Feasibility tests of Johansson-type X-ray fluorescence spectrometer

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Developing an advanced X-ray fluorescence (XRF) spectrometer is essential for realizing chemical analysis of ultra trace metals, since the conventional Si(Li) spectrometer often leads to unsuccessful separation from the scattering background or different X-ray peaks. One could encounter the saturation of the detector system as well. Besides evaluating a super-conducting tunneling junction detector (K.Sakurai, 1997B0021-NM), another preliminary experiments with a Johansson-type spectrometer have been carried out.

Photo 1 shows the spectrometer, which has been assembled at the NRIM (National Research Institute for Metals, Tsukuba). A Ge(220) analyzing crystal (Rowland radius 350 mm) and a NaI:Tl detector with a 0.15 mm receiving slit were employed. The spectrometer is equipped with 3 linear stages and a 1-axis goniometer for angular scan. Typical spectra obtained are shown in Figs 1 and 2. One can confirm that it has sufficient energy resolution to separate different elements, and even the measurement of resonant XRF spectra is performed in reasonably short time. Optimization of efficiency is currently planned to measure trace systems. We thank Drs. K.Hayashi and C.Numako for their assistance.

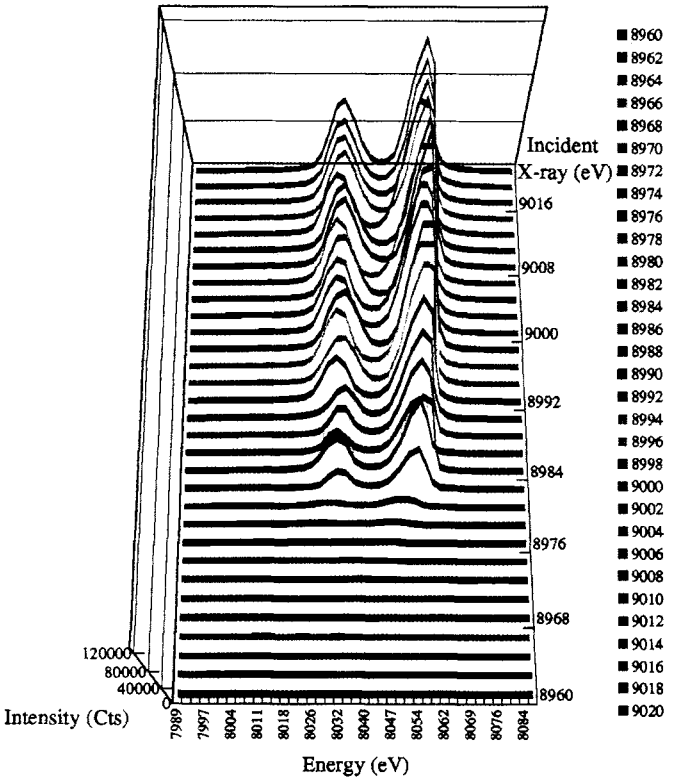

Figure 1 (up) Resonant XRF spectra (Cu $K\alpha_1$ and $K\alpha_2$ from 6 μm Cu foil). Measuring time for one XRF spectrum is ca. 3 min. Incident beam 0.2 x 2 mm^2.
Figure 2 (down/right) XRF spectrum of Cu-Ta alloy powder (10keV excitation). Measuring time 25 min.
Photo 1 (down/left) NRIM Johansson spectrometer used for the present feasibility tests.