High resolution x-ray fluorescence spectroscopy and spin selective XAFS

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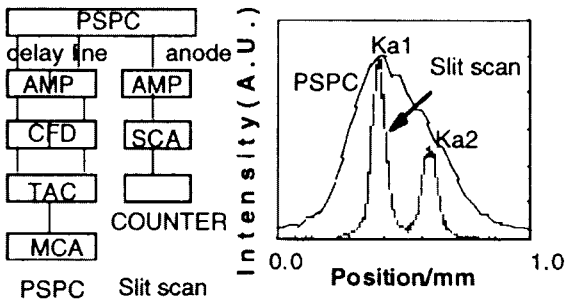
We have developed an x-ray microprobe system for x ray fluorescence (XRF) analysis and spectroscopy at SPring-8 BL39XU. As described in the previous paper [1] a small sized x-ray beam is advantageous not only for the site specific analysis but also for realizing a high resolution XRF spectrometer which is composed of a flat analyzer crystal and the position sensitive proportional counter (PSPC). Energy resolution of the present spectrometer is determined by the spatial resolution of the PSPC and an additional movable slit can be used for realizing spatial resolution better than 200 μm. Figs.1 show circuits of the spectrometer and Cu Kα1,2 x-ray spectra from the conventional x-ray source. The energy resolution of the spectrometer using the PSPC is similar to the energy difference between Kα1(8028eV) and Kα2(8048eV) and it can be improved by using a slit scan method.

Fig. 2 shows x-ray spectra measured from a commercial nickel foil of 8 μm in thickness by using the spectrometer with the Si(111) analyzer crystal. The beam size was around 100 μm on the sample and the takeoff angle was 20 degree. The foil contains iron and manganese as impurities, and the concentrations are 2530 ppm and 1480 ppm for iron and manganese, respectively. The peak which changes its position and intensity as a function of the excitation x-ray energy is attributed to the resonant inelastic scattering. The asymmetrical spectral shape is similar to that reported by Sparks [2]. During this measurement the spatial resolution of the PSPC was degraded owing to the electrical noise and the resultant energy resolution became around 100 eV. These problems were managed recently, and the resonant XRF measurements with better energy resolution will be carried out in the near future.

References
1) S. Hayakawa et al., Proc. of SRI97 in press.
2) C. J. Sparks, Jr., Phys. Rev. Lett. 33, 262(1997).



Figs.1. configuration of circuits for PSPC (left) and dispersed Cu Kα1,2 spectra measured with the PSPC and the slit scan(right).

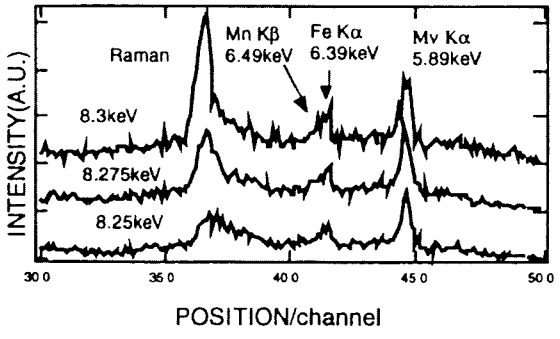


Fig.2. X-ray spectra from a Ni foil measured with x-rays around the Ni K absorption edge.