

Ultrapotassic Carbonatite Preserved in Orogenic Garnet Peridotite in the Continental Collision Zone

KOSUKE NAEMURA¹, SVOJTKA MARTIN², AND
TAKAO HIRAJIMA³

¹ University Museum, Nagoya Univ. Nagoya 464-8601, JAPAN (naemura@num.nagoya-u.ac.jp)

² Institute of Geology, Acad.of Sci.,Czech Republic, 16500, Praha-Lysolaje, Czech Republic (Svojtka@gli.cas.cz)

³Department of Geol. Mineral., Kyoto Univ. 606-8502, Kita-shirakawa Oiwake-cho (hirajima@kueps.kyoto-u.ac.jp)

In the Earth's uppermost asthenosphere corresponding to the seismic low-velocity zone (70-220 km) is generally characterized by high electrical conductivity, and small amount of carbonatite melt can explain the electrical conductivity. Prof. Dan McKenzie speculated that the asthenosphere melt is strongly enriched in incompatible elements and is ultrapotassic. Candidate of the asthenosphere melt has been found as brine inclusion in kimberlitic diamond, but highly chlorine nature suggest brines closely resemble to melts from subducted sediments.

In this study, we document another candidate for the asthenosphere melt from orogenic garnet peridotite from the south Bohemia, Moldanubian Zone of the Bohemian Massif. As this peridotite was derived from the great depth (>100 km), it has a chance to record the melt at the top of asthenosphere. The South Bohemian peridotite (SB peridotite) was recrystallized to garnet lherzolite assemblage at *ca.* 2.9 GPa and 950 °C, but it was originally stable in the stability of diamond (>4 GPa) evidenced by “ultrahigh-pressure (UHP) chromite” in garnet. Such UHP chromite grains ubiquitously contain multiphase solid (MS) inclusions, mainly consisting of aggregate of phlogopite, dolomite and apatite with minor priderite. The reconstructed melt composition of MS inclusions is ultrapotassic dolomitic carbonatite and is characterized by high LILE (Rb, Ba, Th, U), high K₂O/Na₂O ratio~100, (Ce/Yb)_N >100, and negative anomalies in Zr and Ti. Such an ultrapotassic carbonatite can be formed from the primitive mantle by low degree of partial melting (~0.1 %) and is served as a candidate for the asthenosphere melt.