Trace elements in garnets of diamondiferous xenoliths from the Nurbinskaya pipe, Yakutia

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Rare earth elements (REE) and other trace elements were analyzed by LAM-ICPMS in garnets of about 150 mafic and ultramafic diamondiferous xenoliths from the Nurbinskaya pipe. Most garnets are homogeneous in terms of major- and trace-element contents. Garnets from ultramafic xenoliths define two groups, one with sinusoidal REE (chondrite normalised) patterns (10 harzburgites, two lherzolites) and one with flat MREE (lherzolites, some websterites).

Most eclogitic garnets have LREE-depleted patterns (Ce0 as low as 0.1), and no Eu anomalies. Heavy rare earth elements are variably enriched; most Lu varies 20-50. Most websteritic garnets show REE patterns similar to this but they are typically enriched in LREE with Ce0 (0.2-0.5). Garnets with nearly flat HREE and small positive Eu anomalies are common in coesite-bearing eclogites and those containing kyanite and/or corundum [1]. Another group of garnets (n=9) from eclogites and websterites have small negative Eu anomalies. These types of pattern commonly are interpreted as evidence of the reaction of plagioclase to garnet and used to support the origin of mantle eclogites by subduction of oceanic crust [1, 2], but may be simply a redox feature.

Garnets from highly aluminium eclogites show convex REE patterns enrichment in LREE and strong depletion of in HREE (Yb <5). Garnets of corundum-bearing eclogites commonly have positive slopes within the LREE, peaking at Sm and then slowly decreasing to about chondritic abundance for La. LAM-ICPMS analysis could be used to show how different populations within an eclogite xenolith series can document the heterogeneous evolution of the lithospheric mantle beneath cratonic areas.

References