Improvement of Detection Limit for Particle Contamination by Confocal Configuration in X-ray Fluorescence Microscope

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Highly sensitive measurement of minute particle contamination in a material is necessary for quality control. When measuring a small particle, using micro XRF system, XRF from this particle and from base material is detected, therefore the background noise is high. In this configuration, polycapillary lenses are placed after generator and before detector, to focus generated and emitted X-rays.
To be able to detect and quantify the contamination elements selectively, confocal configuration is recommended. This way, X-ray is collected only from confocal volume [1].
As a result, the S/N ratio is improved due to reduction of the scattering X-ray from base materials and contamination particles can be detected with high sensitivity.
In this study, we examined and compared the S/N ratios for the same particles measured by micro XRF [2] and confocal micro XRF [3].
We used 2 mm thickness of acrylic plate contaminated with 20 µm copper and iron particles. We examined and compared the XRF peak and background intensities by micro XRF with and without confocal configuration.

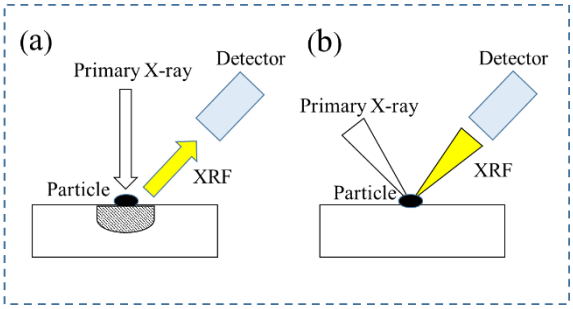

Fig.1 Schematic drawing of (a) Micro XRF and (b) Confocal micro XRF

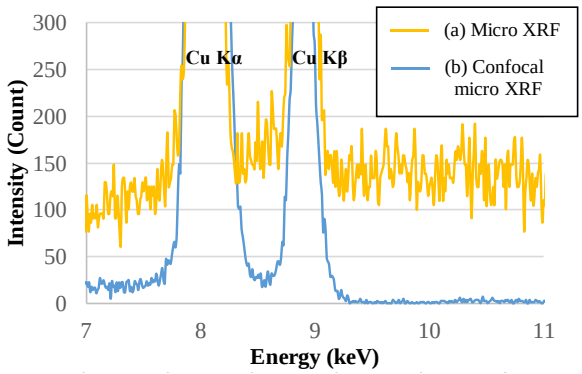

Fig.2 Spectra of (a) Micro XRF and (b) Confocal micro XRF

The signal to noise ratio (S / N) was calculated by dividing the peak net intensities by the background intensities.
We found that the confocal micro XRF has a S / N ratio 6 or 7 times higher than micro XRF.

References

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