

## NEW MINERAL NAMES

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### Heyrovskyite

J. KLUMINSKY, M. RIEDER, C. KIEFT, AND L. MRAZ (1971) Heyrovskyite,  $6(\text{Pb}_{0.88}\text{Bi}_{0.08}(\text{Ag}, \text{Cu})_{0.04})\text{S} \cdot \text{Bi}_2\text{S}_3$ , from Hurky, Czechoslovakia, a new mineral of genetic interest. *Mineral. Deposita* 6, 133-147.

Probe analyses gave Pb 58.6<sub>6</sub>, 57.4, 58.0, 54.7, 53.6<sub>6</sub>; Bi 24.9<sub>5</sub>, 25.9<sub>5</sub>, 26.3<sub>6</sub>, 27.7, 28.3<sub>6</sub>; Ag 1.1<sub>5</sub>, 1.1<sub>5</sub>, 1.1<sub>5</sub>, 2.5, 2.5; S 14.5, 14.5, 14.5, 14.4, 14.4; sum 99.2<sub>5</sub>, 99.0, 100.0, 100.3<sub>5</sub>, 98.9<sub>5</sub>%. These show stoichiometric deficiencies of 0.5, 0.5, 0.7, 0.8, 0.8%. In addition, a chemical analysis is given of a sample in which heyrovskyite had been replaced by an aggregate of cosalite and galena, presumably without changing the bulk composition. Assuming  $S = 9$ , the formulas calculated range from  $6(\text{Pb}_{0.92}\text{Bi}_{0.08}\text{Ag}_{0.08})\text{S} \cdot \text{Bi}_2\text{S}_3$  to  $6(\text{Pb}_{0.88}\text{Bi}_{0.10}(\text{Ag}, \text{Cu})_{0.07})\text{S} \cdot \text{Bi}_2\text{S}_3$  or nearly  $6\text{PbS} \cdot \text{Bi}_2\text{S}_3$ . Etch tests:  $\text{HNO}_3$  (1:1) stains variegated, brown after 1 minute;  $\text{HCl}$  (1:1) stains weakly brown, easily rubs clean;  $\text{FeCl}_3$  (20%),  $\text{HgCl}_2$  (5%),  $\text{KCN}$  (20%),  $\text{KOH}$  (40%) do not react.

Crystals are orthorhombic, acicular to prismatic  $c$  and flattened (010), with forms  $a$  {100},  $b$  {010},  $l$  {120},  $m$  {140},  $e$  {250},  $p$  {321} (?),  $a:b:c = 0.432:1:0.128$ . Precession photographs indicate space group  $Bbmm$  or  $Bbm2$ ,  $a$   $13.705 \pm 0.013$ ,  $b$   $31.194 \pm 0.033$ ,  $c$   $4.121 \pm 0.003\text{\AA}$ ,  $a:b:c = 0.439:1:0.132$ .  $Z = 4$ ,  $\rho$  calcd. 7.18, measured 7.17. The strongest lines are 3.812 (13)(121), 3.739 (13)(270), 3.435 (100)(400, 410), 3.343 (20)(420, 151), 3.006 (15)(450), 2.962 (80)(171). The data agree with those for a phase synthesized by Otto and Strunz [*Neues. Jahrb. Mineral. Abhandl.* 108, 1(1968)], Craig [*Mineral. Deposita*, 1, 278(1967)], and Salanci and Moh [*Neues. Jahrb. Mineral. Abhandl.* 112, 63(1969)] for silver-free material. The material of Otto and Strunz had the composition  $6(\text{Pb}_{0.91}\text{Bi}_{0.09})\text{S} \cdot \text{Bi}_2\text{S}_3$ .

Heyrovskyite is tin-white on fresh fracture; luster metallic, tarnishes black with dull metallic luster. Streak grayish-black. Cleavage  $c$  poor. Microhardness (by E. N. Cameron) 166-234 kg/sq.mm. (50 g. load). Reflectance in air, min. and max., 470 nm 43.3, 47.3; 546 nm; 40.6, 44.6; 589 nm, 39.8, 43.9; 650 nm, 39.6, 43.7%. Under the microscope shows weak bireflectance in air with color white to light gray, distinct bireflectance in oil, white, to grayish white; strong anisotropy with polarization colors from dark gray to white in air, grayish-white to brownish in oil.

