

NEW MINERAL NAMES*

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Alarsite*

T.F. Semenova, L.P. Vergasova, S.K. Filatov, V.V. Anan'ev (1994) Alarsite AlAsO_4 : A new mineral from volcanic exhalations. Doklady Akad. Nauk, 338(4), 501–505 (in Russian).

Electron microprobe analysis (average of 20) gave Al_2O_3 31.98, Fe_2O_3 0.60, CuO 0.54, As_2O_5 66.71, sum 99.83 wt%, corresponding to $\text{Al}_{1.04}\text{Fe}_{0.01}^{3+}\text{Cu}_{0.01}^{2+}\text{As}_{0.96}\text{O}_4$. Occurs as colorless aggregates with yellowish, pale green, and bluish tints, commonly containing powdery hematite or tenorite and gaseous inclusions; also as equant grains to 0.3 mm in diameter, some with poorly developed faces. Vitreous luster, white streak, brittle, no cleavage, $VHN_{20} = 440$ (336–480), $D_{\text{meas}} = 3.32(1)$, $D_{\text{calc}} = 3.34 \text{ g/cm}^3$ for $Z = 3$. Stable at atmospheric conditions; soluble in dilute acids. Colorless in transmitted light, uniaxial positive, $\omega = 1.596(1)$, $\epsilon = 1.608(1)$. The X-ray powder pattern is identical to that of synthetic AlAsO_4 ; by analogy, trigonal symmetry, space group $P3_121$ or $P3_221$, $a = 5.031(1)$, $c = 11.226(6) \text{ \AA}$ as refined from the diffractometer pattern ($\text{CuK}\alpha$; 31 lines given) with strongest lines of 4.36(20,100), 4.06(31,101), 3.442(100,102), 2.359(15,104), and 1.873(16,114).

The mineral occurs in the fumarolic deposits of the Great Tolbachik fissure extrusion, Kamchatka Peninsula, Russia, and is associated with langbeinite, fedotovite, kluychevskite, lammerite, hematite, tenorite, Al- and K-containing sulfates, and sparse nabokoite and atlasovite. The name is for the composition (aluminum arsenate). Type material is at the Mining Museum of the Mining Institute, Saint Petersburg, Russia. J.P.

Baykovite

A.V. Arakcheeva (1995) Crystal structure of the baykovite mineral. Crystallography Reports, 40, 220–227.

The name baykovite had been applied previously to a brown phase that occurs in Ti-bearing silicate slags. Single-crystal X-ray structure study of a synthetic crystal showed it to be triclinic and a member of the aenigmatite structural group; the composition is similar to that of

rhönite, but the synthetic phase is much higher in Ti and lacks Fe.

Discussion. Known only as a synthetic product; not a valid mineral name. J.L.J.

Crawfordite*

A.P. Khomyakov, L.I. Polezhaeva, E.V. Sokolova (1994) Crawfordite $\text{Na}_3\text{Sr}(\text{PO}_4)(\text{CO}_3)$: A new mineral from the bradleyite group. Zapiski Vseross. Mineral. Obshch., 123(3), 41–49 (in Russian).

Electron microprobe analysis (average of two grains) gave Na_2O 31.83, K_2O 0.22, CaO 1.45, SrO 27.42, P_2O_5 23.64, CO_2 (calculated from X-ray structural data) 14.47, sum 99.03 wt%, corresponding to $\text{Na}_{3.03}(\text{Sr}_{0.81}\text{Na}_{0.10}\text{Ca}_{0.08}\text{K}_{0.01})\text{P}_{1.01}\text{C}_{1.00}\text{O}_{7.00}$, ideally $\text{Na}_3\text{Sr}(\text{PO}_4)(\text{CO}_3)$. Occurs as colorless, transparent to translucent irregular grains to 1 mm in diameter, dull vitreous luster, conchoidal fracture, $H = 3$, bright greenish yellow fluorescence in ultraviolet light, readily soluble in 10% HCl and in citric acid at room temperature, $D_{\text{meas}} = 3.05$, $D_{\text{calc}} = 3.08 \text{ g/cm}^3$ for $Z = 2$. The infrared spectrum shows absorption bands at 1445, 1055, and 575 cm^{-1} . Optically biaxial negative, $\alpha = 1.520(2)$, $\beta = 1.564(2)$, $\gamma = 1.565(2)$, $2V_{\text{meas}} = 20(1)$, $2V_{\text{calc}} = 17^\circ$, $X \approx \gamma$, $Y \approx \alpha$, $Z \approx \beta$. Single-crystal X-ray study showed the mineral to be monoclinic, space group $P2_1$, $a = 9.187(3)$, $b = 6.707(2)$, $c = 5.279(1) \text{ \AA}$, $\beta = 89.98(3)^\circ$. Strongest lines of the powder pattern (68 given; 57 mm camera, Fe radiation) are 2.708(100,220,121,12 $\bar{1}$), 2.648(90,301,30 $\bar{1}$,002), 2.172(100,410,130), 1.891(80,222,22 $\bar{2}$), and 1.415(70,042). The structure of the mineral consists of two layers parallel to (100), with one containing Na octahedra and tetrahedra and the other with discrete PO_4 and CO_3 groups, Na octahedra, and Sr octagons.

