DISTRIBUTION OF PLATINUM-GROUP ELEMENTS IN UPPER MANTLE XENOLITHS FROM THE CARPATHIAN-PANNONIAN REGION

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The geochemical behaviour of platinum-group elements (PGE) is widely debated due to their geochemical significance and economic importance. Laboratory experiments revealed that the abundances of PGEs in the silicate Earth are several orders of magnitude higher than is expected, and their Pd/Ir and Ru/Pt ratios are nearly chondritic. A widely accepted model for this high level of PGEs in the silicate Earth is the "Late Veneer" model, which assumes that after formation of the core, and during the "Late Heavy Bombardment" (4–3.8 Ga), an influx of chondritic meteorites caused the anomalous PGE abundances and chondritic ratios. PGEs are used to trace melting and metasomatic events in Earth's mantle. 90% of the PGE content of the mantle resides in sulphides (e.g., monosulphide solid solution, pentlandite, chalcopyrite); by analyzing the PGE contents of these sulphides, in basalt-, kimberlite- and lamprophyre-hosted ultramafic xenoliths, the PGE budget of the mantle can be estimated.

We chose 15 sulphide-bearing peridotite xenoliths from the Carpathian-Pannonian region (CPR), including the Styrian Basin, Bakony-Balaton Highland, Nógrád-Gömör and East-Transylvanian Basin. Petrographically all of them are lherzolites; a few samples contain rare metasomatic amphibole. Their textures are representative for their source region, varying from protogranular to equigranular and some of them show poikilitic textures.

Geochemical features of the bulk rock compositions and clinopyroxenes reveal that partial melting and refertilization processes affected the mantle, which is widely known in this region. These processes also affect the PGE budget of the mantle, which is studied first in our work in the CPR.

Os, Ir, Ru, Rh, Pt and Pd contents were determined in lherzolite xenoliths and in their sulphide grains. Total whole-rock PGE contents range between 7 and 21 ppb regardless of location. Ir-type PGEs are overall high, 5–12 ppb, which confirms the residual-mantle nature of the xenoliths. Pt and Pd contents and their ratios with Ir-type PGEs correlate with Al, as expected, due to the incompatible nature of Pt and Pd during partial melting. In situ PGE analyses on sulphide grains show positive correlations between Os, Ir, Ru and Rh, except in sulphides from the Bakony-Balaton-Highland and some sulphides from Nógrád-Gömör and East-Transylvania, whereas Pt and Pd correlate poorly with the Ir-type PGEs. The total concentrations of PGEs range between 4 and 796 ppm. All these data reveal that the PGE distribution in the mantle under the CPR is heterogeneous, and each of the xenolith localities studied has its own PGE pattern. Most of the PGE patterns show high and variable abundances of Os, Ir, Ru and Rh, with decreasing abundance from Rh to Au and a strong negative Pt anomaly. This distribution could be explained by different degrees of melting and metasomatism beneath the CPR.