PŮVODNÍ PRÁCE/ORIGINAL PAPER

Výskyt asociace Hg a Tl selenidů na opuštěném uranovém ložisku Zálesí v Rychlebských horách (Česká republika)

An occurrence of Hg and Tl selenides association at the abandoned uranium deposit Zálesí, Rychlebské hory Mountains (Czech Republic)

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Abstract

A unique mineral association with Hg and Tl selenides in quartz gangue was found at the abandoned uranium deposit Zálesí, Rychlebské hory Mountains, Czech Republic. Tiemannite forms abundant irregular aggregates up to 1 mm in size, its chemical composition corresponds to the empirical formula $(Hg_{0.97}Cu_{0.02}Cd_{0.01})_{\Sigma 1.00}(Se_{1.00}S_{0.01})_{\Sigma 1.01}$. Three types of hakite were determined on the base of chemical composition. Hg-rich hakite occurs as aggregates up to 700 μm in size and intensively altered tiemannite or as irregular grains up to 100 μm in tiemannite aggregates, its empirical formula is $(Cu_{9.22}Ag_{0.46})_{\Sigma 9.68}(Hg_{1.96}Zn_{0.02})_{\Sigma 1.98}(Sb_{4.09}As_{0.26})_{\Sigma 4.35}(Se_{12.89}S_{0.09})_{\Sigma 12.98}$. Ag-rich hakite was found only rarely as irregular grains up to 50 μm in size, its empirical formula can be expressed as $(Cu_{7.26}Ag_{1.94})_{\Sigma 9.20}Hg_{1.92}(Sb_{4.07}As_{0.32})_{\Sigma 4.39}(Se_{12.44}S_{1.06})_{\Sigma 13.50}$. Rare Cd-rich hakite forms irregular grains up to 100 μm, its chemical analyses correspond to the empirical formula $(Cu_{9.24}Ag_{0.76})_{\Sigma 10.00}(Cd_{0.61}Hg_{0.61}Cu_{0.49}Fe_{0.02})_{\Sigma 1.73}(Sb_{3.88}As_{0.17}Bi_{0.05})_{\Sigma 4.10}(Se_{11.57}S_{1.60})_{\Sigma 13.17}$. Bukovite was found as rare crystals up to 20 μm in size in hakite aggregates or grains up to 30 μm in size in clausthalite or up to 10 μm in size in klockmannite. Its chemical composition corresponds to the empirical formula $(Tl_{1.98}Pb_{0.01})_{\Sigma 1.99}(Cu_{2.97}Ag_{0.01})_{\Sigma 2.98}Fe_{0.97}(Se_{3.75}S_{0.32})_{\Sigma 4.07}$. A new unnamed Ag-Cu-Tl selenide with the ideal formula $AgCu_5TlSe_4$ forms rare irregular grains up to 80 μm in size in umangite or tiemannite aggregates. Its empirical formula can be expressed as $Ag_{1.09}Cu_{4.97}Tl_{0.94}Se_{4.00}$. Naumannite was found as aggregates up to 200 μm in size, in some cases intensively altered klockmannite, its chemical analyses corresponds to the empirical formula $(Ag_{2.00}Cu_{0.02})_{\Sigma 2.02}Se_{0.98}$. Eucairite was found as grains up to 200 μm in size, in some cases its grains are altered by umangite, its empirical formula is $Ag_{1.01}Cu_{1.02}Se_{0.97}$. A new unnamed Ag-Cu-Bi selenide with the ideal formula $Ag_4Cu_3BiSe_5$ occurs as oval aggregates up to 100 μm in length in eucairite aggregates. Its chemical composition corresponds to the empirical formula $Ag_{3.91}(Cu_{3.07}Tl_{0.01})_{\Sigma 3.08}Bi_{1.02}(Se_{4.91}S_{0.08})_{\Sigma 4.99}$. A new unnamed Ag-Cu selenide with the ideal formula $AgCu_3Se_3$, was found as aggregates up to 40 μm replacing older klockmannite. Its empirical formula can be expressed as $Ag_{1.07}Cu_{2.90}(Se_{2.73}S_{0.29})_{\Sigma 3.02}$. Clausthalite forms in studied samples only rare relics up to 300 μm intesively replaced by supergene molybdomenite, its chemical analyses corresponds to the empirical formula $(Pb_{0.98}Ag_{0.01}Bi_{0.01}Tl_{0.01})_{\Sigma 1.01}Se_{0.99}$. Eskebornite occurs as supergene altered aggregates up to 50 μm in size, its empirical formula is $Cu_{1.06}Fe_{0.95}(Se_{1.79}S_{0.21})_{\Sigma 2.00}$. Klockmannite was found as irregular aggregates up to 200 μm in size, partly replaced by naumannite or unnamed Ag-Cu selenide, its empirical formula can be expressed as $(Cu_{0.99}Ag_{0.02})_{\Sigma 1.01}(Se_{0.93}S_{0.06})_{\Sigma 0.99}$. Umangite forms irregular aggregates up to 100 μm in size, which partly replaced older eucairite and an unnamed Ag-Cu-Tl selenide, its empirical formula is $Cu_{3.01}(Se_{1.95}S_{0.03})_{\Sigma 1.98}$. The studied selenide association was formed in the low temperature (below 112 °C) conditions and later it was strongly altered by supergene processes (origin of molybdomenite, chalcomenite, schmiederite, demesmaekerite, kasolite, hydrated U-Pb oxihydroxides and probably olsacherite).

Key words: *tiemannite, hakite, bukovite, unnamed $AgCu_5TlSe_4$, naumannite, eucairite, unnamed $Ag_4Cu_3BiSe_5$, unnamed $AgCu_3Se_3$, clausthalite, eskebornite, klockmannite, umangite, selenide mineralization, chemical composition, uranium deposits, Zálesí deposit, Rychlebské hory Mts., Czech Republic*

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