

Decomposition of aluminosilicates and accumulation of aluminum by microorganisms on volcano

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In 1975-76 Tolbachik volcano erupted last time (the Great Fissure Tolbachik Eruption – GFTE, Kamchatka, Russia). Fumaroles activity provides valuable material in particular Cu- and Al-ores forming minerals. Predominantly, exhalative sediments enriched by aluminum consist of new mineral lesukite $\text{Al}_2(\text{OH})_5\text{Cl}\cdot 2\text{H}_2\text{O}$ [1], whose chemical composition is similar to that of bauxite. Study of the recent bauxite formation of GFTE (lesukite, gibbsite, amorphous Al-containing phase) under Axiolab-Zeiss and Axiostar plus-Zeiss microscopes gave evidences of a leading role of desilification followed by fixation of aluminum *in situ* by microbiological factor [2, 3].

DTA, TG and HTXRD data show that there are three endothermic peaks at 160, 195, and 340 °C and stepwise lost of weight caused by presence of hygroscopic water, structural water, $(\text{OH})^-$ groups, and Cl^- ions [1]. The a parameter of the cubic lesukite cell decreases under heating reversible in the 20-90 °C interval and half-reversible in 20-140 °C interval. The amount of the weight loss is 15 wt. % (the values of one H_2O is 8 wt. %), and only half of that is reversible. Heating above 145 ± 5 °C causes the decomposition of the mineral. So, lesukite permits to extract easily aluminum [3].

Earlier we suggested [2], that microorganisms, inserting by chance on cooling volcano, can isolate acids and decompose this way aluminosilicate materials. After that Al can precipitate on a surface of cells of microorganisms. We attributed the microorganism according to its morphological structures to group Metallogenium-Siderococcus. T.V. Aristovskaya [4] discovered an ability of the microorganism from silt deposits to accumulate Al as well as Fe and Mn. First we reviled such microorganism in a geological process.

So microorganism from GFTE volcano is similar to Metallogenium in morphology (small oval bodies and thin spreads filaments that looks like spider) and in functional aspect – it precipitates Al.

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