



Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/Restoration



The Laboratory of Ion Beam Applications (IBA) (http://iba.atomki.hu/index_en.html) is equipped with a 5 MV Van de Graaff electrostatic accelerator, as well as ion beam analytical facilities and instruments. The assortment of ion beams and their energy range makes it possible to apply most of the non-invasive ion beam analytical techniques used for the study of cultural heritage.

Expected users are scientists, curators, art historians, archaeologists, conservators, restorers who usually carry out research on materials with ion beams especially at a micrometer scale. The main fields of study are: a) materials alterations on samples (origin, products and mechanisms); b) provenance studies; c) characterization of micro-details of altered or unaltered materials e.g. to prevent further damages; d) studying of the manufacturing techniques for a contribution to art-historical studies; e) characterisation of the artwork conservation state or the effectiveness of a conservation treatment.

The following methods are available for research on cultural heritage materials: Particle Induced X-ray Emission technique (PIXE), Rutherford Backscattering Spectrometry (RBS), Particle Induced Gamma-ray Emission technique (PIGE), Nuclear Reaction Analysis (NRA), Elastic Recoil Detection Analysis (ERDA) and Scanning Transmission Ion Tomography (STIM).

Beam lines are included in CHARISMA project:

- Macro-PIXE line for bulk analysis of samples in the Mg-U atomic number range with a milli-beam (Fig. 1)
- Oxford Microbeams Scanning Nuclear Microprobe (SNM) facility (Fig. 2) for analysis of samples from H to U with high lateral resolution; with a micro-beam (1 μm beamsize).

Expected analyses at our infrastructure are: elemental composition, lateral and depth distribution of the elements, elemental mapping, surface topography as well as 2D tomography. The sample chambers are equipped with several detectors. In case of SNM an ultra thin windowed and a Be windowed Si(Li) X-ray detectors are used for the simultaneous detection of elements from Carbon to Uranium. Gamma ray detectors (HPGe and in request Clover-Ge-BGO) are available for PIGE analysis and depth profile measurements of light elements. Particle detectors are installed for RBS and NRA analysis. ERDA setup is applied for hydrogen detection. The data acquisition (DAQ) system consists of an ATOMKI-type Digital Signal Processor at the Macro-PIXE setup and an OM_DAQ and Canberra/Genie-2000 DAQ at the SNM. Auxiliary instruments are also available (http://iba.atomki.hu/facilities_en.html) e.g. XRF setup, optical microscopes, ultrasonic cleaner, evaporator for surface coating.

Services offered within FIXLAB

Access to the ATOMKI IBA service is given in hours. 8 hours/day measurement time is planned but for technical and scientific reasons continuous run (24 hours/day) can also be implemented. The minimum duration of stay is 2 days and it can not exceed 5 days.

Data evaluation is promoted by the assistance of the scientists of the IBA laboratory of ATOMKI-HAS while data interpretation is done by the users.



Cultural Heritage Advanced Research Infrastructures: Synergy for a Multidisciplinary Approach to Conservation/Restoration



Please note: the ATOMKI-HAS can provide only in-vacuum measurements with ion beams within this project.

BEAMLINE /SET-UP	PARTICLES	E (MeV)	BEAM DIAMETER	I (nA)
Macro-PIXE	H ⁺	2	1-5 mm	0.1-30
Scanning Nuclear Microprobe	H ⁺ , He ⁺	0.7-4.0	1 μm	0.01-1

Contact Persons:
Name: Dr. Zita SZIKSZAI, Dr. Zsófia KERTÉSZ
Telephone: (+36)52509211, Fax: (+36)52416181
Email: charisma@atomki.hu

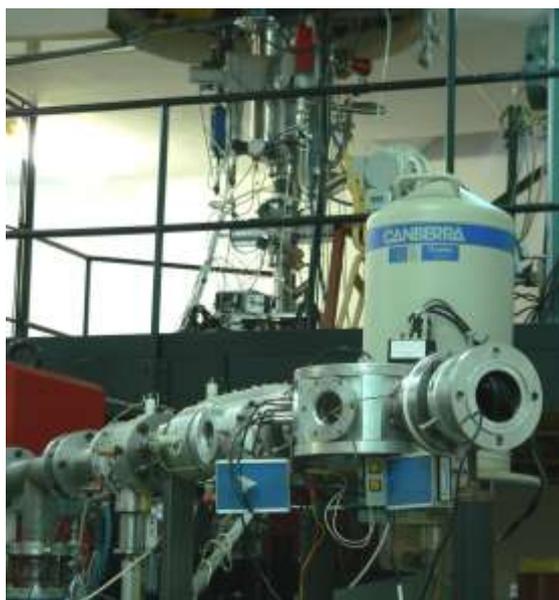


Fig. 1. Macro-PIXE line



Fig. 2. Oxford Microbeams Scanning Nuclear Microprobe