The mineral occurs in pegmatites of the Khibiny massif, Kola Peninsula, Russia, associated with potassium feldspar, nepheline, sodalite, aegirine (main rock-forming minerals), plus pectolite, astrophyllite, barytolamprophyllite, shcherbakovite, vuonnemite, kazakovite, erschovite, chkalovite, natrite, villiaumite, and rasvumite. The name is for Scottish chemist A. Crawford (1748–1795), who discovered the Sr salts. Type material is at the Fersman Mineralogical Museum, Moscow, Russia. J.P.

* Before publication, minerals marked with an asterisk were approved by the Commission on New Minerals and Mineral Names, International Mineralogical Association.

Makovickyite*

L. Zák, J. Fryda, W.G. Mumme, W.H. Paar (1994) Makovickyite, $\text{Ag}_{1.5}\text{Bi}_{5.5}\text{S}_9$, from Baita Bihorului, Romania: The ^4P natural mineral member of the pavonite series. *Neues Jahrb. Mineral. Abh.*, 168, 147–169.

The mineral at Baita Bihorului (formerly Rezbánya) occurs as anhedral grains up to 2 mm, consisting of alternating lamellae of Cu-rich and Cu-poor phases; also found at Felbertal, Austria, as a single homogeneous grain. Gray color, opaque, metallic luster, no cleavage, $VHN_{50-100} = 210-221$ for intergrowths. Light gray in reflected light, no bireflectance, pronounced anisotropism in gray tones, $D_{\text{calc}} = 6.70$ (Cu poor) to 6.66 g/cm^3 (Cu rich). Electron microprobe analyses of the Cu-poor and Cu-rich lamellae and the Felbertal grain gave, respectively, Cu 4.37, 6.47, 0.53, Ag 5.37, 4.17, 5.50, Pb 3.50, 8.20, 12.93, Bi 68.81, 63.33, 62.70, Sb 0.09, 0.12, —, S 17.75, 17.42, 17.97, Se 0.40, 0.48, 0.17, Te 0.69, 0.50, —, sum 100.98, 100.69, 99.80 wt%, corresponding to $\text{Ag}_{0.78}\text{Cu}_{1.08}\text{Pb}_{0.27}\text{Bi}_{5.19}\text{Sb}_{0.10}\text{S}_{8.72}\text{Se}_{0.08}\text{Te}_{0.09}$, $\text{Ag}_{0.62}\text{Cu}_{1.62}\text{Pb}_{0.63}\text{Bi}_{4.82}\text{Sb}_{0.02}\text{S}_{8.64}\text{Se}_{0.10}\text{Te}_{0.06}$, and $\text{Ag}_{0.85}\text{Cu}_{0.14}\text{Pb}_{1.04}\text{Bi}_{4.98}\text{S}_{9.31}\text{Se}_{0.04}$, ideally $\text{Ag}_{1.0}\text{Bi}_{2.0}\text{Ag}_{0.5}\text{Bi}_{3.5}\text{S}_9$, which is the ^4P pavonite homolog. Single-crystal X-ray study indicated monoclinic symmetry, space group $C2/m$; cell dimensions for the respective analyses given above are $a = 13.37, 13.37, 13.83$, $b = 4.05, 4.05, 4.04$, $c = 14.71, 14.94, 14.72 \text{ \AA}$, $\beta = 99.5, 100.5, 97.5^\circ$. Strongest lines of the powder pattern are $3.63(50,004,203)$, $3.485(50,11\bar{2})$, $2.968(30,204,31\bar{T})$, $2.850(100,20\bar{5},311)$, $2.272(40,11\bar{5},404)$, $2.117(30,51\bar{3},601)$, and $2.010(30,51\bar{4},602,020)$.

The mineral occurs with hammarite, bismuthinite, and other Bi- and Cu-containing sulfides (including possibly the ^3P and ^6P homologs, for which microprobe analyses are given) in diopside-chondrodite-grossular-andradite skarns (Romania), and with sulfosalts and sulfides in the tungsten deposit at Felbertal, Austria. The new name is for Emil Makovicky of the University of Copenhagen, Denmark. Type material is in the Mineralogical Collection of the Faculty of Science, Charles University, Praha, and in the National Museum, Praha (Prague).

Discussion. Initial data defining the unnamed mineral were abstracted in *Am. Mineral.*, 76, 669–670 (1991). **J.L.J.**

Protoantigorite

N.N. Bryantschaninova, L.A. Yanulova, A.B. Makeev (1993) Low-hydrate calcic serpentine from ultrabasic rocks of the Syumkeusk massif. *Trudy Inst. Geol. Komi Nauchn. Centra Ural Otd. Ross. Akad. Nauk*, 31, 45–52 (in Russian).

Chemical analysis (wet?) of a concentrate of a serpentine-like mineral from the rocks of the Syumkeusk massif (Urals, Russia) indicated the presence of Ca (3.29) and a low H_2O content (4.69 wt%). X-ray data showed that the material was impure. Infrared, TGA, and physical properties of the studied concentrate are given.

Discussion. Microprobe analysis is necessary. The new name should not have been introduced. **J.P.**

Shuangfengite*

Zuxiang Yu (1994) Shuangfengite: A new iridium bitelluride. *Acta Mineral. Sinica*, 14(4), 322–326 (in Chinese, English abs.).

