Ru-Os-Ir alloys and Ru-Os sulfides from oceanic mantle: evidence for robustness of Os-isotope system

K. MALICH[1]*, I. BADANINA[1], E. BELOUSOVA[2], R. LORD[3], T. MEISEL[4], V. MURZIN[1] AND N. PEARSON[2]

[1]Institute of Geology and Geochemistry, Ekaterinburg, 620075, Russia (*correspondence: dunite@yandex.ru)
[2]Macquarie University, Sydney, NSW 2109, Australia
[3]University of Strathclyde, Glasgow G4 0NG, U.K.
[4]University of Leoben, Leoben 8700, Austria

This study presents the first extensive data set of Os-isotope compositions of intimately intergrown grains of Os-rich alloy and Ru-Os sulfide from deep portions of ophiolite sections from oceanic mantle. These are represented by samples from different in age ophiolite-type massifs (i.e., Neoproterozoic Hochgrossen in Eastern Alps, Austria, Paleozoic Verkh-Neivinsk in Middle Urals, Russia, and Unst, Shetland Islands, UK).

Two distinct platinum-group mineral (PGM) assemblages have been recognized. A 'primary' PGM assemblage at Unst [1] and Hochgrossen [2] is represented by solitary grains of laurite or iridian osmium and composite grains of laurite + osmian iridium ± iridian osmium, whereas a 'secondary' PGM assemblage is formed by laurite, Os-rich laurite, irarsite, osmium and Ru-pentlandite. A 'primary' PGM assemblage at Verkh-Neivinsk is dominated by Ru-Os-Ir alloy grains that are frequently mantled by 'secondary' Ru-Os sulfide and/or Ru-Os sulfarsenide overgrowths.

The osmium isotope results identify (1) a restricted range of 'unradiogenic' $^{187}Os/^{188}Os$ values for coexisting laurite and Os-rich alloy pairs that form 'primary' PGM assemblages at Hochgrossen, Verkh-Neivinsk and Unst (0.11860–0.11866 0.11891–0.11898, and 0.12473–0.12488, respectively), and (2) similar 'unradiogenic' $^{187}Os/^{188}Os$ values for both 'primary' and 'secondary' PGM assemblages at Shetland (with mean $^{187}Os/^{188}Os=0.1244$) and Verkh-Neivinsk (with several mean $^{187}Os/^{188}Os$ values, e.g. 0.1164, 0.1178, 0.1188 and 0.1207). The Os-isotope variability is consistent with conclusion that the 'secondary' PGM assemblage inherited the subchondritic osmium isotope signature of the 'primary' PGM. No evidence for other source contributions (e.g., suprachondritic) during later thermal events, as frequently invoked, has been observed.

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[1] Badanina *et al* (2013) *Mineral. Petrol.* **107**, 963-970 [2] Malitch *et al* (2003) *Can. Mineral.* **41**, 331-352