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Factors, controlling PGE evolution in chromite from zoned Ural-Alaskan intrusions

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The significant sources for platinum elements (PGE)-bearing placer deposits worldwide, Ural-Alaskan complexes are zoned mafic-ultramafic intrusions with typically low sulfide content and diverse associations of platinum-group minerals (PGM) in chromitite lenses. Kondyor dunite-clinopyroxenite intrusion is a key example of Ural-Alaskan complexes in East Siberia.

We investigated PGE distribution in Kondyor chromite by the combination of laser-ablation inductively coupled plasma mass spectrometry (LA-ICP-MS) spot analyses with the laser ablation imaging. Significant concentrations (up to 147 ppb Ru) of iridium-group PGE: Ir, Ru and Os (IPGE) are held within chromite lattice, whereas Pt and Pd (PPGE) are negligible. This is the first in-situ measurement of PGEs in Ural Alaskan intrusion (UAI). The measured IPGE content in Kondyor UAI appeared to be somewhat lower than in chromite from the volcanic settings and significantly higher than that in the layered intrusions, i.e. Bushweld.

In Kondyor UAI a high-fO^2 and low-aAl_2O_3 favored incorporation of IPGE in chromite at the high-temperature stage. Despite the slow cooling of Kondyor intrusion in-situ concentrations of IPGE in chromite remained high, similar to volcanic chromite. Therefore, it may be argued that the coexistence of chromite with sulfides is a more significant factor for low PGE content in Bushveld chromite, than its slow cooling rate. Laser ablation imaging and mantle-normalized PGE patterns reveal Ir and Rh migration by the later metasomatic processes. A spatial correlation between Pt, Au and Cu and their strong affinity for the series of serpentine-filled fractures that cut both chromitite and dunite imply the mobility and redeposition of Pt by hydrous oxidized fluids. Overall, chromite is a significant host for IPGE in UAI dunites.