Contrast distribution of chemical elements in geothermal solutions and bottom sediments of hydrothermal lakes (Uzon, Kamchatka, Russia)

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Thermal lakes located in region of high hydrothermal activity are an excellent model of mineral and ore formation processes. The formation of precipitation in thermal lakes occurs with the participation of a large number of endogenous and exogenous factors that determine the physicochemical conditions of the formation of precipitation. The caldera of the Uzon volcano is the only place in Kamchatka with a developed system of hydrothermal lakes. [1].

The chemical composition of water and the distribution of elements (from K to Ba) in the bottom sediment of the lakes Fumarol and Sizy Pot in the Uzon caldera were studied by SR-XRFA and AAA methods. Lake Fumarole is located within the large sub-latitude zone that controls the main magma-bearing channels [2], and Sizy Pot - in the zone of the feathering fault (shear), outside the sub-latitude zone. Waters of lake Fumarol'noe is more than 2-3 orders of magnitude enriched in Cl^-, Mo, Sb, As, Cs, Li; from 2 to 10 times Rb, K, Na Sr, Al, Ba, V, Cu, Cr, Co, Be, Y, Nb. At the same time, the waters of Sizy Pot are 2-10 times enriched in Fe, Ni, Mn, Mg and have high concentrations of H_2S. In general, the ratio of elements in sediments correlates with their contents in the waters of lakes.

The composition of authigenic minerals in lake sediments has significant differences. In the lake Fumarol, the main minerals are monmorillonite and pyrite, with subordinate quantities of kaolinite and Ca sulfate (gypsum). In the Sizy Pot, smectite, kaolinite, pyrite, and sulphates of Na, Fe, Al, Ca are most common.The results obtained indicate the predominant influx of the substance (including metals) into the sediments of thermal lakes due to solutions. The maximum contents of most elements in waters and solutions are associated with the deepest mantle source (Lake Fumarol'noe), as evidenced by the ratio of Li-Rb-Cs.

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[1] Naboko (1974) *In. Volcanism, hydrothermal process and ore-mineralization*. Moskau: Nedra. 162-196. *(in Russian).* [2] Dobretsov *et al.* (2015) *Russian Geology Geophysics* **56**, 39–63.