High Resolution and Micro-Beam Facilities at the Göttingen Small-Scale Accelerators

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The accelerators of the Ion-Beam laboratory in Göttingen are documented in a recent publication [1]. Meanwhile two beam lines have been added, which expand the analytical possibilities. In standard Rutherford Backscattering spectrometry semiconductor detectors measure the energy of the backscattered particles. In the high-resolution (HR-RBS) line the use of an electrostatic analyzer improves the energy resolution by a factor of 10 to about 1 to 1.5 keV. Along with that the depth resolution [2] increases. This HR-RBS set-up is connected to the 500 kV implanter IONAS, which has itself an excellent energy resolution of about 100 eV at 500 keV. A depth resolution of 1 nm has been achieved in experiments on Pr_2O_3 thin layers grown on Si (see fig.1). A measurable inter-diffusion of both, Pr and Si atoms at the interface occurred only at temperatures above 800°C.

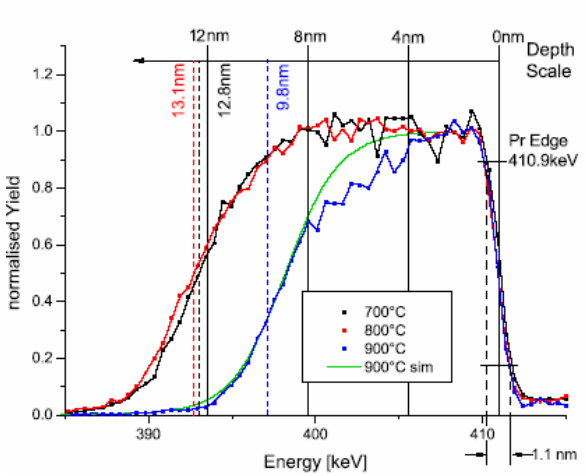

Figure 1: HR-RBS spectra of a thin film Pr_2O_3 layer after different annealings.

The second new instrument is a microprobe of the Melbourne-type, which was transferred from the physics institute of the university Freiburg in Germany. The microprobe is connected to the Görringen 3 MV Pelletron accelerator MaRPel. The distance between object slits and lens are 7 meters, the distance from the lens to the target is about 20 – 30 cm. This allows us to focus the beam to at least 1 µm spot size. Using this microprobe, proton beam writing gets visible. Highly spatial resolved PIXE and RBS measurements will be done as well.

[1] M. Uhrmacher, H. Hofsäss, Nucl. Instr. Meth. in Phys. Res. B, **240** (2005) 48-54
[2] M. Schnell, Diploma Thesis, Göttingen 2006