

Heterogeneous distribution of platinum-group elements in mantle peridotites

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Platinum-group elements (PGE) in the Earth's mantle are key tracers for understanding the differentiation history of the Earth. PGE in mantle peridotite are strongly concentrated in base-metal sulfides, whereas platinum-group minerals (PGM), rarely found in peridotite, are additional potential phases that host PGE in the mantle. Since the modal abundances of discrete PGM are extremely low in peridotites, it has been thought that PGM play only minor roles for the PGE budget in the mantle except for Pt. Although PGM have been identified in peridotite from several locations, it is still unclear how abundantly and pervasively PGM exist in worldwide peridotite samples, which in turn makes it difficult to recognize the role of PGM for the distribution of PGE in the mantle.

Recently we have detected micrometer-size PGM from base-metal sulfides in a lherzolite sample from Horoman peridotite complex, using microbeam synchrotron radiation X-ray fluorescence technique (Kogiso et al., *G-cubed* in press). We investigated 16 base-metal sulfide grains in the sample (15 mm x 18 mm x 0.15mm thin section), and two of the 16 are associated with PGM. There are no systematic differences between the PGM-bearing and PGM-absent base-metal sulfides. The amounts of PGE in the PGM we found roughly correspond to ~10% of the whole-rock PGE budget. The whole-rock sulfur content (125 ppm) suggests that the thin section contains 100-600 grains of Fe-Ni-Cu sulfides, provided that the average size is around 30-50 micrometers. Therefore, if other base-metal sulfides we didn't investigated include PGM at a similar probability (i.e., ~2/16), the total amounts of PGE in whole PGM well exceed the whole-rock PGE abundances. This means that PGM are unevenly distributed within the lherzolite at a length scale much larger than the dimension of the sample.