THE TANDETRON LABORATORY IN REZ

A new Tandetron laboratory has been recently build up at the Nuclear Physic Institute of the Academy of Sciences of the Czech Republic in Rez near Prague. The accelerator is the new Tandetron 4130MC from HVEE with terminal voltage 3MV. The accelerator itself has been set into the operation by HVEE technicians at the end of the 2005. Since then we have installed two ion beam lines for the ordinary and heavy ion RBS analysis, TOF-ERDA, High energy ion implantation and Ion channelling analysis. These two lines are already used for experiments. We also started installation of the third ion beam which will be equipped with flexible target chamber for simultaneous analysis by PIXE, PIGE, RBS. We also plan to extend this line for the external beam applications. The fourth line will be dedicated to ion microprobe and is planned to be finished during years 2007-2008.

The first beam lines constructed at the accelerator was **the high energy implantation line**. The line itself was designed and completed in our laboratory, using key components are from several different vendors. The scanning system and the neutral ion beam trap was supplied by the National Electrostatics Corporation (NEC) USA, the implantation chamber was bought from HVEE and the vacuum beam line components and pumping system was supplied by the Vacuum Praha and Pfeiffer companies. The implantation control and operating code is based on LabWIEW and was developed by ourselves. The sample chamber is equipped with the sample carrousel for 12 samples of 2,5 inch in diameter. Additionally we equipped the sample chamber with the step motor control of the carrousel movement, so an automated implantation of more samples is now available. The maximum energy is 2.5MeV per charge state. For Si4+ it is 10MeV, for H+ 2.5MeV. The lowest available energy is limited by the parameters of the accelerator (stable high voltage generation and stripping conditions) and it is about 300keV. The typical implanted doses range from 1x109 to 1x1016 ions/cm2. The minimum doses are limited by the dose control, which is based on the charge measurement. The high doses are limited by the parameters of the Tandetron ion source, reasonable time of the implantation and by the sample stability. The implanted dose can be further increased by scanning over smaller area. However only time control of the implanted dose can be used in this case.
There is also a demand for the implantation of very low doses. For this purpose we are now developing special system based on a very narrow slit and single scan shot. We expected to be able implant defined doses down to 1x103 ions/cm2.

The TOF-ERDA spectrometer was designed constructed and set into operation at our laboratory during the 2006 year. We appreciate grate assistance, support and cooperation of Rossendorf group. At present, the system consists of thin carbon foil start detector and particle energy detector, which also provides the stop time signal. In the near future the second stop detector will be added. We expect, this will further improve the spectrometer time resolution.

The RBS-Channelling setup is the only equipment which was fully supplied by external vendor. It was bought from NEC company USA and recently installed at -30 deg. beam line. The target chamber is equipped with fine goniometer with five degrees of freedom (x,y,z,θ,ϕ) and two charge particle detectors. Test experiments are now in progress. There is also a possibility to add additional X or γ-ray detector, so the PIXE or PIGE channelling experiments can be performed in future. The setup will be used for routine RBS-channelling and RBS measurements.

The +30 deg. beam line is designed **for the standard PIXE, PIGE and RBS** analysis. The sample chamber will be equipped with two X-ray detectors, γ-detector and two or more charge particle detectors for back and forward scattering detections. The scattering angle will be adjustable. The line is now under construction. The flexible design of target chamber allows also other utilization, as testing of new kinds of particle detectors or experiments with NRA.

The +10 deg. beam line is reserved for **an ion microprobe**. The microprobe procurement is realized with technical and financial assistance of IAEA. It is expected, that the microprobe line will be installed in 2008.

More information about our laboratory can be found at http://neutron.ujf.cas.cz/vdg/home.html