ESRF	**Experiment title:** Local morphology of confined diblock copolymer films	**Experiment number**: SC-1000
Beamline:	**Date of experiment**: from: 5.4.2002 to: 11.4.2002	**Date of report**: 16.2.2003
Shifts: 21	**Local contact(s)**: S.V. Roth, M. Burghammer	*Received at ESRF:*

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Report:

During a first test beam time we combined the small beamsize offered at the ID13 beamline with the grazing incidence small angle scattering technique to prove the feasibility of a new method, namely micro-focus grazing incidence small angle x-ray scattering (μGISAXS). The number of technological developments was that large, that instead of the initially planned sample type two different classes of model systems were addressed. These model systems exhibit a larger scattering signal:

1) S.V.Roth, M.Burghammer, C.Riekel, P.Müller-Buschbaum, A.Diethert, P.Panagiotou, H.Walter: *Self-assembled gradient nanoparticle-polymer multilayers investigated by an advanced characterisation method: Microbeam grazing incidence x-ray scattering*; Apl.Phys.Lett. , at press (2003)

ABSTRACT:

We investigated a gradient of nanometer-sized self-assembled gold clusters on top of a thin polymer film. Using an advanced characterisation method for gradient surfaces and thin films the characteristic change in cluster height is detected. Our unprecedented approach combining a powerful thin film characterisation method with a micrometer-sized X-ray beam enhances the spatial resolution used so far by two orders of magnitude. We show that this advanced concept allows for a non-destructive and contact-free reconstruction of the three-dimensional structure and morphology of the nano-cluster gradient layer. Despite its change in thickness, the individual clusters' in-plane shape and distance remains constant.

2) P.Müller-Buschbaum, S.V.Roth, M.Burghammer, A.Diethert, P.Panagiotou, C.Riekel: *Multiple-scaled polymer surfaces investigated with micro-focus grazing incidence small-angle x-ray scattering*; Europhys.Lett. **61**, 639 (2003)

ABSTRACT:
We show that a position-sensitive sample surface information of multiple-scaled polymer films is successfully addressed with micro-focus grazing incidence small angle X-ray scattering (μ-GISAXS). From the analysis of the diffuse scattering without further model assumptions the length scale of the heterogeneous structures is determinable. The method is illustrated by an example of two-step dewetted polystyrene (PS) films exhibiting droplets on a nano scale in coexistence with mesoscopic drops. The results are compared to scanning force microscopy measurements. As compared to the conventional transmission geometry using the same micro-focus optics the resolvable length scale is increased by one order of magnitude.

The initially planned investigation of the local morphology of confined diblock copolymer films was delayed to future experiments.