The mineral occurs in quartz veins near Hurky, about 65 km. west of Prague, associated with pyrite, sphalerite, galena, molybdenite, chalcopyrite, and covellite, in crystals less than 20 mm. long and 0.1 to 0.5 mm. thick and in masses, mostly less than 2 mm.

The name is for the late Nobel Laureate in chemistry Jaroslav Heyrovsky, whose polarographic methods were used in the first analyses of the mineral. The mineral and name were approved before publication by the Commission on New Minerals and Mineral Names, IMA. Type material is preserved at Charles University, Prague (# 14265).

### Unnamed Sulfosalts

BEATRIZ MELBA HONNOREZ-GUERSTEIN (1971) Betekhtinite and bisulfosalts from the copper mine of "La Leona" (Argentina). *Mineral. Deposita* 6, 111-121.

Mineral I occurs as inclusions in galena 10-20  $\mu\text{m}$  long, acicular or sharply pointed, like arrowheads. They are oriented in a direction parallel to (111) of galena. Probe analysis by J. Ottemann gave Bi 26.2, Pb 26.1, Cu 20.5, S 27.3, sum 100.1%, corresponding to  $\text{Cu}_{3.2}\text{Bi}_{1.2}\text{Pb}_{1.2}\text{S}_{8.5}$ . Color pale lemon, reflectance equal to or higher than that of galena. Anisotropy strong, with colors from purplish brown to light blue green.

Mineral II forms inclusions in galena, (a) acicular, 8-10  $\mu\text{m}$  long, oriented along (111) of galena; (b) drop-shaped or vermiculate, up to 25  $\mu\text{m}$  long. Microprobe analysis by J. Ottemann gave Cu 59.4, Bi 23.7, S 21.8, sum 104.9% corresponding to  $\text{Cu}_{8.3}\text{Bi}_{1.7}\text{S}_{8.5}$ . Color light olive gray, reflectance lower than that of galena. Pleochroic. Strongly anisotropic with colors from greenish yellow to dark gray.

### Indigirite

L. N. INDOLEV, YU. YA. ZHDANOV, K. I. KASHERTSEVA, V. S. SOKNEV, AND K. I. DEL'YANDI (1971) The new mineral indigirite, a hydrous manganese aluminum carbonate. *Zap. Vses. Mineralog. Obshch.* 100, 178-183 (in Russian).

Analysis gave MgO 12.08, CaO 0.45,  $\text{Al}_2\text{O}_3$  14.58,  $\text{Fe}_2\text{O}_3$  0.64,  $\text{CO}_2$  24.18,  $\text{H}_2\text{O}$  44.36,  $\text{SO}_3$  0.45, insol. 1.60, sum 98.34%. Spectrographic analysis showed also Sb (0.3%), Cu, Zn, and Ag. Deducting quartz (insol.) all the  $\text{SO}_3$  as gypsum, and all the iron as "stilpnosiderite" (= limonite), this gives  $\text{MgO}:\text{Al}_2\text{O}_3:\text{CO}_2:\text{H}_2\text{O} = 2.00:1.00:3.86:16.36$ , or  $\text{Mg}_2\text{Al}_2(\text{CO}_3)_4(\text{OH})_2 \cdot 15\text{H}_2\text{O}$ . The mineral is insoluble in water, alcohol, and ammonia, dissolved at once by acids or KOH solution. The mineral lost 24% by weight in vacuo ( $\sim 0.01$  mm. Hg) at room temperature, 49% at 140°, 73% at 660°. The DTA curve shows endothermic breaks at 120° (the main one), 160° and 215°.