The mineral occurs in association with other PGM as aggregates up to 0.5 mm in diameter, and veinlets up to 0.1 mm wide and 1 mm long, in placer concentrates and crushed ores from a chromite deposit near the village of Shuangfeng, about 190 km north-northeast of Beijing, People's Republic of China. Black color and streak, $H = 3$, $VHN_{20} = 108$ (86–161), perfect $\{0001\}$ cleavage, brittle, $D_{\text{calc}} = 10.14 \text{ g/cm}^3$ for $Z = 1$. Electron microprobe analyses (average and range of nine listed) gave Ir 40.3 (34.0–42.7), Pt 1.2 (1.4–5.8), Os 0.1 (0.0–0.7), Rh 0.0 (0.0–0.1), Cu 0.2 (0.1–0.3), Te 56.7 (54.8–57.9), S 0.3 (0.2–0.5), Bi 0.4 (0.3–0.8), sum 99.2 (97.8–100.9) wt%, corresponding to $(\text{Ir}_{0.93}\text{Pt}_{0.03}\text{Cu}_{0.01})_{20.97}(\text{Te}_{1.97}\text{S}_{0.04}\text{Bi}_{0.01})_{22.02}$, ideally IrTe_2 . In reflected light, bright yellowish white with a bluish tint, bireflectance and pleochroism not observed in air or oil; anisotropism moderately weak, with bluish and yellowish tints. Reflectance percentages in air (WTiC standard) are given for R_c and R_o in 10 nm steps from 400 to 700 nm: 45.5, 41.6 (470 nm); 48.3, 40.4 (540); 49.0, 41.1 (590); 51.2, 45.2 (650). By analogy with PtTe_2 , hexagonal symmetry, space group $P\bar{3}m1$, $a = 3.933(5)$, $c = 5.390(5) \text{ \AA}$ as refined from the powder pattern; strongest lines (21 lines listed) are $2.85(100,101)$, $2.10(80,102)$, $1.95(60,120)$, $1.580(70,103)$, and $1.160(60,212)$. The new name is for the locality. Type material is in the Geological Museum of China, Beijing. **J.L.J.**

Sodium meta-autunite,* sodium autunite

A.A. Tschernikov, N.I. Organova (1994) Sodium autunite and sodium meta-autunite. *Doklady Akad. Nauk*, 338(3), 368–371 (in Russian).

Fully hydrated sodium autunite contains not less than 14–16 molecules of H_2O (analyzed by weight loss) and has the formula $\text{Na}_2(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 10-16\text{H}_2\text{O}$. It is stable only under underground mine conditions and decomposes into sodium meta-autunite $\text{Na}_2(\text{UO}_2)_2(\text{PO}_4)_2 \cdot 6-8\text{H}_2\text{O}$ immediately after transportation to the surface. Physical properties of sodium autunite and X-ray powder patterns of both are given. The unit-cell parameters of sodium autunite (sample hydrated in water for a few days) are $a = 6.976(4)$, $c = 8.99(1) \text{ \AA}$, whereas sodium meta-autunite has $a = 6.996(2)$ and $c = 8.64(1)$, space group $P4/nmm$.

Discussion. The proposal that the mineral containing 6–8 molecules of H_2O be called sodium meta-autunite rather than sodium autunite was approved by CNMNM in 1987. The reintroduction of the name sodium autunite for the higher hydrate thus constitutes a new name, a

resurrection that has not been submitted to the CNMMN for approval. J.P.

Vicanite-(Ce)*

A. Maras, G.C. Parodi, G. Della Ventura, D. Ohnenstetter (1995) Vicanite-(Ce): A new Ca-Th-REE borosilicate from the Vico volcanic district (Latium, Italy). *Eur. J. Mineral.*, 7, 439–446.

The mineral occurs as yellowish green aggregates in miarolitic cavities in ejecta of syenitic composition at Tre Croci, Vetralla, Viterbo province, Latium, Italy. The aggregates consist of anhedral grains and, rarely, euhedral prisms to 0.3 mm, with pyramidal termination. Transparent, vitreous luster, white streak, nonfluorescent, $H = 5-6$, $D_{\text{meas}} = >4.2$, $D_{\text{calc}} = 4.73 \text{ g/cm}^3$ for $Z = 3$. Optically uniaxial negative, $\omega = 1.757(2)$, $\epsilon = 1.722(2)$, nonpleochroic. Electron microprobe analysis gave SiO_2 13.82, Al_2O_3 0.16, TiO_2 0.14, P_2O_5 0.38, As_2O_3 4.49, Fe_2O_3 1.66, CaO 17.07, Na_2O 0.14, ThO_2 18.24, UO_2 1.96, La_2O_3 12.01, Ce_2O_3 14.41, Pr_2O_3 2.77, Nd_2O_3 1.77, B_2O_3 (calc.) 5.27, F 7.50, O = F 3.16, sum 98.65 wt%, corresponding to $(\text{Ca}_{8.03}\text{Ce}_{2.32}\text{La}_{1.95}\text{Th}_{1.82}\text{Pr}_{0.44}\text{Nd}_{0.28}\text{U}_{0.19})_{\Sigma 15.03}(\text{As}_{0.86}^{5+}\text{P}_{0.14})_{\Sigma 1.00}(\text{As}_{0.34}^{3+}\text{Na}_{0.12})_{\Sigma 0.46}(\text{Fe}_{0.57}^{3+}\text{Ti}_{0.05}\text{Al}_{0.08})_{\Sigma 0.70}\text{Si}_{6.07}\text{B}_4(\text{O}_{36.57}\text{F}_{10.43})_{\Sigma 47}$; valences and partitioning of As are on the basis of the X-ray structure, from which the simplified formula is $(\text{Ca}, \text{REE}, \text{Th})_{15}\text{As}^{5+}(\text{As}_{0.5}^{3+}\text{Na}_{0.5})\text{Fe}^{3+}\text{Si}_6\text{B}_4\text{O}_{40}\text{F}_7$. Rhombohedral symmetry, space group $R3m$, $a = 10.795(1)$, $c = 27.336(1)$ Å as refined from a Gandolfi powder pattern (114 mm, $\text{CuK}\alpha$ radiation) with strongest lines of 7.70(50,012), 4.42(50,202), 3.13(50,214), 2.993(100,027), 2.950(70,303), 2.698(50,220), 1.839(50,3.0.12), 1.802(50,2.0.14), 1.686(50,057), and 1.572(50,3.0.15).

