ELEMENT ANLYSIS BY X-RAY FLUORESCENCE IMAGING WITH WOLTER MIRROR

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Introductoin

X-ray fluorescence (XRF) has been widely used for trace element analysis. In recent years, many approaches have been developed for XRF micro-analysis. All these methods utilize X-ray microprobes to get high spatial resolution. As a result, an x-ray fluorescence image is obtained with scanning microscopy. XRF analyses with scanning mode are good for quantitative and multi-elemental analysis but not for observing the samples at a time.

In order to overcome this difficulty we proposed and developed the XRF imaging with a Wolter mirror as an objective lens.

Experimental

The experimental arrangement is shown in Fig.1. Monochromatic x-rays in the energy range of 6-10 keV were used for excitation of fluorescent x-rays of specimens. The generated fluorescent x-rays were focused on a CCD by a Wolter mirror. Fig.2 shows the parameters of the Wolter mirror.

Results

Several x-ray fluorescence images were obtained. Fig.3 shows the x-ray fluorescence images of several wires (Cu, Ni, Co, Ti; ϕ50μm, Fe; ϕ100μm). The excitation x-ray energy of the left image was 10 keV. The right image shows the subtraction of fluorescence images of the excitation x-ray energies above and below the Fe absorption edge. The Fe wire could be clearly distinguished.

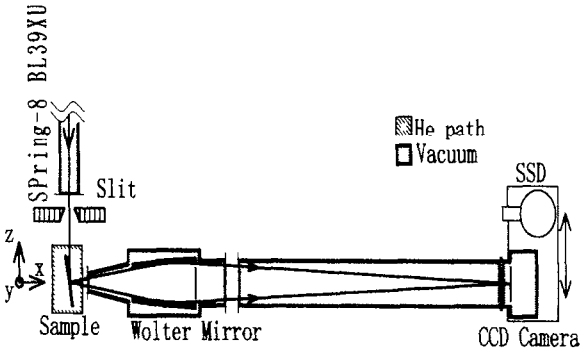

Fig.1 Schematic diagram of the experimental Arrangement

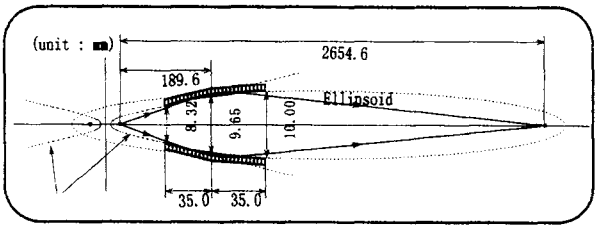

Fig.2 Parameters of Wolter Mirror

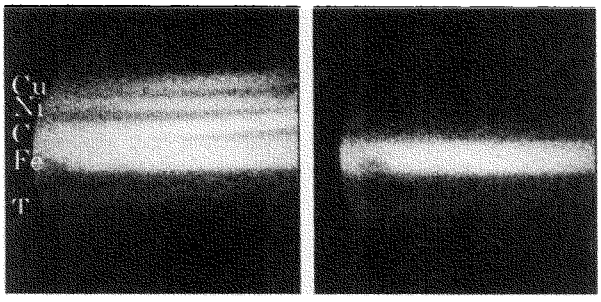

Fig.3 X-ray fluorescence image of several wires (Cu,Ni,Co,Fe,Ti wires)
(left) incident x-ray energy 10.000 keV
(right) subtraction between images of the excitation x-ray energies above and below the Fe absorption edge (7.122-7.102 keV).