Lα/Lβ INTENSITY RATIO DEPENDS ON THE SPECTROMETER RESOLUTION

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Figure 1 shows XRF spectra of the Pb metal by a WDX spectrometer with the change of the Soller slits. The Lα/Lβ intensity ratio changes as the change of the Soller slits resolution. Figure 2 shows the L series line position as a function of atomic number. It is found that the ordinary Pb Lβ is the mixture of $L\beta_1$+$L\beta_2$ but they are separated for Bi (neighbor element). Thus the Lα/Lβ intensity ratio changes as the atomic number changes. Figure 3 compares the Pb spectra measured (i) by a high resolution double-crystal XRF spectrometer, and (ii) by a typical ED-XRF. The quantum mechanics predicts $L\alpha_2$:$L\alpha_1$:$L\beta_1$ = 1:9:5, which is observable by a high resolution spectrometer, but the EDX spectra does not show this ratio. The Lα/Lβ intensity ratio depends on (1) atomic number, (2) chemical state, (3) concentration, (4) X-ray tube voltage, (5) target, (6) filter, (7) spectrometer resolution, (8) counting rate, (9) powder grain size, (10) surface roughness, and (11) self-absorption.

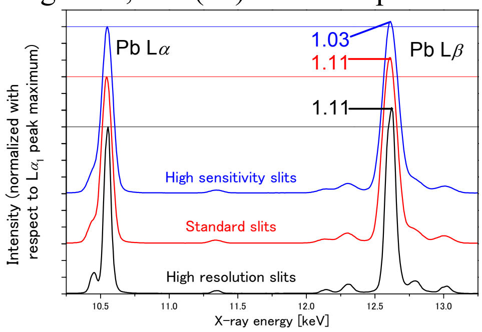

Fig.1 WDX spectrometer resolution dependent intensity ratio.

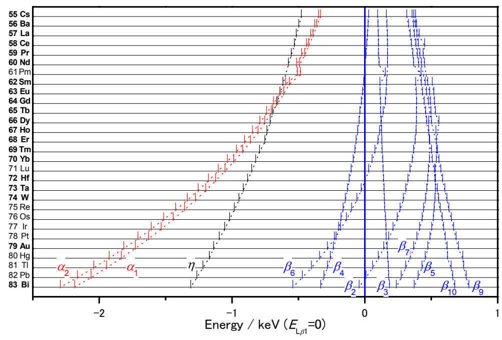

Fig. 2 Atomic number dependent L line series energy

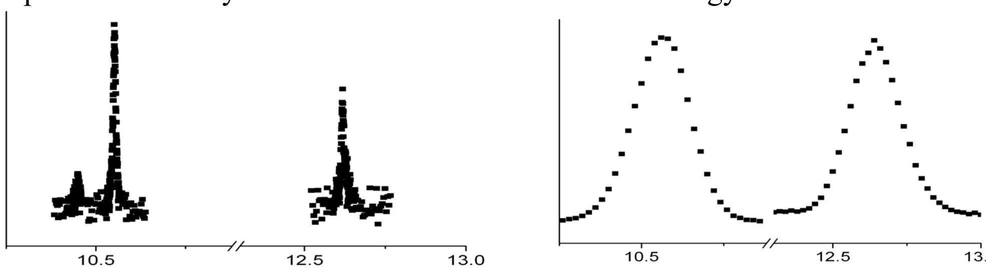

Fig.3 (Left) Double-crystal spectrometer measured Pb Lα and Lβ, where $L\alpha_2$:$L\alpha_1$:$L\beta_1$ = 1:9:5, (Right) ED-XRF, where Lα:Lβ=1:1.