The new name alludes to the type locality, the Vican volcanic district. The type specimen is in the Museo di Mineralogia, Università di Roma "La Sapienza," Rome, Italy. J.L.J.

Yuanjiangite*

Lichang Chen, Cuiqing Tang, Jianhong Zhang, Zhenyun Liu (1994) Yuanjiangite: A new auriferous and stanniferous mineral. *Acta Petrologica Mineralogica*, 13(3), 232–238 (in Chinese, English abs.).

The mineral occurs with placer gold in Middle Pleistocene glaciofluvial sandy gravel in the Yuanjiang River near Yuanlin, Hunan Province, People's Republic of China. The average and range of the seven electron microprobe analyses listed (to three decimal places) are Au 62.731 (60.529–64.580), Pb 0.088 (0.003–0.309), Ag 0.091 (0.001–0.490), sum 99.972 (99.945–99.999) wt%, corresponding to $\text{Au}_{1.008}\text{Sn}_{0.988}\text{Pb}_{0.001}\text{Ag}_{0.003}$, ideally AuSn. Occurs as crystalline granular aggregates that form nodular, pseudobotryoidal forms to 2 mm, with individual grains generally $< 5 \mu\text{m}$; also rarely as slightly larger hexagonal prisms in drusy cavities. Silver white color, opaque, metallic luster, black streak, slightly ductile, $VHN_{25} =$

172–274 (range of seven), $D_{\text{meas}} = 11.7-11.9$, $D_{\text{calc}} = 11.78 \text{ g/cm}^3$ for $Z = 2$. Readily soluble in aqua regia, slowly soluble in HCl or HNO_3 . In reflected light, silver white with a slight yellowish tint, faint birefractance, readily oxidizes to gray or black in air; distinct anisotropism, with polarization colors light yellow with a brownish tint. Reflectance percentages (SiC standard) are given in 20 nm steps from 400 to 700 nm, inclusive; at 460, 540, 580, and 640 nm, R_g and R_p are 63.6, 63.7; 76.1, 74.3; 79.9, 77.4; 82.5, 79.4. The X-ray powder pattern (diffractometer, $\text{CuK}\alpha$ radiation) is in good agreement with that of synthetic AuSn; by analogy, the mineral is hexagonal, space group $P6_3/mmc$, $a = 4.316(1)$, $c = 5.510(2)$ Å. Strongest lines of the powder pattern (20 lines listed) are 3.726(34,100), 3.087(38,101), 2.218(100,102), 2.159(57,110), and 1.546(31,202).

The mineral occurs with irregular boundaries in an interlocking texture with gold. The origin is thought to be by in situ replacement of placer gold. The new name is for the river at the locality. Type material is in the Geological Museum of China, Beijing, and in the China University of Geosciences, Beijing. J.L.J.

(Rh-Ir,Ni-Fe) $_{1-x}\text{S}$, Rh $_{11}\text{S}_9$

N.D. Tolstykh, A.P. Krivenko (1994) On the composition of sulfides containing platinum group elements. *Zapiski Vseross. Mineral. Obshch.*, 123(2), 41–49 (in Russian).

Two unnamed minerals occur as inclusions in riverbed samples containing native osmium, iridium, and ruthenium from the Sayan Mountains and Gornaya Shoria, Siberia, Russia. Seven electron microprobe analyses of one mineral gave Ir 4.78–44.68, Rh 0.39–29.78, Os 0.00–0.68, Ru 0.00–0.07, Pt 0.00–1.91, Pd 0.00, Fe 11.52–15.24, Cu 2.33–6.29, Ni 8.90–18.70, S 25.15–30.06, sum 97.50–101.78 wt%; the analysis with the highest formula Rh corresponds to $(\text{Rh}_{0.33}\text{Ir}_{0.03})_{\Sigma 0.36}(\text{Ni}_{0.34}\text{Fe}_{0.25}\text{Cu}_{0.04})_{\Sigma 0.63}\text{S}$; that for highest formula Ir is $(\text{Ir}_{0.30}\text{Rh}_{0.01})_{\Sigma 0.31}(\text{Fe}_{0.28}\text{Ni}_{0.21}\text{Cu}_{0.12})_{\Sigma 0.61}\text{S}$; also $(\text{Ir}_{0.21}\text{Rh}_{0.09}\text{Pt}_{0.01})_{\Sigma 0.31}(\text{Ni}_{0.29}\text{Fe}_{0.25}\text{Cu}_{0.08})_{\Sigma 0.62}\text{S}$. These results are generalized as Me_{1-x}S . Analysis of another mineral gave Ir 2.38, Rh 64.04, Ru 1.49, Fe 0.99, Cu 1.49, Ni 6.14, S 20.63, corresponding to $(\text{Rh}_{8.6}\text{Ni}_{1.4}\text{Cu}_{0.3}\text{Fe}_{0.3}\text{Ru}_{0.2}\text{Ir}_{0.2})_{\Sigma 11}\text{S}_{9.9}$.

