

Cr-PGE MINERALIZATIONS IN TURKEY: EVALUATION FOR THEIR FUTURE POTENTIAL

I. UYSAL ⁽¹⁾, F. ZACCARINI ⁽²⁾, M.B. SADIKLAR ⁽¹⁾, G. GARUTI ⁽³⁾, T. MEISEL ⁽⁴⁾,
M. TARKIAN ⁽⁵⁾ Y H.J. BERNHARDT ⁽⁶⁾

⁽¹⁾ *Karadeniz Technical University. Turkey.*

⁽²⁾ *University of Granada. Spain.*

⁽³⁾ *University of Modena and Reggio Emilia. Italy.*

⁽⁴⁾ *University of Leoben. Austria.*

⁽⁵⁾ *University of Hamburg. Germany.*

⁽⁶⁾ *University of Bochum. Germany.*

Platinum-group elements (PGE = Os, Ir, Ru, Rh, Pt and Pd) are strategic metals because of: 1) their growing use in advanced technologies, such as electronic, auto-catalyst and fuel cell production; 2) their scarcity in the earth's crust; 3) up to 99% of the world production mainly comes from few mining districts located in South Africa and Russia, that alone, supply 90% of Pt and the 85 % of Pd respectively, that are the PGE economically most important. As a consequence, demand and market price for these strategic metals have increased exponentially, causing a decrease of their cut off concentrations thereby potential deposits may become economic, and promoting exploration for unconventional types of PGE deposits. For these reasons, podiform chromitites hosted in ophiolite complexes have become potential targets for PGE, since they are extremely enriched in these precious metals with respect to their country rocks, and PGE may be recovered as a by-product of chromium beneficiation, provided that problems concerning physical separation of platinum-group minerals (PGM) from the chromite host will be satisfactorily solved. A great number of large-scale economically important deposits of podiform-type chromitite are widespread in Turkey. Most of them occur in the mantle sequence of ophiolites considered to represent remnants of the Tethys Ocean. In this contribution we report the result of investigation of about 50 different individual podiform-type occurrences associated with the ophiolite mantle sequence from Eskisehir, Ortaca, Kahramanmaras and Kop areas, located in N-W, S-W, S-E and N-E of Turkey, respectively. Chromitites have been investigated for their chromite composition, PGE geochemistry and mineralogy. Based on the

composition of chromite, the analyzed chromitites can be classified as refractory and metallurgical, being Cr- and Al-rich. As typical for mantle-hosted ophiolitic chromitite, the PGE contents in the investigated samples are low (less than 1 ppm) with an enrichment in Os-Ir-Ru. Only few samples from Kahramanmaras and Kop display an anomalous Pt-positive anomaly. The platinum-group minerals (PGM) form small grains (generally less than 10 µm in size), occurring as inclusion in fresh chromite crystal or in contact with altered minerals, such as serpentine, chlorite and ferrian-chromite. As typical for mantle hosted ophiolitic chromitites worldwide distributed and according to our geochemical data, most of the encountered PGM are Os-Ir-Ru phases, mainly laurite, Os-Ir-Ru alloys and irarsite. In some chromitites from Kahramanmaras and Kop these PGM are accompanied by the presence of Rh-Pt-Pd specific phases, such as hollingworthite, unidentified Pt-bearing sulfides, Pt-Fe alloys, Rh-Ni-S, Rh-Ir-S, Pd-Sb and Pd-S-Te compounds. The geochemical and mineralogical data presented here indicate that most of the investigated Turkish chromitites have low PGE potential, due to small size of the PGM grains, that prevents an economic separation from their chromite host, low PGE concentration (< 1 ppm total PGE), and predominance of Ru-Os-Ir over Rh-Pt-Pd. However, the identification of a number of Rh-Pt-Pd minerals in some chromitites from Kahramanmaras and Kop suggests that these chromitites represent a future potential target for recovery of the most valuable Pt and Pd. Therefore detailed study of the Pt-Pd mineralogy-geochemistry in the chromite ore, as well as the identification of mechanisms responsible for local enrichment of Pt and Pd in ophiolitic chromitites, are necessary tools to future exploration.