

Minerals in peat from tailing's desperation train.

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The Ursk tailing located in the northern Salair Ridge (Russia) and stores wastes of pyritic primary ore and ore from the weathering profile. Fe-Al-SO₄ acid mine drainage with contents Zn (11 ppm), Cu (2.5 ppm), Se, (0.44 ppm), Hg (11.4 ppb), Pb (0.11 ppm), Ag (0.3 ppb), Au (1.2 ppb) and unfixed wastes influence to natural swampy peat ravine located below them [1]. Enriched zones in peat were formed due to Zn, Hg, Se, Au, Ag reprecipitation [2]. Mineral association was studied by SEM (MIRA 3 LMU) and by TEM (JEM-2010) in enriched peat.

Mercury selenide exists as hollow tubes of tiemannite with Zn (0.4 wt.%) and Ag (0.1 wt.%) partially. Sulfides of Zn and Hg form practically a continuous series of miscibility HgS-ZnS and belong to group of metacinnabar and sphalerite respectively. Sulfides of Zn occur as fine-grained, fluffy aggregates or as spherules where impurities of Fe, As, Pb and Cd were identified in their study. Sulfides of Hg form a complex mixture with various amounts of Zn, Cu, Se, Ag, I, being as very fine-grained segregations, spherules and covers the cells of microorganisms. The Se impurity is present in sulphides both of Zn and of Hg, but the most high is in the latter, showing a metacinnabar-tiemannite miscibility series. Probably Hg and Zn sulfides produce a thin coalescence, as revealed by TEM. The case with Ag and other impurities is similar. An iodargyrite (AgI) was found.

Impurity of Cu (9 wt.%) was established in Au⁰ particles as previously [2], but also Ag (2.9 wt.%), Hg (5 wt.%) and Pb (3 wt.%) exist in them. It is difficult to determine Au and listed elements relationship due to skimpy Au⁰ size. Nanoparticles of Au⁰ make a combined aggregates with colloform sulfides of Hg, Zn and AgI, being on their surface. It is suggested that biogenic H₂S is formed; Au-thiosulfate complexes are destroyed due to sulfate-reducing micro-organisms under peat anaerobic conditions. As a result Au is reduced and reprecipitated as "new" Au⁰. Visible Au associates with Fe(III) hydroxides and invisible – with sulphides of Hg and Zn (metacinnabar, sphalerite) and AgI.

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[1] Myagkaya, I.N., et al., *J. of Geochem. Explor.* (2016a) 160, 16-30. [2] Myagkaya, I.N., et al., *J. of Geochem. Explor.* (2016b) 165, 8-22.