The X-ray pattern (27 lines) shows strongest lines at 7.62 (9), 5.80 (10), 5.24 (9), 4.56 (8), 2.70 (9), 2.60 (9), 1.625 (5). The X-ray pattern of material heated at 900° matched that of spinel (plus a strong line at 3.51Å.). A sample of crystals partly dehydrated under the electron microscope beam gave  $c$   $6.23 \pm 0.02\text{Å}$ . (parallel elongation) and  $3.16 \pm 0.02\text{Å}$ . perpendicular to the elongation. These are close to  $b$  and  $c$  of artinite.

Indigirite occurs as snow-white rosette-like, radiating fibrous aggregates of very fine fibers, needles or plates of length up to 1 mm. Luster vitreous to silky.  $H$ . about 2. The plates and needles are flexible.  $\rho = 1.6 \pm 0.1$ . Optically anisotropic, extinction parallel, elongation positive,  $n_s \alpha$  1.472,  $\gamma$  1.502, both  $\pm 0.002$ . A conoscopic figure could not be obtained. When the mineral is heated  $n$  increases to 1.538 at 100°, 1.668 at 900°, with sharp decrease in birefringence.

The infrared spectrum showed the presence of carbonate iron (up to nearly 700°), of molecular water, of hydroxyl (small), and of  $\text{AlO}_6$  octahedra.

The mineral occurs in the zone of the Sarylakh gold-antimony deposit in the basin of the upper part of the Indigirki River, northeastern Yakutia; associated with gypsum, amorphous Fe oxide, quartz, and gibbsite.

The name is for the river. Type material (about 20 g.) is deposited in the museum of the Institute of Geology, Yakut branch, Siberian section, Academy of Sciences, USSR.

The mineral and the name were approved before publication by the Commission on New Minerals and Mineral Names, IMA.

#### Wermlandite

P. B. MOORE (1971) Wermlandite, a new mineral from Långban, Sweden. *Lithos* 4, 213-217.

Analysis by R. Blix gave CaO 7.04, MnO 0.40, MgO 29.30, Fe<sub>2</sub>O<sub>3</sub> 7.48, Al<sub>2</sub>O<sub>3</sub> 6.30, CO<sub>2</sub> 2.52, H<sub>2</sub>O 47.13, sum 100.17% corresponding to—



Microscopic observation of the effervescence with 1:1 HCl suggests that the carbonate is present in the mineral, not as an impurity. The mineral is dissolved completely by cold 1:1 HCl.

Oscillation, rotation, and Weissenberg photographs show the mineral to be hexagonal, space group  $P\bar{3}c1$  or  $P3c1$ ,  $a$  9.260 (6),  $c$  22.52 (3); it is related to pyroaurite along the  $c$ -axis, but the  $a$ -axis is three times as large. The strongest lines of the X-ray powder pattern (25 given) are 11.16 (7)(002), 7.98 (10)(100), 5.62 (4)(004), 4.63 (5)(110), 3.89 (4)(113), 2.608 (4)(302), 1.541 (4)(330).

The mineral occurs as plates up to 1 cm. in diameter, with breadth to thickness 20:1, implanted along large calcite crystals. Observed faces are  $a$  and  $c$ . Color pale greenish-gray. Cleavage {0001} micaceous; the foils are flexible, but inelastic.  $H$  1½,  $\rho$  1.932. (Berman balance). Optically uniaxial, negative,  $n_s \omega$  1.493,  $\epsilon$  1.482; parts of the plates show  $2V$  2-5°.

The mineral occurs on two specimens from Långban, Värmland, Sweden, associated with calcite and magnetite. The name is for the old spelling of the province. Type material is at the Swedish Museum of Natural History, Stockholm. The mineral and name were approved before publication by the Commission on New Minerals and Mineral Names, IMA.

#### Seeligerite

ARNO MÜCKE (1971) Seeligerit, ein natürliches Blei-Jodat. *Neues Jahrb. Mineral. Monatsh.* 1971, 210-217.

The mineral could not be analyzed because of intimate intergrowth with other minerals, but it was synthesized by heating PbO, PbCl<sub>2</sub>, and Pb(IO<sub>3</sub>)<sub>2</sub> with water in a sealed tube at 100°. Analysis of a product that gave the same X-ray pattern as the mineral gave PbO 72.01, Cl 10.07, I<sub>2</sub>O<sub>5</sub> 17.97, sum 100.05 — (O = Cl<sub>2</sub>) 2.27 = 97.78%, corresponding to Pb<sub>3</sub>(IO<sub>3</sub>)Cl<sub>3</sub>O. No water was given off at 110° in three hours.

