Geophysical Research Abstracts
Vol. 14, EGU2012-8442, 2012
EGU General Assembly 2012

Mixing of fluids in hydrothermal ore-forming (Sn,W) systems: stable isotope and rare earth elements data

T.M. Sushchevskaya, J.A. Popova, T.A. Velivetskaya, A.V. Ignatiev, S.S. Matveeva, and O.A. Limantseva
Russian Federation (wri-lab@geokhi.ru)

Experimental and physico-chemical modeling data witness to important role of mixing of different type of fluids during tin and tungsten ore formation in hydrothermal systems. Mixing of magmatogeneous fluids, exsolved from granite melts, with exogenic, initially meteoric waters in hydrothermal ore-forming systems may change chemical composition of ore-forming fluid, causing cassiterite and/or wolframite precipitation (Heinrich, 1990; Sushchevskaya, Ryzhenko, 2002).
We studied the process of genetically different fluids mixing for two economic Sn-W deposits, situated in the Iultin ore region (North-East of Russia, Chukotka Penninsula). The Iultin and Svetloe deposits are located in the apical parts of close situated leucogranite stocks, formed at the final stage of the Iultin complex emplacement. Both deposits are composed of a series of quartz veins among the flyschoid rocks (T 1-2), cut by the dikes (K1) of lamprophyre, granodiorite porphyre and alpite. The veins of the deposits are dominated by the productive quartz-wolframite-cassiterite-arsenopyrite-muscovite mineral assemblage. Topaz, beryl, fluorite, and albite occur sporadically. The later sulfide (loellingite-stannite-chalcopyrite) and quartz-fluorite–calcite assemblages show insignificant development. The preore quartz veinlets in host hornfels contain disseminated iron sulfides, chalcopyrite, muscovite.
Isotopic (H, O, Ar) study of minerals, supplemented by oxygen isotope data of host granites and metamorphic rocks gave us possibility to conclude, that at the Iultin and the Svetloye deposits fluid mixing was fixed on the early stages of deposit formation and could be regarded as probable cause of metal (W, Sn) precipitation. During postore time the intensive involvement of isotopically light exogenic waters have changed: a) the initial character of oxygen isotope zonality; b) the initial hydrogen isotope composition of muscovites, up to meteoric calculated values for productive fluid (while the δ18O values of quartz from productive association remained rather high). The intense mixing of magmatic and meteoric waters was sponsored by the location of the hydrothermal systems in a permeable zone at the contact of the leucogranite cupolas with hornfels and sandstones, cut by dykes and subsequently developing ore-hosting fissures.
REEs data, which also may describe the process of fluid mixing, have been obtained for the minerals and rocks with the help of ICP MS analysis. The REEs concentrations in mineral- forming fluids have been obtained: a) from total analysis of fluid inclusion solutions and b) from calculations of REEs values for such minerals, as fluorite, wolframite, sheelite with mineral-fluid partitioning coefficients (Raimbault et al., 1985). REEs distribution in host rocks was studied for the cross sections, previously analysed for oxygen isotopic zonality (Sushchevskaya et al., 2008). Interpretation of these results favours the view, that ore-forming fluids are of mixing genesis.