

Some innovative measurements and analyses of isotopically substituted molecules of geochemical interests

N. YOSHIDA

Department of Environmental Science and Technology, Tokyo Institute of Technology (naoyoshi@depe.titech.ac.jp)
 Department of Environmental Chemistry and Engineering, Tokyo Institute of Technology
 The Research Center for the Evolving Earth and Planets, Tokyo Institute of Technology

Isotopes have been used to trace the origin of materials and their cycles in geochemistry and cosmochemistry. Researches have been developing from single isotope analysis to multiple isotopes tracer analysis. Recent innovations in measurement have opened the frontier of the isotopomer analysis. The term isotopomer is used to involve any components arising from isotope substitution of materials including present IUPAC narrow definition of isotopically substituted isomer. Non mass dependent isotope fractionation (NMD-IF) of oxygen and sulfur containing molecules such as SO₂, multiple heavier isotopes substituted molecules such as mass 47 CO₂, and the preferential isotope substitution of different positions in a molecule species such as O₂ and N₂O are those representatives.

We have developed several measurement technologies, applied them to some molecules of geochemical interests, opened the methods, synthesized standards, and discussed wide open in the International Symposia on Isotopomers (<http://nylab.chemenv.titech.ac.jp/isi.html>). Some recent innovations in isotopomer measurements are briefly summarized, their applications to OCS, SO₂, CO₂, N₂O and some organic molecules are described, and their implications and the future perspectives will be discussed.

Rb-Sr isotopic systematics of two-pyroxenes and olivines from dunite channels, the Horoman peridotite complex, Japan

M. YOSHIKAWA¹ AND K. NIIDA^{2,3}

¹Beppu Geothermal Research Laboratory, Kyoto University (masako@bep.vgs.kyoto-u.ac.jp)
²Division of Earth and Planetary Sciences, Hokkaido University (kiyo@mail.sci.hokudai.ac.jp)

The Horoman peridotite complex is one of the freshest orogenic peridotite complexes in the world. Dunite channels occur as dykes of both large scale (several 10 meters width) concordant layers [1] and small scale (< several meters width) discordant layers [2]. The small scale dunite channels incorporate two-pyroxenes + spinel segregations and are interpreted as replacement in origin [2, 3]. In this work, we present the Rb-Sr isotopic compositions of olivine, orthopyroxene and clinopyroxene from dunite dyke swarm sample (Nos. SPR4 and 6) and the wall harzburgite (No. SPR14).

The data obtained and the previously reported [4] indicate that the orthopyroxenes and clinopyroxenes from both the channels and the wall harzburgite have reached equilibrium at a subsolidus-condition, or that the migrating melt was originated from the identical wall harzburgite. This melt-channelling event could generate around 50 Ma, coeval with that of the peak metamorphism of surrounding Hidaka metamorphic rocks. On the other hand, olivines from the SPR 4 and SPR14 are not plotted on the clinopyroxenes-orthopyroxenes line of the ⁸⁷Rb/⁸⁶Sr-⁸⁷Sr/⁸⁶Sr diagram. These findings lead to the inference that the olivines were re-equilibrated by later thermal event, because of their higher diffusion coefficient.

[1] Takahashi (1992) *Nature* **359**, 52-55. [2] Niida *et al.* (2002) *Abs. Orogenic Lherzolites & Mantle Processes*, 107-108. [3] Niida *et al.* (2006) *Geochim. Cosmochim. Acta* **70**, A445. [4] Yoshikawa *et al.* (2006) *Geochim. Cosmochim. Acta* **70**, A724.