The effects of melt depletion and metasomatism on S-Se-Te-PGE systematics of peridotite xenoliths from Kilbourne Hole, New Mexico

JASON HARVEY[1*], STEPHAN KÖNIG[2] AND AMBRE LUGUET[3]

[1]School of Earth and Environment, University of Leeds, Leeds, UK
[2]Department of Geosciences, University Tuebingen, Germany
[3]Steinmann Institut für Geologie, Mineralogie und Paläontologie, Rheinische Friedrich-Wilhelms Universität Bonn, Germany

While considerable attention has focussed on the effects of secondary processes on lithophile element abundances in the mantle, the effects of metasomatism on the concentration, mobility and fractionation of platinum group elements (PGE) and Re, and the strongly chalcophile elements Se and Te, has been the subject of less scrutiny. Critically, estimates of HSE and strongly chalcophile element abundances in PUM may have been derived by including a large number of metasomatized and refertilized samples whose HSE and chalcophile element abundances may not be representative of melt depletion alone. Peridotite xenoliths from Kilbourne Hole, New Mexico, USA, potentially provide an alternative means for testing existing assumptions regarding PUM HSE and strongly chalcophile element abundances. Superimposed upon the effects of melt depletion is the addition of metasomatic sulfide in approximately half of the xenoliths from this study, while the remaining half have lost sulfide to a late S-undersaturated melt. Despite these observations, the Kilbourne Hole peridotite xenoliths have HSE systematics that are indistinguishable from orogenic peridotites and peridotites used for the determination of PUM HSE abundances, with the exception of Os. Osmium in peridotite xenoliths is particularly vulnerable to the effects of supergene weathering and for this reason, peridotite xenoliths may not be suitable for making predictions of the abundance of Os in PUM. Despite earlier studies attesting to the relative immobility of Se during supergene weathering, low S, Se, Os and Se/Te in the Kilbourne Hole peridotites suggests that Se may be more mobile than originally thought. The behaviour of tellurium appears to be controlled by a different phase to that which governs the behaviour of the PGE, Re and Se. In particular, it appears that Te added to melt depleted peridotite in a metasomatic sulfide is more difficult to remove in a S-undersaturated melt than the PGE and Se.