 ROBL-CRG	<b>Experiment title:</b> Thermal behaviour of Fe and Ni thin film onto Si	<b>Experiment number:</b> <b>20_02_657</b>
<b>Beamline:</b> BM 20	<b>Date of experiment:</b> from: 12.12.2007 to 14.12.2007	<b>Date of report:</b> 5.11.2007
<b>Shifts:</b> 6	<b>Local contact(s):</b> Dr. Carsten Baehtz (baehtz@esrf.fr)	<i>Received at ROBL:</i>
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## Report:

In the center of interest in this investigation is to evaluate the possibility of *in-situ* investigation of the dewetting process of thin Fe film. Therefore different film thicknesses 5 and 10 nm onto different substrates with SiO<sub>2</sub> or Al<sub>2</sub>O<sub>3</sub> buffer layers were studied. The use energy was 12keV, as sample environment the ROBL standard furnace was in use.

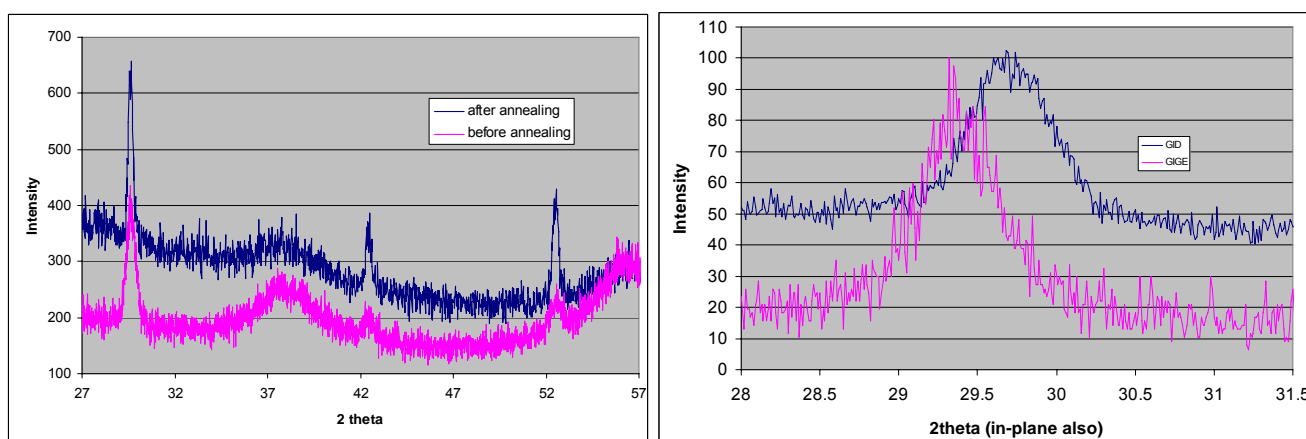


Fig. 1: Diffraction pattern out-of-plane (left) and in-plane (right) of 10 nm Fe onto SiO<sub>2</sub>.

## Results

10 nm Fe onto SiO<sub>2</sub> as well as Al<sub>2</sub>O<sub>3</sub> can be observed in grazing incident diffraction (GID) with  $\alpha_i=0.5^\circ$  up to  $60^\circ 2\theta$  without problems even before annealing and advanced crystallization. Of course after dewetting the corresponding reflection are sharper and

much more pronounced as before as shown in Fig.1 left side. In contrast to this, only the Fe reflection around  $29.5^\circ 2\theta$  can be observed by grazing incident grazing exit

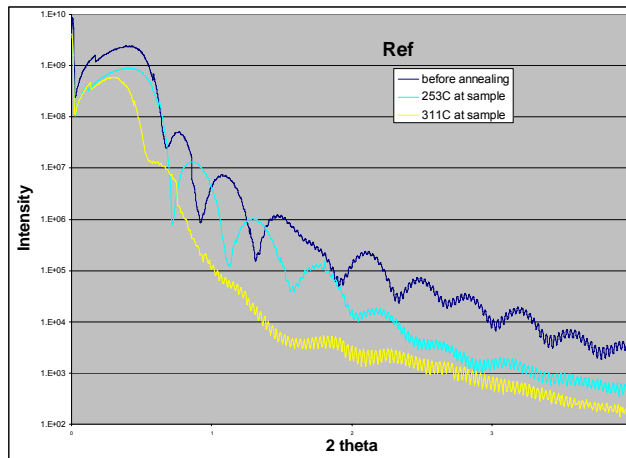


Fig.2: XRR-plot of 10 nm Fe onto SiO<sub>2</sub>.

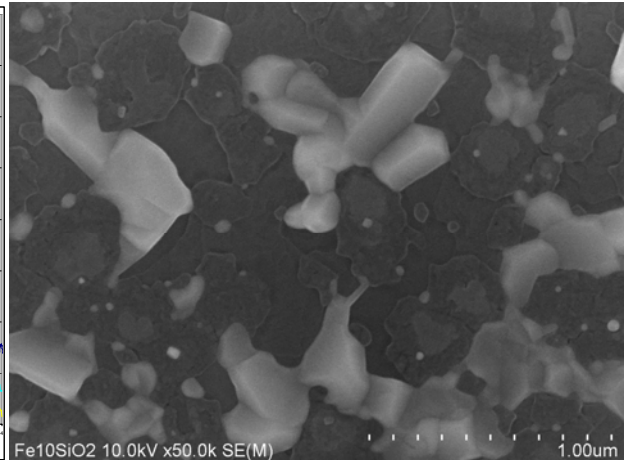


Fig.3: SEM-picture of the dewetted film.

diffraction (GIGE), other reflections suffer from shading effect of the furnace sample holder and the dramatic drop in the polarization factor which also determinates the signal intensity. But the signal-to-noise ratio is much better. The XRR-measurement show first a slight change in the oszillation and between 253 and 311°C clearly the dewetting of the film, which is proven by SEM-image in Fig. 3. 10 nm Fe onto Al<sub>2</sub>O<sub>3</sub> shows the same behavior but dewettes at slightly higher temperatures. Before annealing is no crystalline Fe detectable in 5 nm Fe onto SiO<sub>2</sub> only afterward. The film splitting itself was clearly visible by XRR.

## Outlook

On basis of this investigation further experiments concerning the film dewetting under different atmospheres like hydrogen, oxygen or vacuum ar planned, as well as in-situ growth experiments of carbon-nano tubes with the dewetted film in acetylene/hydrogen atmosphere. Due to the use of explosive gases these experiments are extremely sophisticated and need therefore the prove of feasibility before. These experiments will be carried out on in 2008.