Platinum group elements concentrations of Chilas Complex Gabbros, Kohistan arc lower crust, Pakistan

I Ahmad[a]

[a] *Earth and Atmospheric Sciences, University of Alberta, AB, Canada*

Arc magmas generated during active subduction pass through the upper plate lithosphere, where they fractionate and can be expected to leave small amounts of chalcophile and siderophile element-rich sulfides in lower crustal cumulate zones. Remobilization of such sulfides has been suggested to occur during a variety of post-subduction tectonic and melting processes, such as during continental collision, leading to the formation of a range of post-subduction ore deposits. In order to understand the behavior of chalcophile and siderophile elements in lower crustal arc sections, we have determined the platinum group element (PGE) concentrations and osmium (Os) isotopic composition of cumulate rocks from the Chilas Complex, Kohistan arc, Pakistan.

PGE concentrations in layered gabbros are generally low and highly fractionated (Ir < 0.04 ppb, Pt = 0.23–0.67 ppb, Pd = 0.07–7.67 ppb, Pt/Os = 11–224), whereas higher PGE concentrations with similarly fractionated patterns are locally found in km-scale dunite bodies (Ir = 0.69–1.05 ppb, Pt = 25.3–29.6 ppb, Pd = 7.7–22.4 ppb, Pt/Os =14–104; one sample contained macroscopically visible interstitial sulfides with ppm levels of PGE). Initial Os isotopic compositions ($^{187}Os/^{188}Os)_i$ of the gabbros range from 0.129 to 0.295, with two samples having significantly higher values up to 1.47, reflecting variable degrees of contamination by mature crustal rocks. Dunite ($^{187}Os/^{188}Os)_i$ ratios vary from 0.128 to 0.165. From both absolute and relative PGE concentrations and Os isotopic compositions, the gabbros are interpreted to have been derived by partial melting of supra-subduction zone metasomatized mantle wedge under mildly sulfide-saturated conditions, such that the evolved melts are depleted and fractionated in PGE, but mostly retain mantle-like Os isotopic compositions. The dunite appears to be a more primitive melt, derived from a source with similar Os isotope ratios to the gabbro source, but which has undergone lower degrees of crustal contamination during emplacement in the upper plate lithosphere.

Corresponding author: ijaz1@ualberta.ca