Development of confocal line X-ray fluorescence instrument and application to layer structure samples

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Confocal micro XRF (CM-XRF) method obtains the three-dimensional elemental distribution. The measurement area in CM-XRF is approximately 10^3 μm^3, because polycapillary lenses are well used to focus the X-rays. When this method is applied to sample with layer structure, it is not necessary to obtain the 2D plane imaging. To reduce the measurement time for obtaining the 2D depth profile, we proposed confocal line XRF (CL-XRF) method. In this research, we developed a prototype CL-XRF instrument, and evaluated performance of this instrument.

Developed instrument was equipped with a high-power X-ray tube, a silicon drift detector (SDD), and limited slits. Limited slits that were placed in front of X-ray tube and SDD were used to prepare the thin X-ray beams. To evaluate this instrument, depth resolutions were determined by using thin metric films. As the result, the depth resolution of each element was approximately 100 μm. We prepared the layer structure sample by combining the Ni and Zn films and Kapton films (Thickness: 50 and 200 μm) as a spacer. Ni Kα and Zn Kα peaks separated in the depth profile when a Kapton film of 200 μm was used, while these peaks overlapped when thin Kapton film was used as spacer. Therefore, we think that obtained depth resolutions were reasonable.