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OPHIOLITE-TYPE AND ZONED CLINOPYROXENITE-DUNITE COMPLEXES: GENETIC CONSTRAINTS FROM PGE MINERALOGY AND Os-ISOTOPES

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The use of special separation and concentration techniques enabled us to separate and investigate numerous primary Os-rich platinum group minerals (PGM, e.g. predominantly phases of the laurite-erlichmanite series and Os-Ir-Ru alloys) from massive chromitites of ophiolite and clinopyroxenite-dunite complexes. The samples have been taken from the Kraubath and Hochgrössen massifs (Austria), exemplifying ophiolite-type complexes, and from the Guli, Kondyor and Inagli clinopyroxenite-dunite massifs (Siberian Craton, Russia).

In this contribution we particularly present an extensive data set of Os-isotope compositions of Os-rich PGM. The fact that Os-rich PGM contain Os as a main trace element and almost lack Re, permits the determination of accurate initial Os isotope ratios, assuming that the Os-isotope composition of the PGM has not changed after their formation. Therefore, the Os-isotope composition reflects that of the source and primary Os-rich PGM, frequently the earliest precipitates in ultramafic rocks, are considered the best tracers of i) mantle melting events, and ii) different mantle environments. The Os-isotopic composition of PGM has been measured by i) negative thermal ionization mass-spectrometry (NTI-MS), and ii) laser ablation multiple collector inductively coupled plasma mass-spectrometry (LA-MC-ICP-MS).

The range of $^{187}Os/^{188}Os$ ratios in PGM derived from the Guli, Kondyor and Inagli clinopyroxenite-dunite complexes (Siberian Craton, Russia) show a narrow range of ´unradiogenic` $^{187}Os/^{188}Os$ values, indicative of a sub-chondritic mantle source of platinum group elements (PGE, i.e. 0.12432–0.12520, n = 30; MALITCH ET AL. 2002). In contrast, Ru-Os sulfides from podiform chromitites of the mantle section of the Kraubath and Hochgrössen massifs (Eastern Alps, Austria) revealed a wide range of chondritic to sub-chondritic $^{187}Os/^{188}Os$ values (i.e. 0.1158±0.0015 to 0.1244 ± 0.0005, n = 18; MALITCH ET AL. 2003). These $^{187}Os/^{188}Os$ ratios of PGM from the residual oceanic mantle of ophiolites demonstrate a prolonged melting history of parent ultramafic protoliths, which did obviously not result in a significant concentration of PGE. In contrast, we propose a highly productive single stage melting event in clinopyroxenite-dunite complexes resulting in a significant metallogenic potential.

References

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