

Installation and performance of the Budapest-Hamburg proton microprobe

I. Kovács¹, A. Kocsonya¹, P. Kostka¹, Z. Szőkefalvi-Nagy¹, K. Schrang²,
A. Krüger³, M. Niecke³

¹*KFKI Research Institute for Particle and Nuclear Physics, Konkoly Thege
Miklós út 29-33, H-1121 Budapest, Hungary*

²*Mineralogisch-Petrographisches Institut, Universität Hamburg, Grindelallee 48,
20146 Hamburg, Germany*

³*Institut für Experimentalphysik, Universität Hamburg, Luruper Chaussee 149,
22761 Hamburg, Germany*

The 2 MeV proton microprobe of the I. Institut für Experimentalphysik, Universität Hamburg was stopped for financial reasons in 2001. The device including the control and data acquisition system has been reinstalled at the 5 MV Van de Graaff accelerator of the KFKI Research Institute for Particle and Nuclear Physics and upgraded for use of 2.5 MeV protons.

The focusing system is composed from three pairs of quadrupoles. The most distant one is used to focus the beam to the object slits. The next one is applied in front of the aperture slits in order to increase the proton beam divergence. The final strong focusing quadrupole pair and the scanning coils are located in front of the target chamber.

The fine focusing is performed by computer controlled procedure optimizing the contrast of the secondary electron image of a hexagonal copper grid. A beam diameter of 1.5 µm with 200 pA proton intensity has been achieved. The beam stability is increased by the automatic compensation for thermal beam drift. The effect of mechanical vibrations of the beam line on the proton beam is also discussed.

A detector arrangement of high flexibility was installed. For efficient detection of medium to high Z elements a large area Si(Li) detector is positioned immediately behind the target. At 120° a second Si(Li) detector of high energy resolution is placed for light element detection. The chamber is equipped with a channeltron for secondary electron detection and a Si detector for proton energy loss measurements. During the measurements event-by-event list data are collected and stored. Dedicated software package was developed for on- and off-line data evaluation.

The measurements concerning the time dependence of corrosion in cement due to the attack of sulphuric acid, and studies of elemental maps of otoliths are presented as first examples of application.