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NEW MINERAL NAMES*

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Aschamalmite*

W. G. Mumme, G. Niedermayr, P. R. Kelly, and W. H. Paar (1983) Aschamalmite, $Pb_{5.92}Bi_{2.06}S_9$, from Untersulzbach Valley in Salzburg, Austria—"monoclinic heyrovskyite". Neues Jahrb. Mineral., Monat., 433–444.

Microprobe analysis yielded Pb 62.95, Bi 22.56, and S 14.89, sum 100.4%, which gives an empirical formula (on the basis of S = 9) $Pb_{5.89}Bi_{2.05}S_9$. The normalized empirical formula (on the basis of S = 8.96 to maintain charge balance for the given metal content) is $Pb_{5.92}Bi_{2.06}S_9$. Single-crystal Weissenberg X-ray data from a small prismatic crystal showed it to be monoclinic, space group *C2/m*, *Cm*, or *C2*, with $a = 13.71$, $b = 4.09$, $c = 31.43$Å, $\beta = 91.0°$, $V = 1762.13$Å^3. The strongest X-ray lines (32 given) are 3.426(100)($20\bar{8}$), 3.378(88)(208), 2.941(54)(117), 2.926(54)($31\bar{3}$), 2.861(48)($20,\overline{10}$), and 3.525(42)($11\bar{4}$).

The mineral occurs as lead-gray, lath-like crystals to 5 cm in length or thick, slightly bent plates up to 1 cm^2. Most crystals are heavily altered to a mixture of bismutite and other as yet unidentified phases. Exsolution lamellae of galena and cosalite are commonly present. Luster metallic, cleavage (001) perfect, D 7.33 derived from the normalized empirical formula. Creamy white in reflected light without discernible pleochroism in air. Moderately anisotropic gray to red-brown. Hardness (VHN_{25}) = 150–181 kg/mm^2. Reflectance in air (nm,%) 470, 45.1–48.1; 546, 43.4–46.3; 589, 42.9–46.3; 650, 42.9–46.3.

Aschamalmite is found in mineralized, alpine-cleft veins cutting through gneiss near Ascham Alm in the Untersulzbach Valley associated with quartz, albite, adularia, calcite, chlorite, and galena. It is closely related to heyrovskyite and several other natural and synthetic phases in the Bi_2S_3–PbS system. It is not thought to be a dimorph of heyrovskyite because the latter is always Ag-substituted.

The name is for the locality. Type material is in the Museum of Natural History in Vienna, Austria, and at the Division of Mineral Chemistry, CSIRO, Port Melbourne, Victoria, Australia. **J.E.S.**

Bostwickite*

P. J. Dunn and P. B. Leavens (1983) Bostwickite, a new calcium manganese silicate hydrate from Franklin, New Jersey. Mineral. Mag., 47 387–389.

An electron microprobe analysis gave MgO 0.9, CaO 5.1, Mn_2O_3 56.3, Fe_2O_3 0.5, Al_2O_3 1.0, As_2O_5 1.0, SiO_2 20.1, H_2O 15.1 (by difference), sum 100 wt.% leading to the empirical formula $(Ca_{0.76}Mg_{0.19})_{\Sigma 0.95}(Mn^{3+}_{5.97}Fe^{3+}_{0.05})_{\Sigma 6.02}(Si_{2.80}Al_{0.16}As^{5+}_{0.07})_{\Sigma 3.03}O_{16} \cdot 7.01\ H_2O$. The ideal formula is $CaMn^{3+}_6\ Si_3\ O_{16} \cdot 7H_2O$. Mn valence assigned on the basis of the Gladstone–Dale relationship and the red color of the crystals. Bostwickite is readily soluble in 1:1 HCl. It does not belong to any known mineral family.

Bostwickite crystals are not suitable for single crystal X-ray study. The strongest lines (19 given) in the unindexed powder pattern are: 11.3(100), 3.548(30), 2,898(30), 2.567(40), 2.262(25), and 2.238(25). D meas. 2.93.

