PLATINUM GROUP MINERALS FROM THE LAS AGUILAS ULTRAMAFIC UNIT, SAN LUIS PROVINCE, ARGENTINA

MOGESSIE, A.*, HAUZENBERGER, CH.*, HOINKES, G.*, FELFERNIG, A.*, STUMPFL, E. F., BJERG, E.*** & KOSTADINOFF, J.*****

* Institut für Mineralogie-Kristallographie und Petrologie, Univ. Graz, 8010

** Institut für Geowissenschaften, Montanuniversität, 8700 Leoben

*** Universidad Nacional del Sur, Departmento de Geologia, San Juan, Bahia Blanca, Argentina

The Sierras Pampeanas consist of a crystalline basement of Upper Precambrian to Lower-Middle Paleozoic age, and comprise metamorphic rocks (gneisses, schists, phyllites, amphibolites, migmatites and granulites), including granites, pegmatites as well as mafic and ultramafic rocks.

The mafic-ultramafic units are mainly enclosed within a granulitic complex of Precambrian age trending NNE-SSW over a distance of 100 kms (MALVICINI & BROGIONI 1992, GERVILLA et al.1993, MOGESSIE et al.,1995). There are lenticular gabbros, norites, pyroxenites and differentiated ultramafics. Recent field work and geophysical measurements have indicated the presence of a large body of ultramafic rocks below the enclosing basement rocks measuring up to 3000km^2.

Although all the ultramafic units have been sampled, platinum group minerals were found only in the ultramafic rocks from the Las Aguilas drill holes. Three types of PGMs and modes of occurrences are documented so far:
1. Palladium bismuthotellurides, 2. Platinum arsenides and 3. Iridium-rhodium sulpharsenides.

Palladium bismuthotellurides (merenskyite) and platinum arsenide (sperryllite) are found in a sulphide and spinel rich norite zone mainly at depths of 90 to 120 meters in drill cores 5/2 and 5/3. The characteristic mineral association for this zone are orthopyroxene + plagioclase + phlogopite + BMS (chalcopyrite+pyrrhotite+pentlandite) + spinel. Palladium bismuthotellurides occur also in serpentinized dunite containing abundant base metal sulphides and spinel.

The iridium-rhodium phases are documented in drill cores 4/2 and 5/5 at depths of 36 and 148 meters respectively. These phases are associated with serpentinised olivine, base metal sulphides and Ni-rich cobalt sulpharsenides. molybdenite (MoS_2) as well as palladium bismuthotellurides are in some cases associated with the Ir-Rh phases.

Scanning electronmicroscope (with attached Link Oxford analytical system) analyses show a variation in the composition of the palladium bismuthotellurides in different samples (At% Pd from 15.89 to 27.68, At% Bi 2.8–17.38 and At% Te 46.48–61.81) , the same is the case with the Ir-Rh phases (At% Ir 4.15–14.82 and

At% Rh 4.75–17.52). The only phase with constant composition is sperryllite with a formula $Pt_{33.3}$ $As_{66.7}$.

As mentioned above the PGM-bearing zone in the orthopyroxene as well as olivine rich rocks contains mainly homogeneous spinel. However, the composition of spinel varies in different samples depending on the bulk chemistry. This variation is from Mg# (Mg/(Mg+Fe^{2+})) of 0.20 to 0.48 and Cr# (Cr/(Cr+Al+Fe^{3+})) values of 0.33 to 0.60 with a decrease in Mg# due to Fe-enrichment with increasing Cr#. In a plot of Cr# vs. Mg# the data occupy a field to the right side of spinels from ophiolites and outside the field of spinels from layered intrusions (Fig. 1c). A plot of these data and comparison with mantle spinels occurring in continent-ocean transect indicates that the position they occupy is that of abyssal fracture zones (Fig. 1b).

The average PGE (platinum group element) data of two drill cores from Las Aguilas (5/2 and W6) is plotted on a PGE rock/PGE Chondrite vs. PGE diagram Fig.1a). For comparison data from ultramafic rocks of known tectonic regimes are also included. The plot shows that the chondrite normalised PGE trend of the samples from Las Aguilas is similar to those of stratified or layered intrusions.

Based on the textural features, some of the phases especially the Pd-Bi-Te of group 1 PGM seem to have formed by crystal fractionation of mafic melts, whereas the association of Ir-Rh phases with sulpharsenides and molybdenite in serpentinised olivine may suggest that the mineralisation in the Las Aguilas ultramafic unit was formed as a result of remobilisation of PGM, transport and deposition by hydrothermal fluids and volatiles.

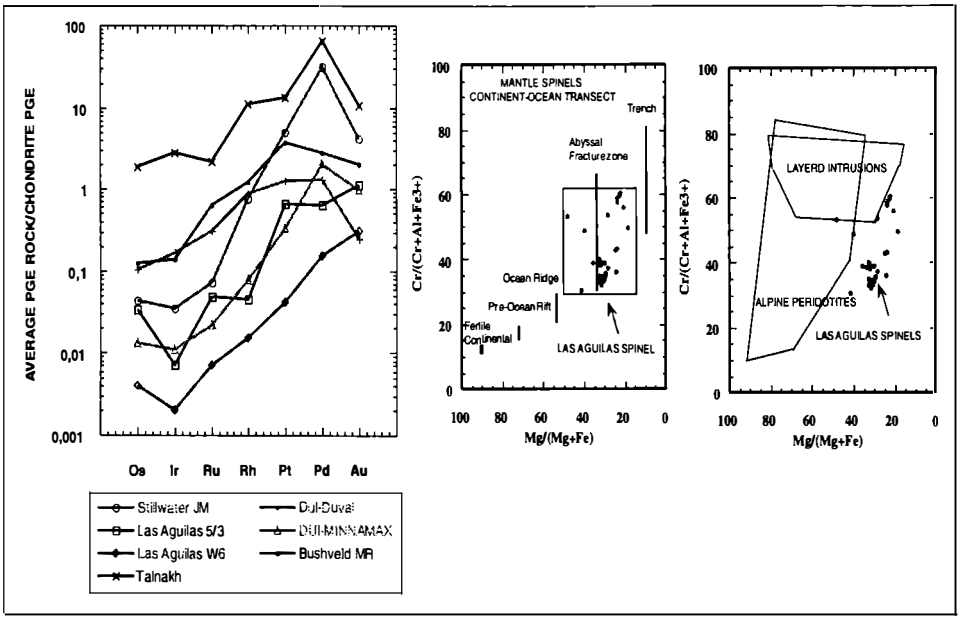

Fig. 1a, 1b, 1c

GERVILLA, F., SABALUA, J. C., CARILLO, R., FENOLL, P. & ACEVEDO, R. D. (1992): Mineralogy and mineral chemistry of the Las Aguilas Ni-Cu deposit, Province of San Luis, Argentina. in FENOLL HOCH-ALI, TORRES-RUIZ & GERVILLA, F. (eds): Current Research in Geology Applied to Ore Deposits, p.461–464.

MALVICINI, L. & BROGLONI, N. (1992): El yacimiento hidrotermal de niquel, cobre y metales del »Grupo del Platino«, Las Aguilas Este, Prov. de San Luis, Argentina. Americano de geologia economica. Acta Cordoba, p. 93–102.

MOGESSIE, A., HOINKES, G., STUMPFL, E. F., BJERG, E. & KOSTADINOFF, J. (1995): Occurrence of platinum group minerals in the Las Aguilas ultramafic unit within a granulite basement, San Luis Province, central Argentina. in Pasava, J., Kribek, B & Zak, K (eds.): Mineral Deposits: From their origin to their environmental impacts. p. 897–900.