Weissenberg and rotation photographs show the mineral to be orthorhombic, pseudo-tetragonal, space group  $D_2^5 - C$  222<sub>1</sub>,  $a = b = 7.964 \pm 0.003$ ,  $c$  27.288 ± 0.007 Å,  $Z = 8$ ,  $\rho$  calcd. 7.052, measured (pycnometer, synthetic) 6.83. The X-ray photographs show disordered reflections. If these are neglected, the mineral can be indexed with  $a = a_0/2 = 3.982$ ,  $c$  27.288 Å. The strongest lines (X-ray) (25 given) are 3.649 (9)(203), 3.219 (10)(205), 2.816 (7)(220), 2.785 (8)(207), 2.172 (6)(228), 1.991 (8)(400), 1.748 (7)(423), 1.693 (8)(425), 1.619 (8)(427), 1.408 (6)(440).

The mineral occurs in thin plates. Color bright yellow. Cleavages {001} perfect, {110} good, {100} and {010} rare. Optically biaxial, negative,  $n_s$  (S-Se melts)  $\alpha$  2.12,  $\beta = \gamma = 2.32$ ,  $2V=4^\circ$ .

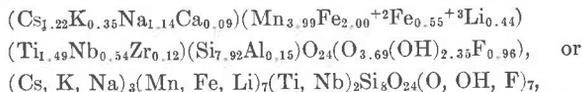
The mineral occurs in small amounts at Mina Santa Ana, near Caracoles, Sierra Gorda, Chile, associated with schwartzembergite, paralaurionite, and boleite.

The name is for Erich Seeliger, Techn. Univ., Berlin. The mineral and name were approved in advance of publication by the Commission on New Minerals and Mineral Names, IMA.

#### Cesium kupletskite

A. F. EFIMOV, V. D. DUSMATOV, A. A. GANZEEV, and Z. T. KATAEVA (1971) Cesium kupletskite, a new mineral. *Dokl. Akad. Nauk SSSR* 197, 1394-1397 (in Russian).

Analysis by ZTK gave SiO<sub>2</sub> 33.00, TiO<sub>2</sub> 8.28, ZrO<sub>2</sub> 1.01, Nb<sub>2</sub>O<sub>5</sub> 4.95, Ta<sub>2</sub>O<sub>5</sub> 0.06, Al<sub>2</sub>O<sub>3</sub> 0.52, Fe<sub>2</sub>O<sub>3</sub> 3.05, FeO 10.00, MgO trace, MnO 19.66, CaO 0.35, Na<sub>2</sub>O 2.46, K<sub>2</sub>O 1.15, Li<sub>2</sub>O 0.46, Rb<sub>2</sub>O 0.18, Cs<sub>2</sub>O 11.60, F 1.26, H<sub>2</sub>O<sup>+</sup> 1.47, sum 99.46 — (O = F<sub>2</sub>) 0.54 = 98.92%. This corresponds to—



the Cs-analogue of kupletskite in the astrophyllite group.

X-ray study showed the mineral to be triclinic,  $a$  5.41 ± 0.01,  $b$  11.74 ± 0.02,  $c$  21.16 ± 0.04 Å.,  $\alpha$  89°,  $\beta$  90°,  $\gamma$  102° 23'. The strongest lines of the X-ray pattern (25 lines) are 10.4 (10), 3.54 (8), 2.79 (8), 2.66 (8), 2.58 (6), very close to those of kupletskite, astrophyllite, and niobophyllite.

Color gold-brown, luster somewhat dull, H. about 4,  $\rho$  3.68. Optically biaxial, positive,  $\beta$  1.726,  $\gamma$  1.758,  $2V$  75°,  $Z = a$ ,  $Y \wedge b$  approx. 10°. Pleochroism  $Z$  brown,  $Y$  yellow to brown,  $X$  yellow-green. Cleavage {001} perfect.

