PART II (Portable ART Analyzer) – Development of a Portable Micro X-ray Fluorescence Spectrometer Adapted for the Special Needs for the Study of Artworks in the Kunsthistorisches Museum, Vienna

G. Buzanich\textsuperscript{1}, C. Streli\textsuperscript{1}, P. Wobrauschek\textsuperscript{1}, A. Markowicz\textsuperscript{2,3}, D. Wegrzynek\textsuperscript{2,3}, E. Chinea-Cano\textsuperscript{2}, M. Grieser\textsuperscript{4} and K. Uhlir\textsuperscript{4}

\textsuperscript{1)} Vienna University of Technology, Atominstitut, Stadionallee 2, 1020 Vienna, Austria
\textsuperscript{2)} Agency’s Laboratories Seibersdorf, International Atomic Energy Agency, 2444 Seibersdorf, Austria
\textsuperscript{3)} AGH University of Science and Technology, Faculty of Physics and Applied Computer Science, Department of Radiometry, Al. Mickiewicza 30, 30-059 Krakow, Poland
\textsuperscript{4)} Conservation Science Department, Kunsthistorisches Museum, Burgring 5, 1010 Vienna, Austria

A portable focused-beam x-ray fluorescence (XRF) spectrometer was designed and manufactured taking into account the requirements for the analysis of various museum objects in terms of material, size and shape. The spectrometer is equipped with a vacuum chamber enclosed with 8\(\mu\)m thick Kapton\textsuperscript{TM} film window allowing the detection of chemical elements from Na upwards, which enables the characterization of glass and enamel objects. Two low power X-ray tubes, one with a Mo-anode and a Cr-anode, operating from 4 to 50kV and 0 to 2.5mA with a maximum power of 50W and a point focus of 180\(\mu\)m for the Mo-anode and 120\(\mu\)m for the Cr-anode tube can be used alternatively as excitation source alternatively. A polycapillary lens with a spot size of about 150\(\mu\)m is used for focusing the primary beam to access small details of the different objects, e.g. single strokes of a fine brush in paintings. The vacuum chamber can be pumped down to about 1mbar by using an oil free membrane pump.

A miniature camera is installed inside the chamber for inspecting the analyzed area through the Kapton\textsuperscript{TM} window. Two laser pointers mounted inside the chamber cross at about 1mm distance outside of the chamber coinciding with the focal point of the polycapillary and the position of the investigated spot. The excitation and x-ray fluorescence radiation paths are reduced to about 2mm minimizing the absorption losses. The laser pointers and the internal video system assist in precise selection of the spot to be analyzed. The design of the spectrometer was done to maximize the accessibility to all parts of the investigated objects through the use of translation stages and an innovative design of the detection head, especially the vacuum chamber. This poster shows the capability of the spectrometer to reach measuring positions in concave parts of objects and presents the determined detection limits of elements.