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Application of Schottky Type Field Emission Electron Probe Microanalyser Equipped with Wavelength Dispersive X-ray Spectrometer

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50 years have passed scince the development of Electron Probe Microanalyser (EPMA), and now it has been used for many fields, i.e. mineralogy, geology, metallurgy, and recently industry. In the industrial fields, finer evaluation methods have been required in submicron scale, in order to obtain X-ray images with higher spatial resolution, lower accelerating voltage and/or thin film methods have been applied.

In case of the lower accelerating voltage, however, there is a limit in the kind of usable characteristic X-ray and the thin film method needs more skillful techniques and longer time for a sampling than the case of bulk sample. For this requirement, the EPMA equipped with LaB6 emitter has been developed, which gives X-ray images of higher spatial resolution than EPMA equipped with W-filament emitter. Moreover, along this tendency, the Schottky type field emission EPMA (SFE-EPMA) had been developed[1)]. For trace element analysis and for getting better peak to background ratio of the X-ray signal, this EPMA has been equipped with a wavelength dispersive X-ray spectrometer (WDS). Since the X-ray diffusion range depends on the accelerating voltage in the point analysis, for scanning method of line and mapping analysis, a finer electron beam is found to be effective for obtaining the higher spatial resolution. The SFE-EPMA is possible to attach 5-channel spectrometers maximum. The electron gun is kept in a sufficiently higher vacuum pressure and the electron beam current is kept stably, because this gun system is separated from the specimen chamber by the differential pumping system.

For the higher spatial resolution of X-ray images, SFE-EPMA has been applied to metallurgy and ceramics. The ability of this instrument to maintain the higher probe current can make possible to analyze trace and small regions with WDS. We applied SFE-EPMA to a ceramic including fayalite and slag. FIG. 1 shows the comparison of the maps of Si, Fe and secondary electron images obtained with an SFE-EPMA and a W filament EPMA.

Reference

[1] T. Kimura: 4th KVS-Surface Analysis Science Journal 2002.

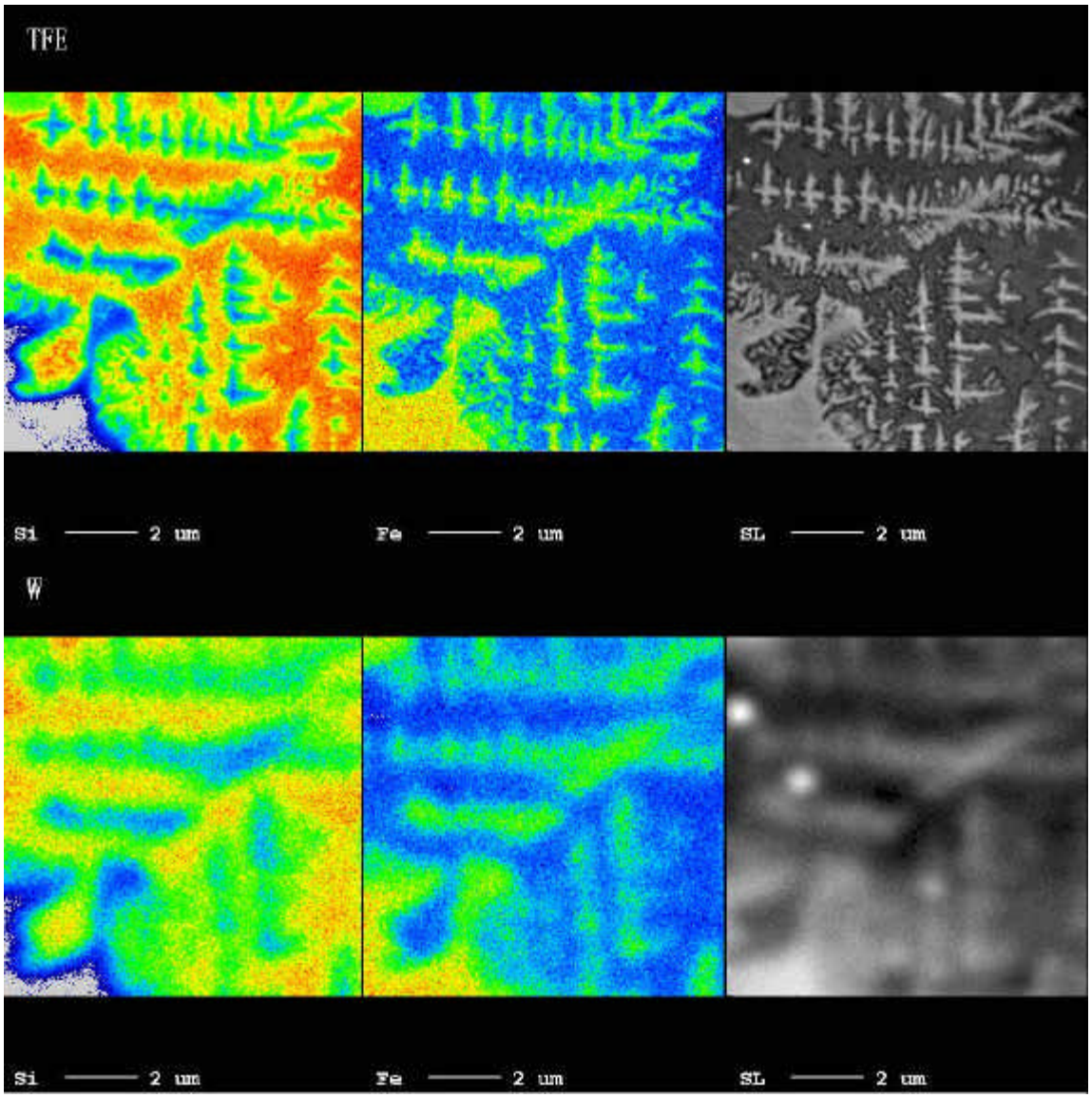

FIG. 1. Comparison among the maps of Si, Fe and secondary electron images of a ceramic by the use SFE-EPMA and W filament EPMA.

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