



Cr-PGE mineralizations and Os-isotope signatures of chromitites in the Kahramanmaraş ophiolitic complex, Southeastern Turkey

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More than 2000 deposits of podiform-type chromitites are known in Turkey; thereby this country can be grouped among the world's richest areas for the chromium recovery. Podiform-type chromitites have been recognized as a potential source for platinum-group elements (PGE) recovery. Despite of this great economic interest, few data are available in literature concerning the chromite composition, as well as PGE mineralogy and geochemistry of Turkish chromitites (Uysal et al. 2005, 2006). In this abstract we present the results of a mineralogical and geochemical investigation of the Kahramanmaraş chromitites, located in southeastern Turkey. As the majority of the other Turkish chromitites, the Kahramanmaraş chromitites are hosted in the mantle sequence of Cretaceous ophiolitic complexes that are considered the remnants of the Tethyan Ocean. According to the last geodynamic interpretations, all the Turkish ophiolites formed in supra-subduction zone (SSZ) setting (Parlak et al. 1996, 2002; Uysal et al. 2005, 2006).

The Kahramanmaraş chromitites form small deposits and display massive, nodular, disseminated and rarely banded textures. The chromitite bodies are always surrounded by dunite envelopes in mantle tectonite. They are chromium-rich (Cr_2O_3 up to 60.01 wt%) and have low titanium content (TiO_2 less than 0.18 wt%). Their total PGE content is low and varies from 28 to 541 ppb. They display an enrichment

in Ru+Os+Ir over Rh+Pt+Pd and, as consequence, a negative slope of the chondrite-normalized patterns, although some chromitites are slightly enriched in Pt. Consistent with these geochemical data, several Ru-Os-Ir minerals have been found in the Kahramanmaraş chromitites (laurite, iridium, irarsite) accompanied by minor hollingworthite and unidentified Ir-Pt-Rh-Fe-Cu sulfides. The Platinum group minerals (PGM) are very small in size (generally less than 10 microns) and they occur as single or polyphasic grains, in association with clinopyroxene, amphibole, base metals sulfides and other PGM. They are located in fresh chromite, along cracks of chromite filled with chlorite and in the matrix of serpentine. Despite of their association with altered silicates, on the basis of their composition, shape and chemical zoning, most of the Kahramanmaraş PGMs are considered to have formed at high temperature, prior or concomitantly with the crystallization of the host chromite.

The $^{187}\text{Os}/^{188}\text{Os}$ isotopic composition of the chromitite samples from Kahramanmaraş are in general superchondritic which means that their $^{187}\text{Os}/^{188}\text{Os}$ is higher than what could be expected from an average mantle composition. Since the Re/Os ratios of the chromitites are relatively high, the radiogenic ingrowth through time cannot be neglected. Although the measurement uncertainty of $^{187}\text{Os}/^{188}\text{Os}$ determined via ICP-QMS (quadrupol ICP-MS) is about 1%, it is possible to calculate a pseudo-isochron with an age of about 1 Ga which is much higher than what could be expected. The initial isotopic composition of the samples calculated from this regression ($^{187}\text{Os}/^{188}\text{Os}_i = 0.1286 \pm 0.0017$) is consistent with a Mesozoic or even younger chondritic or primitive mantle composition. Hence increased Re/Os ratios and this errorchron age point to a mixing of Os from the upper mantle with Os from a source characterized through a more radiogenic signature. Such a source could be fluids originating in the SSZ region of the upper mantle (Brandon et al. 1996).

The present investigation shows that chromite composition, PGE distribution and mineralogy of the Kahramanmaraş chromitites are similar to those hosted in the mantle sequence of SSZ ophiolites world-wide, thus confirming that they formed in this geodynamic setting. Due to the small size of PGM and low PGE concentration, and the absence of Pt and Pd minerals, the Kahramanmaraş chromitites represent only a future potential target for PGE recovery.

References:

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