Discussion. See the abstracts in *Am Mineral.*, 76, p. 1437 (1991) and 79, p. 1211 (1994) for previous reports of Me_{1-x}S . The formula of the second mineral may be close to that of so-called prassoite. J.P.

Zn-Cd-In sulfides

V.A. Kovalenker, I.P. Laputina, V.S. Znamenskii, I.A. Zotov (1993) Indium mineralization of the Great Kuril Island arc. *Geol. Ore Deposits*, 35(6), 491–495 (translated from *Geol. Rudnykh Mestorozhdenii*, 35, 547–552).

Sulfide grains up to dozens of micrometers in size form powdery aggregates amidst the cracks and pores of basalts

affected by high-temperature (500–940 °C), predominantly magmatic-hydrothermal fluids at Kudryavyi Volcano on Iturup Island, one of the Kuril Islands. Electron microprobe analyses (15 listed) show that sphalerite-like phases contain up to 22.28 wt% Cd and up to 14.90 wt% In, and three analyses are for grains much higher in In. The first has the composition Fe 1.80, Cu 0.90 Zn 24.72, Cd 15.25, In 25.83, S 28.82, sum 97.32 wt%, corresponding to $Zn_{2.93}Fe_{0.25}Cu_{0.11}Cd_{1.05}In_{1.74}S_{6.94}$, ideally $Zn_3CdIn_2S_7$. The second is Fe 2.56, Cu 0.48, Zn 8.04, Cd 17.80, In 42.23, S 28.42, sum 99.53 wt%, corresponding to $Zn_{0.70}Fe_{0.26}Cu_{0.04}Cd_{0.90}In_{2.08}S_{5.02}$, ideally $ZnCdIn_2S_5$, perhaps isostructural with the compound $Zn_2In_2S_5$, which has hexagonal symmetry. The third analysis is for a sulfide derived from present-day gaseous jets at the volcano: Fe 2.07, Cu 0.40, Zn 2.12, Cd 18.34, In 48.25, S 27.70, sum 98.88 wt%, corresponding to $Zn_{0.15}Fe_{0.17}Cu_{0.03}Cd_{0.75}In_{1.93}S_{3.97}$, ideally $CdIn_2S_4$. This mineral may be the Cd analog of indite $FeIn_2S_4$; the Cd-Fe synthetic counterparts are known to be isostructural and distinct from $ZnIn_2S_4$. **J.L.J.**

AgHgSb₃, Ag₄Sb₂S₅

N.N. Mozgova, Yu.S. Borodaev, A.V. Efimov, S.M. Sandomirskaya, S.N. Nenashcheva, A.P. Lisitsyn, Y.A. Bogdanov, K.G. Murav'ev (1993) Silver minerals in oceanic hydrothermal ore occurrences (Manus and Woodlark basins, Papua New Guinea region). *Geol. Ore Deposits*, 35(4), 297–306 (translated from *Geol. Rudnyk Mestorozhdenii*, 35, 333–343).

Finely dispersed, Ag-bearing sulfides occur within a barite-opal cone, 1.5 m high, that was recovered from the caldera of Mount Franklin, a hydrothermally active submarine volcano off the southern tip of Papua New Guinea. Mineral A is strongly anisotropic, red internal reflections, elongate prismatic, and has an electron microprobe composition of Ag 21.07, Hg 37.10, Sb 20.29, As 2.35, S 19.05, sum 99.85 wt%, corresponding to $Ag_{1.00}Hg_{0.95}(Sb_{0.85}As_{0.16})_{21.01}S_{3.04}$, which may be the Sb analog of laffittite, $AgHgAsS_3$. Mineral B is elongate prismatic to equant; bluish color, red internal reflections, and similar to pyrargyrite in reflected light. Electron microprobe analysis (average of four listed) gave Ag 53.06, Cu 0.08, Sb 24.78, As 2.38, S 19.63, sum 99.93 wt%, corresponding to $(Ag_{4.04}Cu_{0.01})(Sb_{1.67}As_{0.26})_{21.93}S_{5.02}$. Minerals A and B are associated with one another and with pyrargyrite, miargyrite, and freibergite. **J.L.J.**

χ-alumina

B. Singh, R.J. Gilkes (1995) The natural occurrence of χ-alumina in lateritic pisolites. *Clay Minerals*, 30, 39–44.

Dense pisolites in laterites at the Darling Range of Western Australia consist of goethite, hematite, maghemite, and minor amounts of quartz, gibbsite, böhmite,

anatase, and corundum. An extremely hard, clear to cloudy, glassy material in interstices consists of an optically isotropic phase that is crosscut by, and exhibits small areas of incipient crystallization to, anisotropic areas identified as corundum. Electron microprobe analysis of the isotropic phase gave Al_2O_3 97, SiO_2 <0.2, TiO_2 <0.2, Fe_2O_3 3 wt%. The Debye-Scherrer X-ray powder pattern has lines at 2.38(311), 2.28(222), 2.13(321), 1.99(400), and 1.39 Å (440), corresponding to the pattern for χ-alumina. **J.L.J.**

FeS₂O₃, (Fe_{1.5}Pb_{0.5})S₃O₇

H. Kucha, H.L. Barnes (1995) Compounds with mixed and intermediate sulfur valences in pyrite from the Amelia mine, southwest Wisconsin. *Mineralium Deposita*, 30, 78–81.

