



## **First occurrence of PGM and electrum from low grade PGE chromitites from the Pefki area of the Pindos ophiolite complex, northern Greece**

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The Pindos ophiolite complex (northern Greece) hosts various small podiform chromitites, which mainly consist of massive and disseminated, and less schlieren and orbicular types, and are characterized by very low PGE (platinum-group elements) grades. The total PGE concentration (excluding Os) from three chromitites are less than 400 ppb. These new data combined with previous results indicate that there is no simple relationship between PGE concentration and type or area of chromitites.

Systematic scanning with an optical microscope and a scanning electron microscope of 10 polished sections did not yield any platinum-group minerals (PGM). Thus, a composite sample from the Pefki occurrence was treated by gravity concentration methods to recover and investigate PGM. The sample is representative of massive chromitites that occur in association with serpentinites and strongly serpentinitized and deformed coarse-grained dunites. The chromite composition is Cr-rich (Cr# = 78-80).

The sample was divided into two size fractions (+40  $\mu\text{m}$  and -40  $\mu\text{m}$ ). The fine fraction has yielded 65 PGM that occur as single phase or in polyphasic grains. The PGM assemblage displays a great mineralogical variability and the following PGM, in decreasing order of abundance, have been identified: secondary Ru-bearing minerals, ruarsite (RuAsS), laurite (Ru,Os)S<sub>2</sub>, irarsite (Ir,Ru,Rh,Pt)AsS, alloys of Os-Ir-Ru, hollingworthite (Rh,Pt,Pd)AsS, paolovite (Pd<sub>2</sub>Sn) and four unnamed PGM. The ma-

majority (85%) of the PGM are typically less than 20  $\mu\text{m}$  and 15% less than 30  $\mu\text{m}$ . The coarse fraction contained only two PGM grains, braggite (Pd,Pt,Ni)S and sperrylite (PtAs<sub>2</sub>) that range in size from 10-15  $\mu\text{m}$ . A single grain of electrum (AuAg) was also identified in the same fraction and is <11  $\mu\text{m}$  in size. Previously recorded PGM from a different location (Korydallos) include Os-rich laurite, sperrylite and an unidentified phase [Pt(Ni,Fe)<sub>3</sub>].

This study reports the first data on the presence of PGM in the Pindos chromitites. The obtained results provide significant information on PGM mineralogy, grain size and mineralogical assemblages that are important factors to better understand the petrogenesis, exploration and recovery of PGM. In particular our investigation has revealed that the examined chromitites contain specific phases of Ru-Os-Ir minerals, as typical for ophiolitic chromitites, accompanied by the presence of a number of unusual Pd, Pt and Au minerals. Preliminary chemical and textural observations indicate that most of the PGM found in the Pindos chromitites were possibly altered at low temperature during different alteration processes that affected the samples.