The role of Cr-spinel crystallization on platinum group elememt fractionation in terrestrial magmas

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All terrestrial magmas contain relatively abundant PPGE (Pd-group platinum group elements: Pd, Pt, Rh) compared to IPGE (Ir-group platinum group elements: Ir, Ru, Os). As a consequence they show fractionated mantle normalized PGE patterns with $Pd_N/Ir_N > 1$, although the magnitude of fractionation varies with magma types. Various mineral phases are suggested to account for the fractionation during partial melting and fractional crystallization. The phases include monosulfide solid solution, platinum group minerals and olivine. The role of Cr-spinel has been given little attention, although recent *in situ* LA-ICP-MS studies revealed that Cr-spinels can contain tens of ppb IPGE and Rh.

In order to contrain the role of Cr-spinel crystallization on PGE fractionation, we measured PGE concentrations of Cr-spinels from diverse magma types by *in situ* LA-ICP-MS. The results show that IPGE and Rh concentrations are higher in Cr-spinels from arc-related magmas, oceanic island basalts, continental flood basalts and komatiites compared to mantle PGE values with total IPGE and Rh contents of 60 to 300 ppb. Furthermore, there is a systemmatic difference in primitive mantle normalized PGE patterns between Cr-spinels from arc and plume-related magmas with the former characterized by high Rh_N/Os_N values (6 to 55) and the latter by low values (0.7 to 2.2). In contrast, these elements are below the LA-ICP-MS detection limits in the mid ocean ridge samples. This study suggests that crystalization of Cr-spinel can play an important role in fractionating the PGE when Cr-spinels is a cumulus phase in a cyrstallizing magma or a residual phase during partial melting.