Micro-XANES study of the chromium oxidation state of natural ferropericlase

Shoko Odake[1]; Satoshi Fukura[2]; Masashi Arakawa[1]; Hiroyuki Kagi[1]; Atsuyuki Ohta[3]; Ben Harte[4]

[1] Geochem. Lab., Grad. School Sci. Univ. Tokyo; [2] Chemistry, Tokyo Univ.; [3] GSJ, AIST; [4] GeoScience, Edinburgh Univ.

Redox condition of the Earth's interior is a much-discussed subject these days, because it influences various properties such as phase relationship, water content, elastic property, electrical conductivity, etc. In general, redox condition of the Earth's interior was estimated from the valence of Fe. However, the redox state of the Earth's lower mantle is still unclear. This is partly because valence of Fe in lower mantle minerals is independent of the redox state of lower mantle. According to Fukura (2006), the Cr^{3+}/Cr^{2+} value of synthetic ferropericlase changed according to the oxygen fugacities. It strongly suggests that the valence of chromium changes with the oxidation fugacity where ferropericlase formed. In this study, we focused on the oxidation state of chromium in ferropericlase for searching a proper indicator of redox state of the Earth's lower mantle. We investigated Cr X-ray absorption near-edge structure (XANES) spectra of natural ferropericlase samples. Four natural ferropericlase grains were recovered from lower mantle originated diamonds from Brazil and Guinea as inclusions. Three inclusions were picked up from the host diamonds and buried in epoxy mounts. And the other one was measured within diamond. Micro-XANES spectra were recorded in the fluorescence mode at the beamlines BL4A of the Photon Factory, KEK, Japan. The intensity ratio (Cr^{3+}/Cr^{2+}) was calculated using least-squared fitting method. Further details about the results of micro-beam XANES measurements will be presented.