7C/1999G257

Characterization of natural chromite samples from ophiolite complexes in the Philippines

Akihito KUNO*, Motoyuki MATSUO
The Univ. of Tokyo, Komaba, Meguro-ku, Tokyo 153-8902, Japan

Introduction

Natural chromites show a very wide compositional range and crystallize in spinel structure AB_2O_4, where A refers to a divalent metal ion (Fe^{2+}, Mg^{2+}) in tetrahedral site and B refers to a trivalent metal ion (Cr^{3+}, Fe^{3+}, Al^{3+}) in octahedral site. In each unit cell of a face-centered cubic oxygen sublattice, 8 of 64 tetrahedral and 16 of 32 octahedral sites are occupied by cations. The distribution of the cations in chromites has an important bearing on olivine-spinel and pyroxene-spinel geothermometry, the spinel peridotite-garnet peridotite transition, and estimation of the oxygen fugacity in rocks of basic and ultrabasic composition. Although a number of investigations have been carried out on natural chromites, there have been few speciation studies on chromites from the Philippines, where one of the largest chromite deposits in the world is located. In this study, XANES spectroscopy has been applied to the characterization of natural chromite samples from ophiolite complexes in the Philippines.

Experimental

Samples were collected from two Philippine ophiolite complexes, Palawan and Dinagat. Both complexes host chromitite pods and layers of economic quantities and are hosted by depleted mantle rocks (harzburgite) with dunite selvage. For comparison, natural chromite samples from the Bushveld complex, South Africa, were also subjected to the analysis. The Cr and Fe K-absorption spectra of the samples were measured in fluorescence mode using a Si(111) double-crystal monochromator and a Lytle-type detector at BL-7C. The samples were also analyzed by ^{57}Fe Mössbauer spectroscopy, X-ray diffraction (XRD), and X-ray fluorescence spectrometry (XRF).

Results and discussion

Figures 1 and 2 show the Cr and Fe K-absorption XANES spectra of the different chromite samples, respectively. LG5 is a sample from South Africa measured for comparison. RS126(P) and RS142(P) are from Palawan complex while DIN38(D) and RSD11(D) from Dinagat complex. Although no significant variation was observed for the Cr XANES, the Fe XANES of Philippine samples shift to a higher energy side compared to the South African sample. This observation was consistent with speciation results by Mössbauer spectroscopy, and suggested that these Philippine samples were formed under relatively high oxygen fugacity [1].

References

[1] A. Kuno et al., J. Radioanal. Nucl. Chem. 246, 79 (2000).

* kuno@dolphin.c.u-tokyo.ac.jp

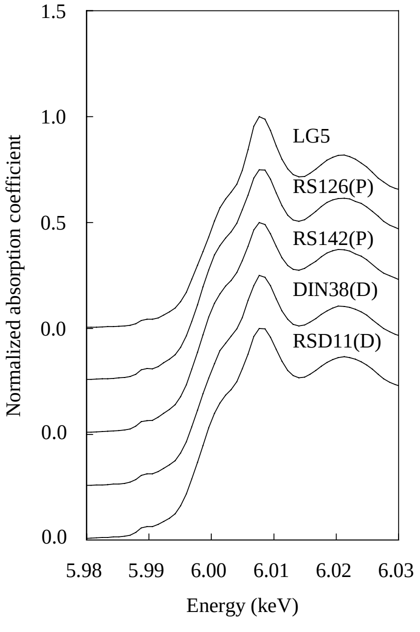

Fig. 1: Cr XANES spectra of the chromite samples.

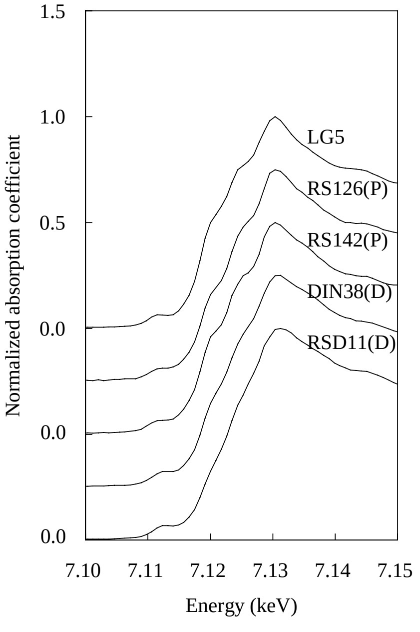

Fig. 2: Fe XANES spectra of the chromite samples.