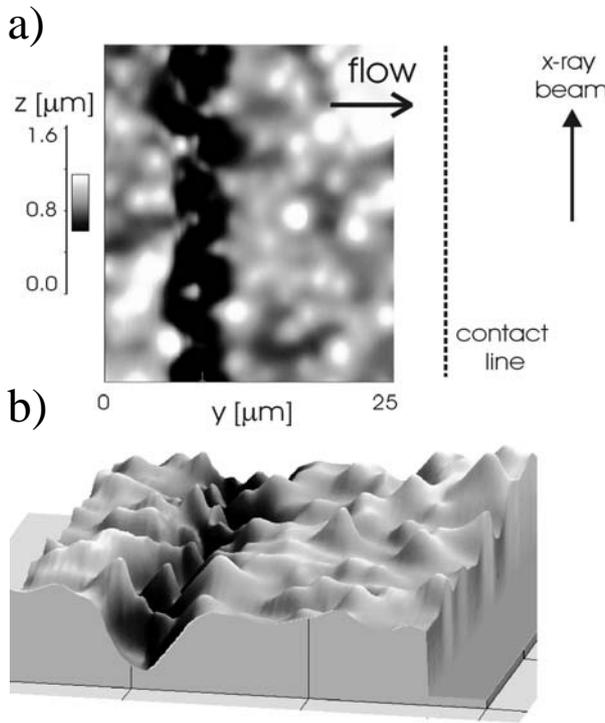


Fig. 1. AFM pictures (scan range $25 \times 40 \mu\text{m}^2$) of the topology as observed after toluene evaporation. In the elsewhere continuous film a micro-crack has formed being parallel to the three-phase contact line and perpendicular to the flow. The blend surface is covered with small drops. a) In the sub-microbeam GISAXS experiment the crack was aligned parallel to the incoming x-ray beam. b) The crack nearly extends down to the substrate surface.

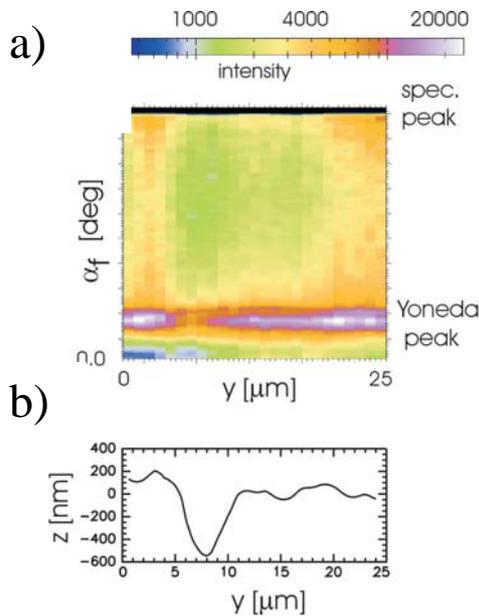


Fig. 2. a) Reduced representation (y - α_f)-mapping in the region around the Yoneda peak: With the sub-microbeam GISAXS experiment a region of $25 \mu\text{m}$ was scanned in steps of $\Delta y = 1 \mu\text{m}$. b) Representative line from the AFM data visualizing the micro-crack.