

XRF mapping with polycapillary optics for assessing sulfonate distribution in impregnated CTMP fibers

Farangis Foroughi^{1,2}, Henrik Bergman¹, Hafizur Rahman¹, David Krapohl¹, Dean Chapman², Ralf Hendrik Menk^{1,3}, Börje Norlin¹

(1) Mid Sweden University, (2) University of Saskatchewan, (3) Elettra Sincrotrone Trieste

Setup description and preliminary results

The setup consists of a MOXTEK 12 W X-ray source, equipped with polycapillary optics from MiniBeam by XOS. A silicon drift detector from AMPTEK, a Z123SSD spectrometer, is used to achieve XRF information. Two-dimensional stepping imaging is created using two Thorlabs linear actuators (ZFS25). A control interface is built in LabView using Thorlabs Kinesis driver software. To 3D-print a low-cost atmosphere chamber, polyethylene terephthalate glycol (PETG) is used (Fig. 1a).

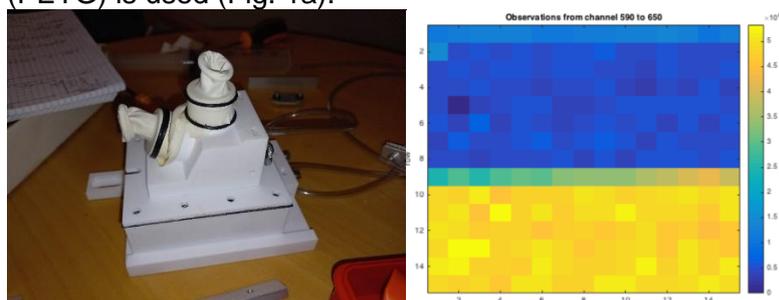


Figure 1: a) Left, 3D printed chamber. b) Right, Edge image of a Chromium film on plastic to verify the functionality. The intensity of the Cr peak is plotted. Step size is 1 mm

To exemplify scanning imaging of a chromium edge, a 1951 USAF resolution test target is used as an object. The $K\alpha$ peak intensity for the peak is imaged, and the edge image is evident (Fig 1b). The step size is 1 mm. The material shift is noticeable. (Fig 1b). To verify the ability to image sodium, spectra of NaCl are compared with and without helium. In the air, the Na $K\alpha$ peak is barely visible, while $K\alpha$ and $K\beta$ from argon in the air are visible. In a helium atmosphere, only the Na signal is the relevant signal in the spectrum.

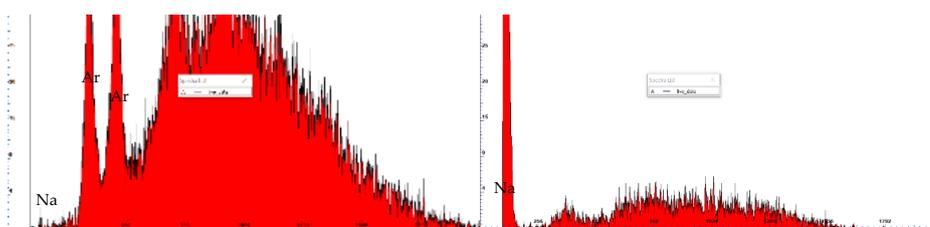


Figure 2: a) Left: Spectrum of NaCl in air. B) Right: spectrum of NaCl in helium atmosphere.

References

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