Black-gray patchy areas within stalactitic and banded pyrite-marcasite consist of mixtures of pyrite-marcasite and thiosulfates, as determined by electron microprobe analysis in which the valence state of S is related to the wavelength shifts in the peaks for S. Within the patchy mixtures, analysis of a homogeneous area, 40–50 μm across, gave Fe 33.47, Co 0.31, Ni 0.27, Zn 0.03, Ag ≤0.01, Pb 1.07, As 0.09, S 36.90, O by difference 27.86, sum 100 wt%, corresponding to $Fe_{1.0416}Co_{0.0091}Ni_{0.0081}Pb_{0.0090}Zn_{0.0008}As_{0.0021}S_{2.0000}O_{3.0263}$, ideally FeS_2O_3 . Analysis of a second homogeneous area, 50 μm across, gave Fe 19.02, Ag 0.04, Pb 28.84, Co-Ni-Zn-As each ≤0.01, S 22.82, O 27.50 (by difference 29.28) wt%, corresponding to $Fe_{1.4356}Ag_{0.0016}Pb_{0.5867}S_{3.0000}O_{7.7144}$, close to $(Fe,Pb)_2S_3O_7$. **J.L.J.**

Ca[B₃O₄(OH)]₃

N.A. Yamnova, Yu.K. Egorov-Tismenko, S.V. Malinko, D.Yu. Pushcharovskii, G.I. Dorokhova (1994) Crystal structure of a new natural calcium hydroborate $Ca[B_3O_4(OH)]_3$. *Crystallography Reports*, 39(6), 905–907.

The mineral occurs with colemanite, howlite, veatchite, ulexite, probertite, and “studenticite” in drill cores from a Miocene borate deposit intersected at 100 m depth near Belgrade (Serbia, Yugoslavia). Colorless, transparent, vitreous luster, parallel to radial aggregates, $H = 6$, perfect cleavage along [001], twinning common, $D_{meas} = 2.49$, $D_{calc} = 2.54$ g/cm³ for $Z = 4$. Chemical analysis gave SiO_2 0.20, Al_2O_3 0.03, Fe_2O_3 0.20, MnO 0.01, CaO 30.56, MgO 0.02, SrO 0.01, Na₂O 0.05, K₂O 0.07, B₂O₃ 55.44, Cl 0.21, H₂O⁺ 13.36, O ≡ Cl 0.05, sum 100.11 wt%. Optically biaxial positive, $\alpha = 1.573$, $\beta = 1.586$, $\gamma = 1.626$, $2V = 58^\circ$. Single-crystal X-ray structure study ($R = 0.035$) indicated monoclinic symmetry, space group $P2_1/a$, $a = 8.386(3)$, $b = 8.142(4)$, $c = 7.249(3)$ Å, $\beta = 98.33(3)^\circ$. Structurally similar to colemanite.

Discussion. The associated mineral “studenticite” appears to be a mistranslation of studentisite, a new ap-

proved name for which a full description has not been published but which corresponds to the unnamed borate as abstracted in *Am. Mineral.*, 79, p. 1213, 1994. J.L.J.

Trigonal analog of donnayite-(Y)

Ching Tji Le Tji, E.A. Pobedimskaya, T.N. Nadezhina, A.P. Khomyakov (1992) Polymorphism of donnayite $(\text{Na,REE})\text{Sr}(\text{CO}_3)_2 \cdot \text{H}_2\text{O}$. *Moscow University Geol. Bull.*, 47(5), 60–70.

Single-crystal X-ray structural study of donnayite-(Y) from the Khibiny alkaline massif, Kola Peninsula, Russia, gave triclinic symmetry, space group $P1$, $a = 8.993(2)$, $b = 8.985(2)$, $c = 6.780(2)$ Å, $\alpha = 116.25(2)$, $\beta = 102.76$, $\gamma = 60.00(1)^\circ$. The electron microprobe composition corresponds to $(\text{Sr}_{0.73}\text{Na}_{0.40}\text{Y}_{0.26}\text{Ce}_{0.20}\text{Ca}_{0.15}\text{La}_{0.10}\text{Nd}_{0.05}\text{Ba}_{0.03}\text{Dy}_{0.03}\text{Gd}_{0.02}\text{Pr}_{0.01}\text{Er}_{0.01}\text{Yb}_{0.01})_{\Sigma 2.00}(\text{CO}_3)_2 \cdot \text{H}_2\text{O}$. Occurs as yellow, transparent, well-faceted, wedge-shaped crystals to 3 mm. Optically biaxial negative, $2V = 10\text{--}30^\circ$, $\alpha = 1.57$, $\beta = 1.65$, $\gamma = 1.65$, $D_{\text{calc}} = 3.42$ g/cm³ for $Z = 3$. Isostructural with weloganite.

