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A Soft X-ray Emission Spectrometer with High-energy Resolution for Electron Probe Microanalysis

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A soft X-ray emission spectroscopy (SXES) with high-energy resolution is very useful to determine the chemical bonding state of various compounds. Terauchi et al[1)] reported that the spectrum of the Al-L band in Al metal had successfully been observed with an high energy resolution of 0.2 eV, using TEM equipped their SXES.

An improved SXES with a newly designed diffraction grating has been developed. This can measure spectra with a wider energy range from 50 to 200eV in which energy range are included representative peaks such as Li-K(55eV), Al-L(70eV), Si-L(100eV) and B-K(180eV). This SXES can be equipped not only with TEM, but also with EPMA.

Figure 1 shows an external view of EPMA JXA-8100 equipped with the SXES, together with EDS (energy dispersive spectrometer) and WDS (wavelength dispersive spectrometer). These three types of spectrometers covering a wider energy range can serve as complementary roles. For example, EDS can be used to quickly determine the constituent elements qualitatively. WDS can be used for quantitative analysis. SXES covering a lower energy range, on the other hand, can be used for chemical bonding state analysis.

Figure 2 shows three kinds of SXE spectra: Al-L in Al metal-K, Li-K in LiF and C-K in graphite, measured with the SXES equipped on EPMA. The enlarged spectrum of the Al-L band in Al metal is shown in Fig. 3. In this figures, the high energy resolution of these spectra can be noticeable. Several other data on chemical state analysis will be reported with the use of improved SXES equipped on EPMA.

This development is conducting as one project of Collaborative Development of Innovative Seeds(Practicability verification stage) by Japan Science and Technology Agency.

Reference

1) M.Terauchi, M.Koike, K.Fukushima and J.Kimura: 16th Inte. Conf. Microscopy , 892 (2006).

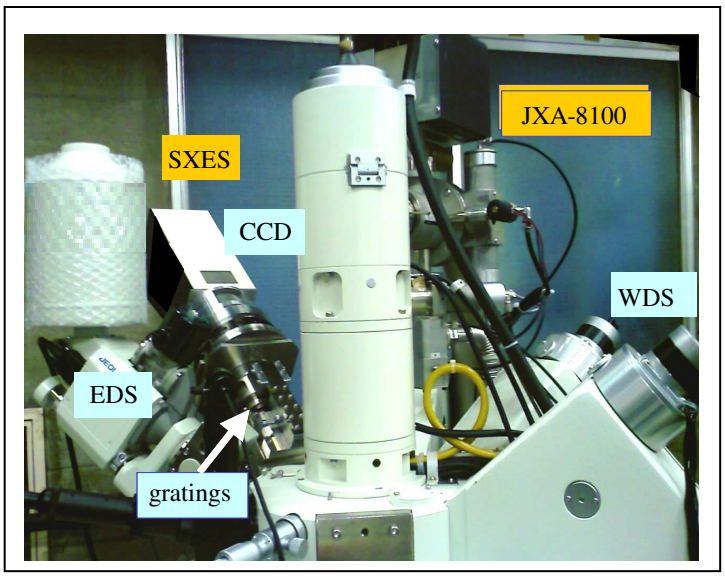

Fig. 1. An external view of EPMA JXA-8100 installed with SXES, EDS and WDS

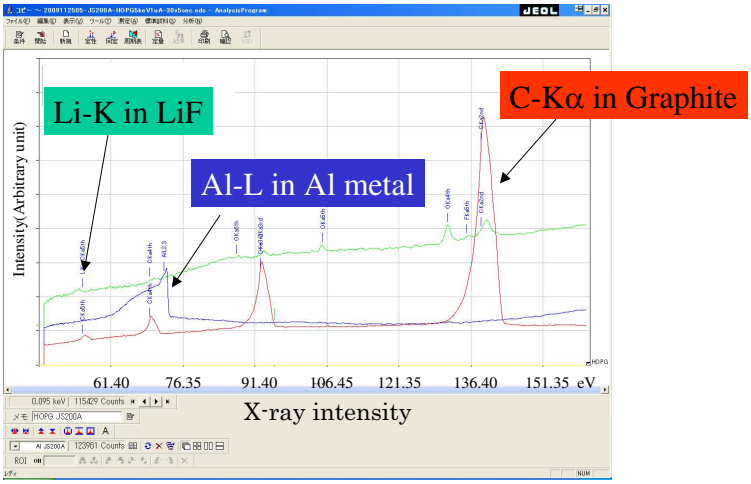

Fig. 2. The spectra of Al-L band in Al metal, Li-K in LiF and C-K in graphite measured with SXES.

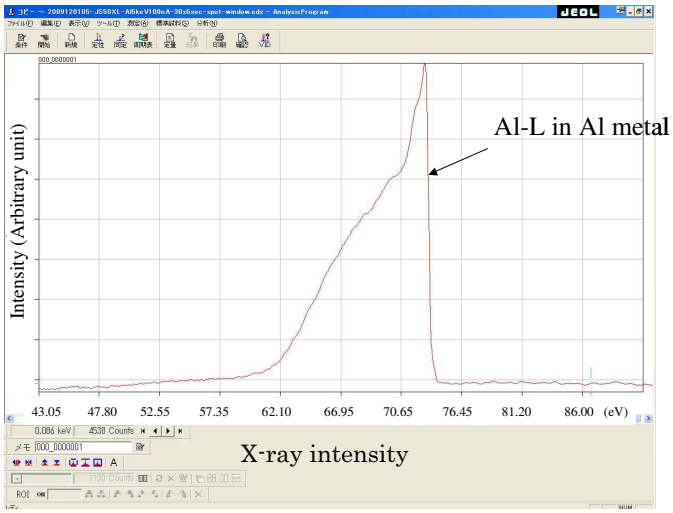

Fig. 3. The enhanced spectrum of the Al-L band in Al metal.

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