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# Process mineralogy of low grade PGM-bearing chromitites from the Vourinos ophiolite complex, northern Greece

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The Vourinos ophiolite complex (northern Greece) hosts various chromite deposits located in the northern and southern parts of the complex. The Vourinos chromitites are characterized by very low PGE grades. PGE analyses from fourteen chromitites samples varied in total PGE (excluding Os) from 200 to 300 ppb. These new data combined with previous results indicate that there is no simple relationship between PGE concentration and type or area of chromitites. However, it has been observed that the north Vourinos chromitites generally contain more PGE than those of the south, where strongly mineralized PGE zones are typically missing.

Systematic scanning with an optical microscope and a scanning electron microscope of 30 polished sections from samples from the north and south chromitites yielded only a small number of PGM (3 grains). Thus, two separate composite samples V-1 (north Vourinos, Voidolakkos) and V-2 (south Vourinos, Xerolivado), were treated by gravity concentration methods to recover and investigate PGM. Sample V-1 is derived from massive chromitites, with chromites having Cr# = 79-81, is associated with fine-grained dunite, and generally shows small degree of alteration that is significant only locally. Sample V-2 is dominated by schlieren type chromitites having Cr# = 79-85, hosted by coarse-grained dunites, characterized by more intense tectonic deformation, while all rocks are either not altered or very intensely altered.

V-1 has yielded 74 PGM grains that include laurite (Ru,Os)S2, irarsite (Ir,Ru,Rh,Pt)AsS, erlichmanite (Os,Ru)S2, ruthenium pentlandite, iridosmine (Os,Ir), osmiridium (Ir,Os,Ru,Pt), secondary phases of Ru, Os, Cu, and alloys of Ir-Fe, RhNiFe, RuNiFe and Os-Ir-Fe. V-2 has yielded 45 grains that include laurite, irarsite, erlichmanite, and minor other PGE-bearing sulfides, and Os-Ir-Ru alloys, iridosmine, and secondary phases of Ru-Os. PGM occur both as single and polyphase particles in the two samples. V-1 contains a finer variety (predominately $<$10 ìm) of PGM than V-2 (mainly $<$20 ìm). It also hosts considerably more altered PGM grains, less laurite and a larger variety of PGM than V-2, whereas Os-Ir alloys are present in equal amounts in both samples. Textural evidence indicates that a large number of the secondary assemblage may have been derived from laurite and lesser from Os-Ir alloys. Furthermore, preliminary electron probe micro analyses show compositional differences mainly in laurite.

These differences may reflect styles of mineralization, and may indicate significant remobilization of PGE, caused by different alteration processes that affected the two samples. This study reports the first data of separated and concentrated PGM from the Vourinos chromitites. The obtained results provide significant information on PGM mineralogy, grain size and associations, that are important factors to better understand the petrogenesis, exploration and recovery of PGM.