Thermodynamical model of lanthanides behavior in the formation of Sn-W deposits

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The content of rare earth elements in rocks, ore minerals, fluorite and fluid inclusions in quartz was determined by ICP-MS method using a mass spectrometer Element-2 and LA-ICP-MS method using mass spectrometer X-series.

Svetloye greisen-vein type Sn-W deposit is located in East Russia, Chukchi peninsula, Iultin ore district. Svetloye deposit is composed by a series of quartz veins among the shale rocks (T_{1-2}), cutting by the dikes (K_1) under Iultin granite pluton. This deposit was formed in a hydrothermal system associated with granitoids. The ore bodies are presented by quartz and quartz-feldspar-topaz veins and dikes of greisenized granites. Sedimentary rocks are altered sandstones and siltstones. Svetloye was formed under the influence of a chloride fluid with low salinity (mainly NaCl) with temperature decrease below 400°C.

Two generations of minerals were divided by REE patterns: some are close to granite composition, others - to wall rocks. The first group is formed by magmatic fluid and the second one is formed by meteoric water interacting with shales.

REE concentrations in the hydrothermal fluid in equilibrium with fluorite, wolframite and scheelite were calculated based on mineral/fluid partition coefficients [1]. The evolution of hydrothermal fluid shows that mixing of two types of fluid is the main ore deposition factor. These data demonstrate good agreement with isotopic composition of O, H and Nd.

The thermodynamic computational model of ore-forming process was calculated using HCh software [2]. Compositions of fluid in equilibrium with the granite and with the wall rocks were calculated. The mixing of these fluids allows to mineral precipitation for Svetloye deposit. REE concentrations in minerals, fluid and their evolution were calculated by mineral/fluid partition coefficients [1]. These results are in agreement with natural data.

[1] Raimbault L. (1985) *Bull. Mineral*, V. **108**, pp.737-744.[2] Shvarov Ju., Bastrakov E. (1999) *Australian Geol. Surv*. org. **56** p.