Magmatic Platinum Group Minerals (PGM) in the Loma Peguera Chromitites (Dominican Republic): Further Finding

/ FEDERICA ZACCARINI (1,), GIORGIO GARUTI (1), JOAQUIN A. PROENZA (2), FRANCISCO LONGO (3)*

(1) Department of Applied Geological Sciences and Geophysics, The University of Leoben, P. Tunner Str, 5, A-8700 Leoben, Austria
(2) Departament de Cristal.lografia, Mineralogia i Dipòsits Minerals. Facultat de Geologia, Universitat de Barcelona, C/ Martí i Franquès s/n, E-08028 Barcelona (Spain)
(3) Falcondo Xstrata Nickel, Box 1343, Santo Domingo, Dominican Republic

INTRODUCTION.

In the mid-90's, during mining activity in the Falcondo Ni-laterite deposits located in Loma Caribe peridotite of the Cordillera Central (Dominican Republic), relatively small bodies of chromitite were discovered in the Loma Peguera area. The chromitites are randomly distributed, forming discontinuous pods or lenses within small masses of serpentinized dunite that are in turn hosted by a serpentinized harzburgite, considered the mantle sequence of an ophiolite (Lewis et al., 2006). Previous study on selected samples of Loma Peguera chromitite, indicate that primary chromite composition is Cr-rich (0.74 < Cr# < 0.78) and exhibits high Ti (average value: 0.84 wt% TiO_2) and Fe^{3+} (average value: 7.82 wt% Fe_2O_3). They have also high total PGE (up to more than 3 ppm) contents (Proenza et al., 2007) and, according to these geochemical data, a great number of platinum group minerals (PGM) have been found. However, with the exception of few grains of laurite, irarsite and an unnamed Rh_2As_3, all classified as magmatic, most of the PGM previously described in Loma Peguera chromitites are secondary in origin (Proenza et al., 2007; Zaccarini et al., 2009, McDonald et al., 2010). In this contribution we report on the presence of abundant magmatic PGM found in chromitites from Loma Peguera, never investigated before, with the target to provide information about their genetic significance.

SAMPLING, METHODOLOGY AND RESULTS.

Several samples, representing massive chromitites, were collected from three different outcrops in the Loma Peguera area. The PGM were investigated in situ, by scanning polished sections using both reflected-light an electron microscopes. The composition of chromite and PGM was obtained by electron microprobe analyses at the Leoben University (Austria). The collected data indicate that the chromite composition is constant in all the analyzed chromitites and is similar to the samples analyzed by Proenza et al. (2007). Several PGM, less than 10 microns in size, and characterized by a polygonal shape, have been found included in fresh chromite. Therefore they have been classified as magmatic. Based on their chemical composition, the following PGM have been recognized: laurite, erlichmanite, malanite, cuproirdsite, Ru-pentlandite, iridium, irarsite, hollingworthite, platinum, Pt-Fe alloys and several unnamed PGM. The PGM form single phase crystals (Fig. 1) or they are part of polyphase grains (Fig. 2) composed of different PGM, pyrrhotite, pentlandite, amphibole and rutile. Selected composition of the PGE sulfides has been plotted, as at%, in the ternary diagrams of Fig. 3.

DISCUSSION AND PRELIMINARY CONCLUSIONS.

The mineral assemblage of PGM associated with chromitite hosted in the mantle section of ophiolites, generally consists of Ru-Os-Ir phases such as laurite, accompanied by minor Os-Ir alloys, erlichmanite and irarsite, suggesting that they crystallized under low sulfur fugacity. The chromite composition of this type of chromitite is Cr-rich with low contents of TiO_2 and Fe_2O_3. Abundant minerals belonging to the cuproiridsite-cuprorhodsite-malanite series are common in chromitites associated with sub-continental mantle (Garuti et al., 1995) and Uralian-Alaskan concentrically zoned complexes (Garuti et al., 2002).

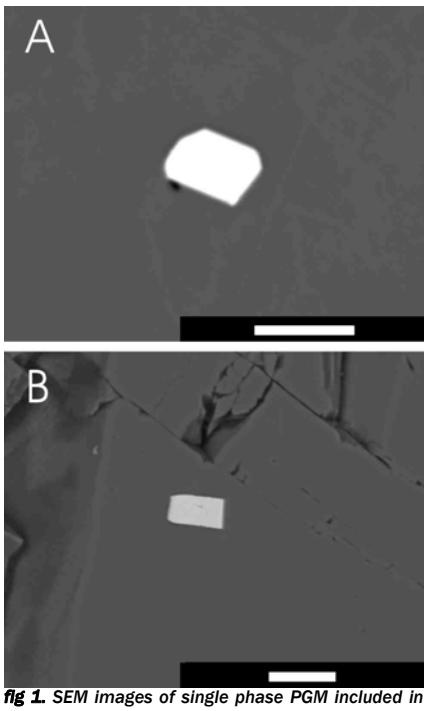

fig 1. *SEM images of single phase PGM included in fresh chromite. A = laurite, B = Pt-Fe alloy. Scale bar is 5 microns.*

