

Molecular-scale mechanism of Mo isotopic fractionation during adsorption on ferromanganese oxides

TERUHIKO KASHIWABARA^{1*}, YOSHIO TAKAHASHI²
AND MASAHIRO TANIMIZU¹

¹Japan Agency for Marine-Earth Science and Technology (JAMSTEC)

(*correspondence: teruhiko-kashiwa@jamstec.go.jp)

²Hiroshima University

Molybdenum (Mo) shows a large mass-dependent isotopic fractionation during adsorption on ferromanganese oxides, which is responsible for isotopic composition of Mo in modern oxic seawater [1]. The aim of this study is to reveal the fractionation mechanisms of Mo isotopes during adsorption on natural ferromanganese oxides. We investigated surface complex structures of Mo on various Fe/Mn (oxyhydr)oxides, key factors for the isotopic fractionation, and compared them with previously-reported isotopic fractionation.

Our XAFS analysis showed that symmetry of surface Mo species is different from MoO_4^{2-} (Td) in seawater in the case of its adsorption on some solids. This structural information showed the excellent correlation with the degree of isotopic fractionation of Mo reported in previous studies: the proportion of Oh species or their magnitude of distortion in surface Mo species becomes larger in the order of ferrihydrite < goethite < hematite < $\delta\text{-MnO}_2$ [2], a trend identical to the degree of isotopic fractionation [3]. Based on the comparison with previous reports for surface Mo species on various oxides such as MgO , Al_2O_3 , and TiO_2 , the symmetric change from Td to Oh is suggested to be driven by the formation of inner-sphere complexes on specific sites of the oxide surfaces. In addition, the mode of attachment (inner- or outer-sphere) of surface Mo species is well correlated with the hydrolysis constant of the cation (e.g. Fe^{3+} and Mn^{4+}) in oxides.

- [1] Barling *et al.* (2001) *Earth Planet. Sci. Lett.* **193**, 447.
- [2] Kashiwabara *et al.* (2009) *Geochim. J.* **43**, e31.
- [3] Goldberg *et al.* (2009) *Geochim. Cosmochim. Acta*, **73**, 6502.

EPMA study of sulfides in ultramafic suites of J.C.pura belt, Western Dharwar craton, India

NAMRATHA R. KASHYAP* AND B.C. PRABHAKAR

Department of geology, Bangalore University, Bangalore 560056, India

(*correspondence: namratharkashyap@gmail.com)

Significant ultramafic magmatism has been recorded in the western part of the Dharwar craton, southern India. J.C.Pura schist belt is one such ultramafic milieu with abundant dunite and peridotite which have been extensively serpentинised. Their komatiitic nature and extrusive mode of formation is evident from the field study. Some of the dunite bodies are chromitite in nature and contain veins and stringers of chromite. Highly altered bodies of chromitite show strong development of magnesite veins. They contain complex nickel sulfides which have been studied by ore microscopic method, besides analysing by EPMA. Camica (France Make) EPMA system was used for EPMA. Polished thin sections were prepared for this study and through a preliminary study the mineral-spots were marked for the EPMA studies. Selected representative samples from different rock types of dunite/peridotites, pyroxenites and cumulus schistose rocks were identified for this study. The chemical composition of different ore phases and the identified mineral phases are presented. From the analysis it is deciphered that cobalt-nickel-pyrite and pentlandite make the most abundant ore phase among the sulfides followed by pentlandite-pyrohite-chalcopyrite assemblage. Occurrence of sulfides within the oxide phase (Chromite-Magnetite-ilmenite) is also noticed infrequently. This suggests to the possibility of sulfide evolution progressively with magma cooling. Strong immiscible and solid-solution relation are evident in the entire sulfide phase. The disseminated nature of them suggests to the possibility of poor sulfidation process during their formation i.e. either there was poor endowment of sulfur at the time of partial melting or during the ascent of magma through the crustal rocks. This is being reported for the first time for the J.C.Pura area. However detailed volcanic stratigraphy of the belt when studied, which is underway, and whole rock geochemistry including elemental ratios integrated, it will provide more insight in to the actual potential of the sulfides especially Ni sulfides in the said belt.