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Mineralogy and composition of solid phases in chromite grains of ophiolitic podiform chromitites from the Pozanti-Karsanti Ophiolite, southern Turkey

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Ophiolitic rocks are widely distributed in Turkey, and one of which, the Pozanti-Karsanti ophiolite from southern Turkey, contains large number of chromitite deposits located mostly in the mantle peridotites, and also close to the Moho transition zone dunite. Chromite grains from the chromitites are represented by high Cr# (70-81) and their Mg# range from 55 to 70. They contain low amount of TiO_2 ($<$0.31 wt%) and Fe_2O_3 ($<$3.30 wt%). The detailed optical investigation of number of polished chromitite samples reveals that the chromite crystals contain silicate and platinum group mineral (PGM) inclusions. Single phase inclusions of amphibole is the most abundant silicate phases, and they contain low Ti ($<$0.42 wt% TiO_2). Amphibole grains are sometimes observed to be associated with PGM of mostly laurite. Olivine, with high Fo ($\sim$97) and Ni contents (0.57-0.67 wt% NiO), and clinopyroxene with low Ti ($<$0.12 wt% TiO_2), Al ($<$1.79 wt% Al_2O_3) and Na contents ($<$0.39 wt% Na_2O) are also observed as primary silicate inclusions. Chromitites contain low concentration of total Platinum Group Elements (PGE) ranging between 32 and 162 ppb, with an average value of 94 ppb. Chondrite-normalized PGE diagrams show positive slope from Os to Ru, and negative slope from Ru to Pd. All the samples show marked positive Ru anomaly. Consistent with the geochemical data, Ru,Os,Ir bearing PGE sulfide, laurite-erlichmanite serie [(Ru,Os)S_2-(Os,Ru)S_2] phases, are the most common PGM detected in the investigated chromitite samples. Laurite-erlichmanite serie phases show narrow range of Os-Ru substitution, characterized with Ru# [100$\times$Ru/(Ru+Os)] between 72 and 97, indicating no erlichmanite in the PGM paragenesis. In addition to the most common PGM laurite, number of osmium and iridium as alloy phases, and single grain of speryllite ($PtAs_2$) were detected as magmatic inclusion in chromite. We also detected two unidentified PGE and PGE-BME phases in chromite grains whose chemical composition correspond to the formulas Os_2S_5 and Ir(Rh,Pt,Ni,Cu)S_3, respectively. High-Cr# and low Ti content of chromite grains suggest crystallization from boninitic melt, and amphibole inclusions with low Ti content as hydrous phases in chromite grains require hydrous melt for the formation of investigated chromitites; therefore, we suggest island arc tectonic environment for the generation of Pozanti-Karsanti chromitites. The presence of Os-Ir alloys and Ru-rich laurites imply that chromite crystallization took place at relatively high temperature and low fS_2 conditions.