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Redistribution of platinum-group elements in the lithosphere: hindrance to the estimation of abnudances in the mantle

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Platinum-group elements (PGE) in the Earth's mantle are key tracers for understanding the chemical differentiation history of the Earth's interior. In particular, PGE abundances in the primitive mantle are important indices to reveal detailed differentiation processes in the early Earth. The PGE abundances in the primitive mantle are generally estimated from PGE concentrations in natural peridotite samples, most of which derived from oceanic and continental lithosphere. However, it is difficult to estimate the PGE concentrations in a relatively undifferentiated mantle from PGE concentration data of natural peridotites, because PGE concentrations in natural peridotites are quite heterogeneous and don't seem to correlate with other chemical indices. Recent studies on PGE in natural peridotites have revealed that PGE in peridotite are mainly distributed in micrometer-scale platinum-group minerals as well as in 10- to 100-micrometer-scale base metal sulfides (e.g., Lorand et al., 2008, 2010; Kogiso et al., 2008). These studies also demonstrated that PGE in natural peridotites have been remobilized by sulfur-bearing aqueous fluid or silicate melt, although it is not clear where and when such remobilization processes occurred. In any case, it is highly probable that many of the natural peridotites that were used to determine PGE abundances in the mantle had experienced remobilization of PGE. Thus, it is not appropriate to estimate the PGE abundances in the primitive mantle using correlation of PGE with any indices that are thought to reflect "degree of melting" of peridotite. To know the original concentrations of PGE in peridotite samples, it is necessary to reveal the details of the processes that are responsible for redistribution of PGE in the lithosphere.

Rererences:

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