The mineral occurs in rosette-like intergrowths of curved platy crystals at the border of aegirine-microcline-quartz pegmatites and in polythionite-quartz replacement complexes in pegmatites of a massif of the Alai alkaline province. Associated minerals are pyrochlore, stillwellite, tienshanite, sogdianite, and thorite.

The name is for the composition. Type material is deposited in the Mineralogical Museum, Acad. Sci. USSR, Moscow. The mineral and name were approved before publication by the Commission on New Minerals and Mineral Names, IMA.

#### NEW DATA

##### Bursaitite

J. KLOMINSKY, M. RIEDER, C. KIEFT, AND L. MRAZ (1971) Heyrovskyite, 6(Pb<sub>0.88</sub>Bi<sub>0.68</sub>(Ag, Cu)<sub>0.04</sub>)S·Bi<sub>2</sub>S<sub>3</sub>, from Hurky, Czechoslovakia, a new mineral of genetic interest. *Mineral. Dep.*, 6, 133-147.

In order to be sure that heyrovskyite is not identical with bursaitite [Amer. Mineral. 41, 671 (1956)] type material of the latter mineral was re-examined and

was found to be distinct from heyrovskite; it contained chalcopyrite, sphalerite, and cosalite. Microprobe analyses gave Pb 45.0, 44.6; Bi 38.5, 39.3, Ag 1.0, 1.0; S 14.7, 14.7; sum 99.20, 99.6% (S deficiency from stoichiometry 1.25, 1.4%). A chemical analysis gave Pb 39.62, Bi 37.60, Fe 1.98, Zn 3.18, S 17.32, sum 99.70%. The probe analyses correspond to  $Pb_{4.72}Ag_{0.20}Bi_4S_{10.82}$  and  $Pb_{4.68}Ag_{0.20}Bi_4S_{10.68}$ .

X-ray powder data are given; the strongest lines are 3.56 (60), 3.48 (100), 3.40 (85), 3.13 (65) (coincidence with sphalerite), 3.00 (50), 2.92 (40), 2.90 (40), 2.156 (40), 2.053 (60). These are very close to the strongest lines of lillianite [See *Amer. Mineral.* 54, 579 (1969)].

The status of bursaitite remains in doubt.

## DISCREDITED MINERALS

### Khlopinite = Samarskite

M. V. KUZ'MENKO, N. A. AKELIN, AND R. I. SOKOLOVA, (1969) Regularities of the distribution of tantalum and niobium in endocontact pegmatites and the parent granites. In *Features of the Distribution of Rare Elements in Pegmatites*. Izdat. Nauka, Moscow, p. 44-78 (especially p. 54-58) [in Russian].

Khlopinite was described in 1952; it is listed in *Dana's System*, 7th Ed., v. 1, p. 792 (1944), as a doubtful species close to euxenite-polycrase incomposition; in *Mineralogy* 2 (3), p. 337 (1967) as a variety of samarskite high in  $TiO_2$ . New analyses by M. E. Kazakova from the type locality, Baitis-Kundui, Transbaikal, gave  $Nb_2O_5$  35.41, 35.26;  $Ta_2O_5$  15.78, 22.76;  $TiO_2$  3.88, 3.25;  $Al_2O_3$  0.23, —; FeO 12.16, 7.99; MgO 0.13, 0.27; MnO 0.47, 0.95; CaO 0.84, 0.38;  $U_3O_8$  9.97, 7.08;  $ThO_2$  2.52, 3.01; rare earths 15.74, 15.31;  $Na_2O$  0.91, 0.65;  $K_2O$  tr., tr.;  $SiO_2$  1.30, —;  $H_2O^+$  0.09, —;  $H_2O^-$  0.04, —; sum 99.47%, —. This differs from the original in showing more  $Ta_2O_5$ , less  $TiO_2$ ; the differences are ascribed to the difficulties of separation of Ta, Nb, and Ti in the older methods and to the presence of euxenite and betafite. The DTA curve corresponds to that of samarskite and the analyses correspond to those of samarskite.

Khlopinite is therefore a tantalooan samarskite.