The trigonal analog forms yellow, transparent portions of crystals, to 3 mm, which are intergrown with a porcelainous grayish white phase along (0001). Electron microprobe analysis of the yellow phase corresponds to $(\text{Sr}_{0.71}\text{Na}_{0.46}\text{Y}_{0.24}\text{Ca}_{0.19}\text{Ce}_{0.11}\text{La}_{0.09}\text{Ba}_{0.09}\text{Nd}_{0.03}\text{Gd}_{0.02}\text{Dy}_{0.02}\text{Er}_{0.01}\text{Yb}_{0.01}\text{Pr}_{0.01})_{\Sigma 2.00}(\text{CO}_3)_2 \cdot \text{H}_2\text{O}$. Optically uniaxial negative, $\omega = 1.650$, $\epsilon = 1.565$. Trigonal symmetry, space group $R3m$, $a = 5.211(1)$, $c = 18.357(7)$ Å, $D_{\text{calc}} = 3.44(3)$ g/cm³ for $Z = 3$. The structure is characterized by a disordered distribution of Na and REE, whereas in the triclinic polymorph these elements are partly ordered in several positions. J.L.J.

$\text{K}_2(\text{Na,Li})_4\text{Ca}_3\text{Ti}_2\text{Be}_4\text{Si}_{12}\text{O}_{38}$

R.K. Rastsvetaeva, V.G. Evsyunin, A.A. Kashaev (1995) Crystal structure of a new natural K,Na,Ca-titanoberyllosilicate. *Crystallography Reports*, 40, 228–232.

The mineral occurs as equant grains, typically 0.5–1.0 mm, in the Malomurun massif, Yakutia, Russia. Colorless to light pink, to pink with a brownish hue, $H = 5\text{--}5.5$, no cleavage; optically biaxial positive, $\alpha = 1.630(3)$, $\beta = 1.675(3)$, $2V = 70^\circ$. Electron microprobe analysis gave SiO_2 52.56, TiO_2 11.42, Al_2O_3 0.11, FeO 0.42, MnO 0.05, CaO 11.51, SrO 1.21, Na_2O 8.57, K_2O 6.86, BeO (atomic absorption) 6.75, sum 99.42 wt%; Li by spectroscopy 0.047 wt%. Single-crystal X-ray structure study ($R = 0.038$) gave orthorhombic symmetry, space group $Fddd$, $a = 14.243(3)$, $b = 13.045(4)$, $c = 33.484(6)$ Å. Structural formula $\text{K}_2\text{Na}_{3.75}\text{Li}_{0.25}\text{Ca}_3\{\text{Ti}_2\text{O}_2[\text{Be}_4(\text{Si}_6\text{O}_{18})_2]\}$; $D_{\text{meas}} = 2.94(2)\text{--}2.98(2)$, $D_{\text{calc}} = 2.91(2)$ g/cm³ for $Z = 8$. J.L.J.

New Data

Chevkinite

T. Imaoka, K. Nakashima (1994) Chevkinite in syenites from Cape Ashizuri, Shikoku Island, Japan. *Neues Jahrb. Mineral. Mon.*, 358–366.

Various properties are described for nonmetamict chevkinite from Shikoku Island. Electron microprobe analysis gave a composition corresponding to $(\text{Ce}_{1.685}\text{La}_{1.005}\text{Ca}_{0.694}\text{Na}_{0.298}\text{Th}_{0.229}\text{Y}_{0.061}\text{Eu}_{0.016}\text{Dy}_{0.012})_{\Sigma 4.00}(\text{Ti}_{2.402}\text{Fe}_{2.068}\text{Nb}_{0.381}\text{Mg}_{0.090}\text{Ca}_{0.065}\text{Mn}_{0.041})_{\Sigma 5.05}\text{Si}_{4.07}\text{O}_{22}$.

Discussion. The formula of chevkinite in compilations is commonly written with Ca predominance in the A position, but this seems to be incorrect. Most analyses show Ce predominance (as above), indicating that the mineral should be named chevkinite-(Ce). Some analyses show a predominance of La (*Am. Mineral.*, 63, 499–505, 1978), but chevkinite-(La) is not a formally approved name. J.L.J.

Dzhezkazganite

A.D. Genkin, E.M. Poplavko, A.I. Gorshhov, A.I. Tsepin, A.V. Sivtsov (1994) New data on dzhezkazganite—rhenium-molybdenum-copper-lead sulfide—from the Dzhezkazgan deposit (Kazakhstan). *Geol. Ore Deposits*, 36(6), 481–489 (translated from *Geol. Rudnykh Mestorozhdenii*, 36, 536–544).