Bostwickite was found at Franklin, New Jersey in 1874 as divergent sprays of bladed crystals about 250 μm in length. It is optically biaxial negative, $2V_\alpha = 25°$, $\alpha = 1.775(5)$, $\beta = 1.798(3)$, $\gamma = 1.800(3)$; strong dispersion $r < v$; strongly pleochroic $X = Y$ = red-brown, Z = yellow-brown; absorption $X = Y > Z$. Optical orientation described only relative to crystal shape: $Z \|$ length, $Y \|$ width, $X \|$ thin dimension of laths. H approximately 1.

The name honors Richard C. Bostwick, a collector of Franklin minerals. Type specimens are preserved in the collections of Harvard University and the United States National Museum (Smithsonian Institution).

Discussion: The optical data imply that the mineral is orthorhombic. **C.A.F.**

Clinokurchatovite*

S. V. Malinko and N. N. Pertsev (1983) Clinokurchatovite, a new structural modification of kurchatovite. Zapiski Vses. Mineralog. Obshch., 112, 483–487.

Analyses of several grains of the mineral by electron microprobe showed variable composition CaO 32.29–32.5, MgO 21.21–22.6, MnO 0.4–1.82, FeO 6.16–8.2, B_2O_3 (by difference from 100%) 37.1–38.52, sum 100.00%. The ideal formula is $Ca(Mg,Fe,Mn)B_2O_5$. Analyses of kurchatovite are given for comparison.

X-ray study shows the mineral to be monoclinic, unit cell $a = 12.19 \pm 0.07$Å, $b = 10.95 \pm 0.05$Å, $c = 5.59 \pm 0.02$Å. The strongest lines (49 given) are 3.093(80)(230), 3.045(100)($\bar{2}21$), 2.799(100) ($\bar{1}02$); 2.586(50)(231), 2.027(50)(312), 1.937(80)(042), 1.236(50)(572).

The mineral occurs as a modification of earlier formed kurchatovite, and forms polysynthetically-twinned crystals several tenths to 2 mm in size. It is associated with kurchatovite, suanite, ludwigite, szaibelyite, magnetite, pyroxene, harkerite, sakhaite, calcite, vesuvianite, clinohumite, svabite and sphalerite in borate-bearing rocks in a number of areas. H 4.5. D 3.07–3.08 (hydrostatic suspension). Optically biaxial, *ns* $\alpha = 1.642$–1.644, $\beta = 1.674$–1.675, $\gamma = 1.699$–1.704 (all ±0.002), $2V = 82$–$88°$ meas., $[010] \wedge Z = 52°$, $[010] \wedge Y = 38°$, $[100] \wedge Z = 26°$, $[100] \wedge Y = 64°$.

Samples of clinokurchatovite are at the Mineralogical Museum, Acad. Sci. USSR, Moscow. **D.A.V.**

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* Minerals marked with asterisks were approved before publication by the Commission on New Minerals and Mineral Names of the International Mineralogical Association.

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Daqingshanite*

R. Yingchen, X. Lulu, and P. Zhizhong (1983) Daqingshanite, a new mineral recently discovered in China. Geochemistry (China), 2, 180–184 (in English).

Analysis by wet chemical (?) methods and gas chromatography gave BaO 15.98, SrO 26.10, CaO 6.17, MnO 0.02, MgO 0.72, RE oxides 20.736, ThO_2 0.04, Al_2O_3 0.18, Fe_2O_3 0.21, P_2O_5 11.73, CO_2 16.19, K_2O 0.03, Na_2O 0.13, H_2O^+ 0.68, F 0.80, sum 99.716 − $(O–F_2)$ = 99.376%. This corresponds to an empirical formula of $(Sr_{1.53}Ca_{0.67}Ba_{0.63}Mg_{0.11}Na_{0.03})_{2.97}(RE_{0.76}Al_{0.02}Fe^{3+}_{0.02})_{0.80}(PO_4)_{1.00}(CO_3)_{2.23}((OH)_{0.46}F_{0.26}U_{0.07})_{0.79}$, or ideally $(Sr,Ca,Ba)_3RE(PO_4)(CO_3)_{3-x}(OH,F)_y$ where Sr > Ca, Ba and OH > F, and $x = y \simeq 0.8$. The rare earth oxides were La_2O_3 7.88, Ce_2O_3 10.16, Pr_6O_{11} 0.70, Nd_2O_3 1.59, Sm_2O_3 0.106, Eu_2O_3 0.02, Gd_2O_3 0.12, Tb_4O_7 0.05, Dy_2O_3 0.03, Ho_2O_3 0.03, Er_2O_3 0.01, Tm_2O_3 0.01, Yb_2O_3 0.02, and Lu_2O_3 0.01.

