Trace elements in grain-boundary component in mantle xenoliths from Far Eastern Russia

J. YAMAMOTO[1,2], S. NAKAI[2], I. KANEOKA[2], H. KAGI[3], K. SATO[4], V.S. PRIKHOD'KO[5] AND S. ARAI[6]

[1] Institute for Geothermal Sciences, Kyoto University, Beppu, 874-0903, Japan; jyama@bep.vgs.kyoto-u.ac.jp
[2] Earthquake Research Institute, University of Tokyo, 1-1-1 Yayoi, Bunkyo-ku, Tokyo 113-0032, Japan; snakai@eri.u-tokyo.ac.jp; ikaneoka@aol.com
[3] Geochemical Laboratory, University of Tokyo, 7-3-1 Hongo, Bunkyo-ku, Tokyo 113-0033, Japan; kagi@eqchem.s.u-tokyo.ac.jp
[4] IFREE, Japan Agency for Marine-Earth Science and Technology, 2-15 Natsushima, Yokosuka 237-0061, Japan; keisato@jamstec.go.jp
[5] Institute of Tectonics and Geophysics (Far-Eastern Branch, Russian Academy of Sciences), 65 Kim Yu Chen Str., Khabarovsk 680063, Russia; vladimir@itig.as.khb.ru
[6] Department of Earth Sciences, Faculty of Science, Kanazawa University, Kakuma, Kanazawa 920-1192, Japan; ultrasa@kenroku.kanazawa-u.ac.jp

Based on both major and trace element chemistry, we have constrained the occurrence of grain-boundary component in mantle wedge-derived xenoliths from Far Eastern Russia. Mineral separates and whole rock of the xenoliths were washed using hot nitric acid for extraction of grain-boundary components. The whole rock of one xenolith shows an apparent negative Ce anomaly and large depletion in high-field-strength elements (HFSE) with the W-type lanthanide tetrad effect. The trace element pattern of the whole rock is not correlated with those of constituent minerals, but rather the leachate. That fact suggests that the lanthanide tetrad effect and negative anomaly in Ce and HFSE in the whole rock are attributable to the presence of the grain-boundary component.

In order to distinguish these signatures, we analyzed trace element compositions of the grain-boundary using laser ablation ICP-MS. The grain-boundary component apparently included negative Ce anomaly. Also some kinds of melt inclusion show negative Ce anomaly. In contrast, such anomalies were not found in host alkaline basalts. That is, the grain-boundary component and some kinds of melt inclusion infiltrated into the Far Eastern Russian mantle before ascent of the host magma. The lanthanide tetrad effect and negative anomaly in Ce and HFSE in mantle rocks are generally regarded to be mantle metasomatism related to the specific subduction environments such as infiltration of aqueous fluid dehydrated from subducted slab. Because the Far Eastern Russia area was located at the subduction zone in the Jurassic - early Cretaceous Period, the present mantle rocks would have been infiltrated by fluid dehydrated from the subducted slab.