Highly siderophile elements in platinum-group element ore deposits

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We have studied the distribution of siderophile elements among base metal sulphides (BMS) and platinum-group minerals (PGM) found in platinum-group element (PGE) ore deposits. In order to address the question of which processes affect the formation of these deposits we have selected deposits that have undergone different cooling rates and degrees of metamorphism

In sulfide droplets from the unmetamorphosed Noril'sk sills, which have undergone rapid cooling, almost all of the siderophile elements (except Pt and Au), occur in BMS. This suggests the model whereby a base metal sulfide liquid collects the PGE to form these deposits is correct. Platinum occurs as PGM exsolutions within the BMS. Possibly the Pt partitioned into the sulfide liquid, but it exsolved from the BMS during cooling.

In the PGE-reefs of unmetamorphosed layered intrusions (Busveld Complex and Great Dyke) ~30 to 60 % of the siderophile elements (except Pt and Au) are present in BMS. The balance is found in PGM, which occur as exsolutions in the BMS or as grains at the contact with the BMS. The reason that a larger percentage of PGE are in the form of PGM is the slower cooling of the BMS in the layered intrusion, which would allow more time for exsolution of the PGE than in the case of the BMS from subvolcanic sills.

In the PGE-reefs from the metamorphosed layered intrusion (Penikat) the percentage of siderophile elements present in BMS covers a larger range, ~ 8 to 70 percent. There are many more PGM present and there has been extensive recrystallization of the BMS. Possibly the recrystallization of BMS during metamorphism facilitated the formation of a large number of PGM. The Pd-PGM are not always found associated with BMS. Three processes could have led to this: a) the BMS, which originally contained Pd, dissolved during metamorphism, leaving an insoluble Pd-PGM; b) the Pd could have been introduced to the PGE reef by metamorphic fluids; c) the Pd could have been locally remobilized into the silicates adjacent to the BMS.

The use of Campanian pumices in the Roman mortars of Messina area (Sicily) as indicator of technological tradition

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In this work we present the petrographic and geochemical characterization of pumices employed in the roman mortars sampled in the archeological sites of Messina area (Capo Peloro and Messina). The petrographic analysis shows the presence of two principal groups of mortars: i) cocciopesto bearing mortars; ii) pumices bearing mortars.

These data confirm the Romans' knowledge of the property of pyroclasts and pottery fragments as raw material in the preparation of hydraulic binders with optimal physical and mechanical characteristics.

The archeologists, on the basis of the proximity, considered the pumice coming from the Aeolian Islands but no archeometric data exist till now supporting this hypotesis.

With the aim to establish the provenience of the pumice inclusions chemical analysis, carried out with SEM/EDS, were made on numerous mortars samples.The multivariate principal components diagram of the geochemical data (Fig.1) indicates the use of campanian pozzolana that was preferred to the Aeolian pumices because it guaranteed better hydraulic properties.

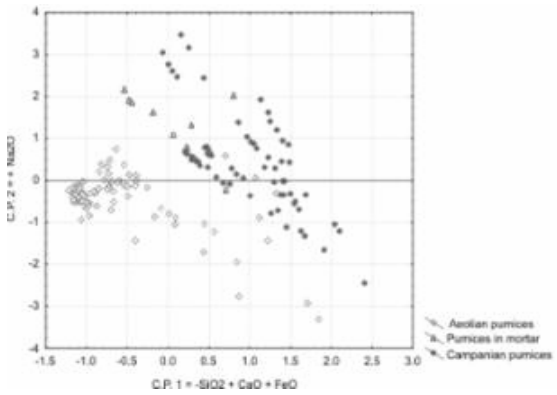

Fig.1