FILTERED TWO COLOR X-RAY MICROBEAMS FOR ENHANSEMENT IN SENSITIVITY OF LIGHT ELEMENTS

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A laboratory-based X-ray microprobe has been realized by utilizing a fine focus x-ray source (Rh target) and a poly-capillary (X-beam, XOS) equipped with a scanning stages and a Si PIN detector. The incident beam size on the sample is less than 20 μm for 20 keV x-rays in horizontal and vertical directions, and trace characterization and imaging can be carried out by measuring x-ray fluorescence from a sample.

To reduce background in the x-ray fluorescence spectrum an adequate filter is installed between the x-ray source and the poly-capillary. An Al filter of 696 μm thick transmits 60 % of Rh Ka line from the source. Owing to the reduced background around Cu Ka line the detection limit for Cu was 3.2 pg (0.18 nm) for 100 s data acquisition time. However, quasi monochromatic excitation realized by the filter is similar to that with the typical synchrotron light source, and the sensitivities for light elements are getting poorer as the absorption edge of the element becomes far from the excitation energy. To overcome with the weak point two color microbeams were produced by a filter that has an absorption edge between 4 keV to 10 keV. A Cu filter of 20 μm thick shows large transmittance below the Cu K edge, and the sensitivity for Ca could be improved by the factor of 12. With the selection of an adequate filter optimized sensitivities can be realized simultaneously for the wide range of elements.