The chromitites associated with the Uralian-Alaskan type complexes contain also abundant alloys in the Pt-Fe-Cu-Ni system. The association PGM and rutile is common in the several stratiform chromitites (Tredoux et al., 2011, and unpublished data of the authors). The paragenetical assemblage of the magmatic PGM found in the Loma Peguera chromitites suggests that they precipitated under high sulfur fugacity. The presence of abundant sulfarsenide indicates that also As played an important role during the magmatic precipitation of the Loma Peguera PGM. These results confirmed that the Loma Peguera chromitites are characterized by the presence of a very complex PGM assemblage that is very different from those reported from ordinary chromitites hosted in the mantle sequence of

palabras clave: Cromitita, Minerales del grupo del platino (MGP), Loma Peguera, República Dominicana.

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* corresponding author: Federica.Zaccarini@unileoben.ac.at

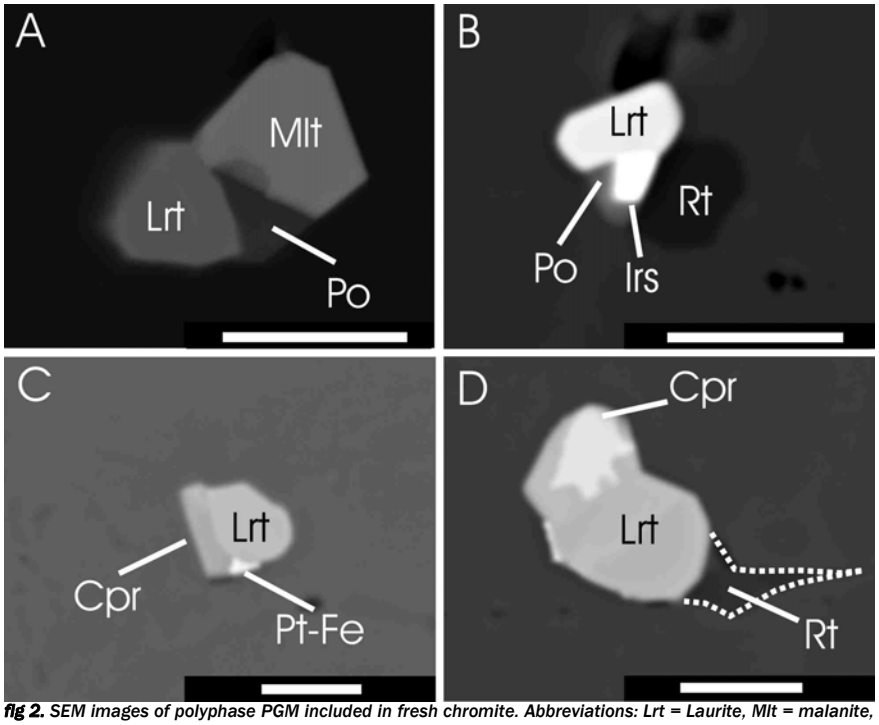

fig 2. SEM images of polyphase PGM included in fresh chromite. Abbreviations: Lrt = Laurite, Mlt = malanite, Po = pyrrhotite, Irs = irarsite, Rt = Rutile, Cpr = cuproiridisite, Pt-Fe = Pt-Fe alloy. Scale bar is 5 microns.

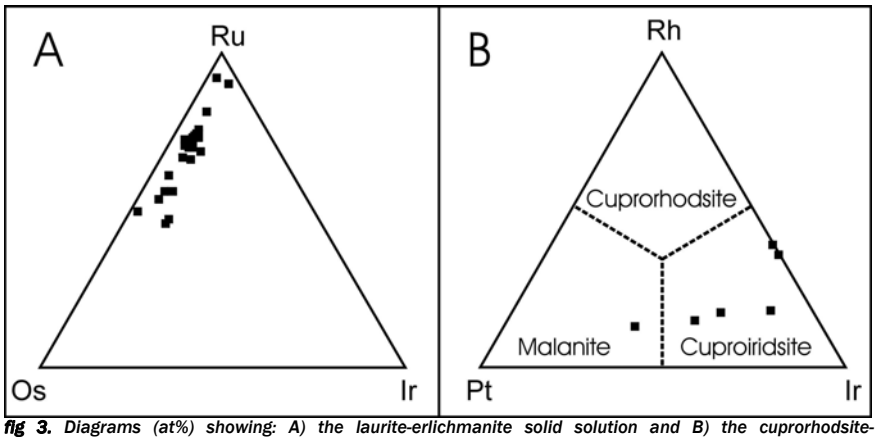

fig 3. Diagrams (at%) showing: A) the laurite-erlichmanite solid solution and B) the cuprorhodsite-cuproiridsite-malanite solid solution.

ophiolites formed in supra-subduction zone. Also the chromite composition is not consistent with this type of chromitites. All the analyzed samples, although collected in different areas of Loma Peguera, have the same chromite composition and PGM distribution, suggesting that they precipitated from the same magma and under the same chemical-physical conditions.

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