5.4.P14

Geochronology and PGE geochemistry of the Pajonal-El Abra complex (Chuquicamata, Chile)

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Abstract

We report the results of an extensive geochronological and geochemical study of Tertiary igneous intrusions in the Chuquicamata-El Abra porphyry copper belt of Northern Chile. Zircon U-Pb isotope ages of 16 samples from 8 intrusive units from the Pajonal-El Abra igneous complex were determined by excimer laser ablation inductively coupled plasma mass spectometry (ELA-ICP-MS). For each intrusive suite, two samples were chosen, the most primitive and the most differentiated sample. PGE and Au geochemistry was also determined for the same samples by solution ICP-MS obtained using the Ni sulphide fire essay method.

The eight principle units of the Pajonal-El Abra complex show a continuous age range from 42.9 to 37.4 Ma and the ages of the most differentiated unit of one intrusion overlaps the age of the most primitive unit of the next. This correlates with major and trace element whole rock composition which also overlaps in the same fashion.

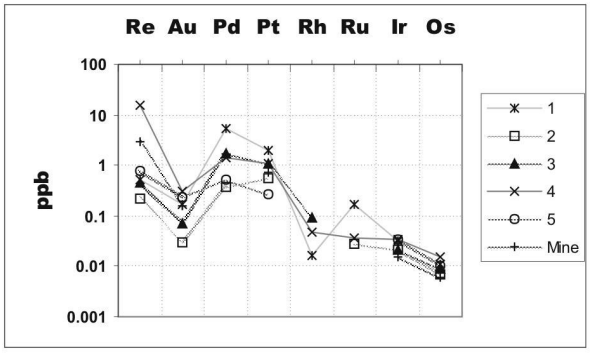

Figure 1- PGE patterns of a representative differentiation suit, the Pajonal-El Abra complex (1=primitive, 5=evolved) and the mine porphyry.

PGE data shows that Au and PGE concentrations in a given intrusion decrease with differentiation (figure 1), where the most differentiated rocks usually have less PGE content than the most primitive ones. However this trend reverses in the most evolved intrusions, which are the ones associated with ore (mine porphyry).

5.4.P15

Sulfide inclusions in residual enclaves of metamorphic rocks from Mesozoic intermediate-acid plutons in Tongling, Anhui Province

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A number of residual enclaves of metamorphic rocks are discovered in the Mesozoic intermediate-acid plutons in Tongling area, Anhui Province, of which gneiss enclaves belong to lower Dongling group. The Dongling group, as basement of the middle-lower Yangtze valley in Anhui Province, was originated from a series of basic-acid volcanites and intercalated volcanic fragmental rocks and siltstones etc.. The basic volcanites can be classified into continental tholeiite series and their metamorphic facies are up to greenschist or amphibolite ones. Recently, authors have discovered a number of sulfide inclusions in the residual enclaves of metamorphic rocks such as plagioclase-amphibole schist, amphibole-plagioclase gneiss and plagioclase amphibolite (Cu: 580ppm; Pb: 848ppm; Zn: 535ppm). All sulfide inclusions are enclosed within mineral grains of the metamorphic rocks, of which amphibole is predominant and plagioclase is only individual. Generally, the inclusions are rounded, lenticular or vermicular, ranging from 5 to 20 micron in diameter. Most sulfides are scattered as an individual grains, but a few are arranged along C axes of host crystals. As a Fe-S-O system, mineral assemblage of the sulfide inclusions in amphibole is composed of pyrrhotite and magnetite, and both closely intergrowth in nearly one-third samples. However, the sulfide inclusions in plagioclase have an assemblage of chalcopyrite and magnetite. sulfides are poor in nickel (mostly $Ni \leq 0.5\%$). The occurrence of sulfide inclusions in residual enclaves of metamorphic basement rocks from Mesozoic intermediate-acid plutons implies that both underplating of sulfur-enriched magma and enrichment of ore-forming materials such as S, Fe, Cu, Pb and Zn etc., took place in Tongling area during Early Proterozoic. Up to Mesozoic, metamorphic basement rocks were partially melted to form magma due to thermal events, and the magma was mixed with re-underplating sulfur-enriched basic magma around 140Ma. Consequently, the ore-forming materials within basement were involved in the process of magmatism-metallogeny beneath Tongling area, and this leads to inference that immiscible sulfide grains would formed due to high concentration and supersaturation of sulfur in mixed magma, and then enclosed in mineral grains of magma mixing products such as mafic-dioritic micro-grain rock enclaves (such sulfide inclusions are found by authors according to the inference).