

$\text{Fe}^{2+}/\text{Fe}^{3+}$ mapping with the electron probe micro analyzer (EPMA)

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The relative intensity of Fe $L\alpha_{1,2}$ and $L\beta_1$ X-ray emission peaks varies significantly with valence state and bond association. These emission peaks can be easily distinguished from each other by wavelength-dispersive spectrometer (WDS). A crystal whose 2d value is around 60 Å is suitable to analyze the first order of Fe $L\alpha_{1,2}$ and $L\beta_1$ X-ray emission peaks because of their wavelength. The second order of these peaks can also be analyzed by lead stearate (STE: 2d = 100.4 Å) crystal.

Although it is difficult to use 'peak seek' routine for mapping analysis, effects of chemical shifts can be suppressed by configuring spectrometer. The interferences of high orders of Si and Na emission peaks can be suppressed by pulse height analysis. Applying mapping technique to measuring Fe $L\alpha_{1,2}$ and $L\beta_1$ emission peaks and calculating relative intensities of these peaks, $\text{Fe}^{2+}/\text{Fe}^{3+}$ mapping can be obtained using an electron probe microanalyzer (EPMA).