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## Origin of Peridotites and Chromitites in the Pozanti-kar Santi Ophiolite, Turkey

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### 1 Abstract

The Pozanti-Karsanti ophiolite (PKO) in Turkey's eastern Tauride belt comprises mantle peridotites, ultramafic to mafic cumulates, isotropic gabbros, sheeted dikes and pillow lavas. The mantle peridotites are dominated by spinel harzburgites with minor dunites. The harzburgites and dunites have quite depleted mineral and whole-rock chemical composition, suggesting high degrees of partial melting. Their PGEs vary from Pd-depleted to distinct Pd-enriched patterns, implying the crystallization of interstitial sulphides from sulphur-saturated melts (e.g. MORB-like forearc basalt). U-shaped or spoon-shaped REE patterns indicate that the PKO peridotites may have also been metasomatized by the LREE-enriched fluids released from a subducting slab in a suprasubduction zone. Based on the mineral and whole-rock chemical compositions, the PKO peridotites show affinities to forearc peridotites. Chromitites occur both in the mantle peridotites and the mantle-crust transition zone horizon (MTZ). Chromitites from the two different horizons have different textures but similar mineral compositions, consistent with typical high-Cr chromitites. Chromitites hosted by mantle harzburgites generally have higher total platinum-group element (PGE) contents than those of the MTZ chromitites. However, both chromitites show similar chondrite-normalized PGE patterns characterized by clear IPGEs, Rh-enrichments relative to Pt and Pd. Such PGE patterns indicate no or only minor crystallization of Pt- and Pd enriched sulphides during formation of chromitites from a sulphur-undersaturated melt (e.g. boninitic or island arc tholeiitic melt). Dunite enveloping chromitite lenses in the hosting harzburgite resulted from melt-rock reaction.

We have performed mineral separation work on samples of podiform chromitite hosted by harzburgites. So far, more than 200 grains of microdiamond and more than 100 grains of moissanite (SiC) have been separated from podiform chromitites. These minerals have been identified by EDX and Laser Raman analyses. The diamonds and moissanite are accompanied by large amounts of rutile. Additionally, zircon, monazite and sulphides are also common phases within the heavy mineral separates. Both diamond and moissanite have been analyzed for carbon and nitrogen isotopic composition using the CARMECA 1280-HR large geometry Secondary Ion Mass Spectrometer at the Helmholtz Zentrum Potsdam. In total, 61  $\delta^{13}\text{C}_{\text{PDB}}$  results for diamond were acquired, exhibiting a range from -28.4 ‰ to -18.8 ‰. 31  $\delta^{13}\text{C}_{\text{PDB}}$  results for Moissanite vary between -30.5 ‰ to -27.2 ‰, with a mean value of -29.0 ‰. Diamond has relatively large variation in nitrogen isotopic composition with 40  $\delta^{15}\text{N}_{\text{AIR}}$  results ranging from -19.1 ‰ to 16.6 ‰.

The discovery of diamond, moissanite and the other unusual minerals from podiform chromitite of the Pozanti-Karsanti ophiolite provides new support for the genesis of ophiolitic peridotites and chromitites under high-pressure and ultra-high reducing conditions. Considering the unusual minerals, the high Mg# silicate inclusions, and the needle-shaped exsolutions in the PKO chromitites, the parental melts of these chromitites may have been mixed with deep asthenospheric basaltic melts that had assimilated materials of the descending slab when passing through the slab in a subduction zone environment. We suggest melt-rock reactions, magma mixing and assimilation may have triggered the oversaturation of chromites and the formation of PKO chromitites.

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