The mineral occurs with bornite, chalcocite, and galena in sandstones that host the stratiform Dzhezkazgan ore deposit in central Kazakhstan. Size of the individual grains is < 1 μm, but concentrations of the mineral are segregated into aggregates to 0.1 mm. Cream colored and slightly anisotropic in reflected light, $VHN_{30} = 206$, maximum reflectances (given in 20 nm steps from 400 to 740) are 34.4 (400), 33.7 (440), 33.5 (480,520), 33.3 (560), 32.9 (600), 32.3 (640), 31.5 (680), and 30.4 (720). The mean of 22 electron microprobe analyses gave Re 17.36, Mo 9.86, S 24.33, As 0.34, Cu 23.95, Ag 2.44, Fe 3.05, Cl 0.26, Co 0.17, Pb 17.85, sum 99.61 wt%; after deduction of bornite impurity, estimated at 17%, the calculated formula is $\text{Re}_{0.87}\text{Mo}_{0.93}\text{Cu}_{1.94}\text{Pb}_{0.81}\text{Ag}_{0.21}\text{Fe}_{0.22}\text{S}_{5.85}$. The analysis with the highest Re and Mo contents (estimated 4.8 vol% bornite impurity) gave Re 22.09, Mo 12.20, S 25.02, As 0.32, Cu 17.25, Ag 1.50, Fe 2.40, Cl 0.19, Co 0.17, Pb 17.41, sum 98.55 wt%; after deduction of the bornite, the formula is $\text{Re}_{0.96}\text{Mo}_{1.03}(\text{Cu}_{1.82}\text{Ag}_{0.11})_{\Sigma 1.93}(\text{Pb}_{0.68}\text{Fe}_{0.27}\text{Co}_{0.02})_{\Sigma 0.97}(\text{S}_{6.02}\text{As}_{0.03}\text{Cl}_{0.04})_{\Sigma 6.09}$, ideally $\text{ReMoCu}_2\text{PbS}_5$. Electron diffraction patterns showed the cell to be similar to that of molybdenite-3R and to have $a = 3.22(3)$, $c = 18.54(3)$ Å. J.L.J.

Hydroxyllestadite

N.I. Organova, R.K. Rastsvetaeva, O.V. Kuz'mina, G.A. Arapova, M.A. Litsarev, V.I. Fin'ko (1994) The crystal

structure of low-symmetry ellestadite in comparison with other apatite-like structures. *Crystallography Reports*, 39(2), 234–238.

Wet-chemical analysis of hydroxyllestadite from a wollastonite deposit in Cuba gave a composition corresponding to $\text{Ca}_{10}(\text{Si}_{3.14}\text{S}_{2.94}\text{C}_{0.08}\text{P}_{0.02})_{26.18}\text{O}_{24}(\text{OH}_{1.12}\text{Cl}_{0.316}\text{F}_{0.06})_{21.50}$. Single-crystal X-ray structure study ($R = 0.043$) gave monoclinic symmetry, space group $P2_1$, $a = 9.526(2)$, $b = 9.506(4)$, $c = 6.922(1)$ Å, $\gamma = 119.99(2)^\circ$. The structural formula is $\text{Ca}_4[\text{Ca}_6(\text{OH})_{1.2}\text{O}_{0.5}\text{Cl}_{0.3}](\text{SiO}_4)_2(\text{SO}_4)_2\text{--}[(\text{Si,S})\text{O}_4]_2$, and the lowering of symmetry from $P2_1/m$ is the result of mixed (O,OH,Cl) occupancy of the channels, a slight ordering of tetrahedral cations with Si atoms, and splitting of the Ca positions. **J.L.J.**

Poitevinite

G. Giester, C.L. Lengauer, G. Redhammer (1994) Characterization of the $\text{FeSO}_4\cdot\text{H}_2\text{O}\text{--}\text{CuSO}_4\cdot\text{H}_2\text{O}$ solid-solution series, and the nature of poitevinite, $(\text{Cu,Fe})\text{SO}_4\cdot\text{H}_2\text{O}$. *Can. Mineral.*, 32, 873–884.

A new chemical analysis of holotype poitevinite gave a composition corresponding to $(\text{Cu}_{0.48}\text{Fe}_{0.45}\text{Zn}_{0.07})\text{SO}_4\cdot\text{H}_2\text{O}$. Rietveld refinements for the synthetic series $\text{FeSO}_4\cdot\text{H}_2\text{O}\text{--}\text{CuSO}_4\cdot\text{H}_2\text{O}$ showed a reduction in symmetry from monoclinic to triclinic beyond 20 wt% Cu. For poitevinite, the new triclinic cell in space group $P\bar{1}$ has $a = 5.120(1)$, $b = 5.160(1)$, $c = 7.535(2)$ Å, $\alpha = 107.06(1)$, $\beta = 107.40(1)$, $\gamma = 92.73(1)^\circ$. Cation ordering is significant, and the structural formula is $[\text{Cu}_{0.28}(\text{Fe,Zn})_{0.22}][\text{Cu}_{0.19}(\text{Fe,Zn})_{0.31}]\text{SO}_4\cdot\text{H}_2\text{O}$. **J.L.J.**

Uralolite

K. Mereiter, G. Niedermayr, F. Walter (1994) Uralolite, $\text{Ca}_2\text{Be}_4(\text{PO}_4)_3(\text{OH})_3\cdot 5\text{H}_2\text{O}$: New data and crystal structure. *Eur. J. Mineral.*, 6, 887–896.

Single-crystal X-ray structure study ($R = 0.058$) of uralolite gave monoclinic symmetry, space group $P2_1/n$, $a = 6.550(1)$, $b = 16.005(3)$, $c = 15.969(4)$ Å, $\beta = 101.64(2)^\circ$. For the new cell and $Z = 4$, $D_{\text{calc}} = 2.197$ g/cm³. **J.L.J.**