

Chemical state analysis of trace elements with a scanning x-ray microprobe

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Brilliant undulator radiation from SPring-8 is attractive for x-ray microscopy and spectroscopies. We have developed an x-ray microprobe system for x-ray fluorescence (XRF) analysis and spectroscopy at BL39XU. Fig. 1 shows a schematic illustration of the x-ray microprobe system. The chamber can be evacuated by an oil-free evacuation pump, and atmospheric and vacuous environments can be selected. A pinhole of 10 to 50 μm placed approximately 50 m from the source is used to define the beam size. Owing to the extremely small beam divergence between the pinhole and the sample, the beam size on the sample is identical to the pinhole size under the normal incidence condition. To collect x-ray fluorescence (XRF) signals, both a conventional energy dispersive spectrometer using a Si(Li) detector and the wavelength dispersive spectrometer are attached. These spectrometers can be switched by rotating the sample surface. In the wavelength dispersive spectrometer the central Bragg angle of the analyzer crystal is fixed to be 21 deg. 10 analyzer crystals can be mounted on the crystal revolver and an adequate analyzer crystal is remotely selected for the energy range of interest. The distance between the sample and the position sensitive proportional counter (PSPC) is 200 mm and the energy resolution, $\Delta E/E$, of 1/400 is expected around 8 keV when the PSPC is used.

Fig.2 shows transmitted x-ray image of a nickel grid which has 2000 patterns per inch. The pinhole of 10 μm was used for this measurement. Capabilities for trace elemental analysis was examined by measuring metal thin films evaporated on Mylar and results were quite promising for the future application of the microprobe.

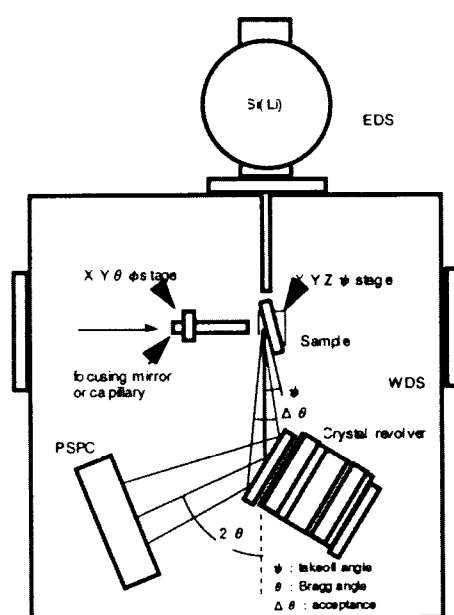


Fig. 1 Schematic view of the x-ray microprobe system.

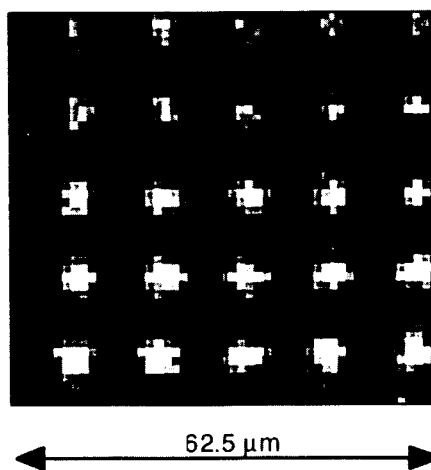


Fig.2 transmitted x-ray image of a Ni grid #2000.