

**3.6.P10****Metasomatic monazite in apatites from felsic porphyries related to Cu-Mo mineralization**

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Monazite inclusions in chloro- and fluorapatite have been observed in high-grade metamorphic rocks [1], PGE mineralized layered intrusions [2], Kiruna-type deposits [3], and in experimental runs [4] (under certain conditions). In this study, we document the presence of metasomatic monazite inclusions in apatites from a porphyry Cu-(Mo) system, a newly reported natural environment in which this mineral may form.

Apatites from felsic rocks associated with Cu-(Mo) mineralization at La Huifa-La Negra deposit (adjacent to the El Teniente porphyry copper deposit, Chile), are Cl-rich (up to 2.8 wt% Cl) hydroxyfluorapatite, with minor amounts of Na, S, La, Ce, Sr, Fe, Mn, Si and Mg. Texturally, the apatite is present as inclusions in phenocrysts of plagioclase, biotite and oxides, as well as microphenocrysts in the groundmass. Some of the apatite grains in the groundmass have been partially or completely altered, displaying a turbid aspect due to the presence of small channels along the c-axis. Using backscattered electron images, these modified apatites show bright and dark areas. In the former, the original magmatic composition is preserved, whereas the later are chemically characterized by a strong depletion of Cl, Na, REE (La+Ce), S and to a minor extent Si. Monazite inclusions are spatially related to the dark areas. Xenotime inclusions have not been observed, probably because of the low HREE content of these apatites.

These textural and compositional features, supported by experimental studies [1,4], allow us to determine that these monazite inclusions originated from the REE budget of the magmatic Cl-rich hydroxyfluorapatite during a metasomatic alteration event triggered by water-rich fluids.

Additionally, the observed presence of these metasomatic inclusions and textures in apatites from other porphyry systems as El Teniente, Los Pelambres and Río Blanco-Los Bronces, suggests that it may be a common process in this hydrothermal environments.

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**References**

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**3.6.P11****Pb isotope composition of modern sulfide hydrothermal fields (MAR)**

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There were taken some samples of different sulfides from TAG, Snake Pit, Lachev-1 and Logachev-2 hydrothermal ore fields and the underlying rocks – basalts and peridotites. Ore fields located within the ultrabasic rocks have developed Cu mineralization. They are characterized by the accumulation of Au, Ag, Ni, Co. There is fixed Au-Ag (mainly Au) mineralization where the main admixture in the nugget gold is Cu. In the ores located within the basalts Cu specialization is less developed. They are characterized by accumulation of Zn, Ag, Au, Cd and Si (especially for axial type). There is fixed Au-Ag (mainly Ag) mineralization represented by acanthite, nugget Ag and Au. In the latter the main admixture is Ag. High Au content in the ores from the Logachev-1 field and the finding of uraninite suppose the participation of the mantle fluids in the ore formation process.

The obtained data show that Pb isotope composition for hydrothermal sulfide fields located within basalts differs considerably. Variations  $^{206}\text{Pb}/^{204}\text{Pb}$ ,  $^{207}\text{Pb}/^{204}\text{Pb}$ ,  $^{208}\text{Pb}/^{204}\text{Pb}$  isotope ratios are the following 18.010-18.329, 15.359-15.489, 37.372-37.820, correspondingly. Such variations evidence the absence of a single homogeneous source of lead, moreover Pb composition in the basalts also varies: 18.103-18.452, 15.435-15.590, 37.540-38.137, which reflects the complicated processes of recycling and some other processes causing isotope heterogeneity of the upper mantle. On the diagrams of Pb isotope compositions the isotope signatures of ore fields and host basalts make up subparallel trends. In spite of the similarity of Pb isotope composition of hydrothermal sulfides and basalts there are observed systematically higher value of  $^{207}\text{Pb}/^{204}\text{Pb}$  and  $^{208}\text{Pb}/^{204}\text{Pb}$  isotope ratios in basalts. Sulfides from the ore fields located within the ultrabasic rocks (Snake Pit, Logachev) are characterized by increasing value of Pb isotope composition, as well as host peridotites. Variations of  $^{206}\text{Pb}/^{204}\text{Pb}$ ,  $^{207}\text{Pb}/^{204}\text{Pb}$ ,  $^{208}\text{Pb}/^{204}\text{Pb}$  isotope ratios correspond to 18.412-19.135, 15.434-15.483, 38.281-38.589 in sulfides and 18.160-18.237, 15.462-15.558, 37.754 -38.277 in peridotites. There is considerable excess of radiogenic Pb in sulfides in comparison with host peridotites.

It is obviously that some part of metals (Pb) is leached from the rocks during recycling, but the main source is represented by deep fluids which transferred metals into the zone of ore formation. Their activity is fixed in the zones of large anomalies with dome structures, unstable geodynamic regime and contrast magmatism, higher permeability of lithosphere and disintegration of mantle substance.