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Tracking mantle metasomatism under the Carpathian-Pannonian Region using siderophile and chalcophile elements

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Siderophile (mainly PGEs) and chalcophile elements have been used to trace melting and metasomatic events in the Earth's mantle. These elements have an affinity with sulfur and reside in sulfide minerals, therefore studying sulfides and whole rocks provides information on the siderophile and chalcophile element budget of the mantle.
We chose 20 sulfide-bearing peridotite xenoliths from the Carpathian-Pannonian region (CPR), including the Styrian Basin, Bakony-Balaton-Highland, Nógrád-Gömör and East-Transylvanian Basin. All of the samples are lherzolites and a few xenoliths contain rare metasomatic amphibole. Their textures are considered to be representative for their source mantle, varying from protogranular to equigranular, and some of them show poikilitic textures.
The bulk rock compositions and clinopyroxene chemistry reveal that partial melting and refertilization processes affected the samples. These processes also affected the PGE budget of the mantle, which is studied in this work for the first time in the region.
The concentrations of Cu, Co, and S were measured in all xenoliths. The S contents are overall low, ranging between 10 and 25 ppm. The contents of Cu are positively correlated with Al_2O_3 , whereas the contents of S correlate poorly with Al_2O_3. Poor correlation between S and Al_2O_3 is explained by later loss of S possibly during the weathering of samples. 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 origin of the xenoliths. Concentration of Pt and Pd and their ratios with Ir-type PGEs correlate with Al. The data are consistent with the incompatible nature of Pt and Pd during partial melting.
In situ PGE analyses on sulfide grains show positive correlations between Os, Ir, Ru and Rh, except in sulfides from the Bakony—Balaton-Highland and some sulfides from Nógrád-Gömör and East-Transylvania, whereas the concentrations of 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.
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