X-ray study (Weissenberg, oscillating crystal) shows the mineral to be trigonal with a rhombohedral lattice, space group $R3m$, $R\bar{3}m$, or $R32$. Unit-cell parameters (hexagonal orientation) a = 10.058(3), c = 9.225(3)Å, V = 808.2026Å^3, Z = 3, and (rhombohedral orientation) a_R = 6.570(3)Å, α_R = 99.87(3)°, V = 269.34Å^3. Strongest powder diffraction lines (for Fe$K\alpha$; 25 given) are 3.95(60)$(20\overline{21})$, 3.16(100)$(20\bar{2}2)$, 2.52(70)$(22\bar{4}0)$, 2.11(50)$(30\bar{3}3)$, 2.04(60)$(20\overline{24})$, 1.941(60)$(2\bar{4}23)$. Unit-cell parameters confirmed by both diffraction and single-crystal methods.

Daqingshanite occurs as small, rhombohedral crystals with rounded edges about 0.05 mm in size. Color pale yellow, luster greasy-glassy, streak white, cleavage $\{10\bar{1}1\}$ perfect, conchoidal fracture. Microhardness VHN_{20} 335, D calc. 3.71, meas. 3.81. Optically uniaxial (−), ϵ = 1.609, ω = 1.708, colorless in thin section, non-fluorescent in UV light. Exhibits infrared absorption bands for CO_2, PO_4, and H_2O. Hardly soluble in ammonium acetate but readily dissolved in dilute hydrochloric acid.

The mineral occurs in monomineralic aggregates in veins cutting dolomite in the footwall zone of the Bayan Obo iron ore deposit. The deposit consists of Proterozoic layered dolomite and minor arkose units which host the iron mineralization. The carbonate mineralogy of the deposit is quite complex. Minerals associated with daqingshanite include benstonite, huntite, strontianite, pyrite, phlogopite, and monazite.

Preliminary study of the crystal structure of the mineral shows it has a calcite-type structure similar to that of huntite. Extensive isomorphous substitution of both anions and cations is evident.

The name is for a mountain near the ore deposit. **J.E.S.**

Ferrostrunzite*

D. R. Peacor, P. J. Dunn, and W. B. Simmons (1983) Ferrostrunzite, the ferrous iron analogue of strunzite from Mullica Hill, New Jersey. Neues Jahrb. Mineral., Monat., 524–528.

Microprobe analysis gave P_2O_5 28.1, FeO 13.9, Fe_2O_3 30.9, MnO trace, H_2O (by difference) 27.1, sum 100%, corresponding to $Fe^{2+}_{0.98}Fe^{3+}_{1.96}(PO_4)_{2.00}(OH)_{1.84} \cdot 6.68H_2O$ (P = 2), or ideally $Fe^{2+}Fe^{3+}_2(PO_4)_2(OH)_2 \cdot 6H_2O$. The $Fe^{2+}:Fe^{3+}$ ratio of 1:2 was established by microchemical tests and in part of the basis of known structural relationships to strunzite.

X-ray study shows the mineral to be triclinic, space group $P\bar{1}$ or $P1$, unit cell a = 10.23(2), b = 9.77(3), c = 7.37(1)Å, α = 89.65(16)°, β = 98.28(12)°, γ = 117.26(16)°, V = 646(4)Å^3, and Z = 2. The strongest lines (34 given) are 8.94(80)(100), 5.29(100)$(1\bar{1}1)$, 4.47(30)$(11\bar{1},200,2\bar{1}\bar{1})$, 3.452(30)$(1\bar{1}\bar{2})$, 3.277(40)$(012,3\bar{2}0,2\bar{1}\bar{1})$, 3.213(30)$(1\bar{3}0)$.

Ferrostrunzite occurs as flattened prisms to 0.5 mm that are elongated parallel to [001] and are flattened parallel to the pinacoid {100}. Light brown color and streak. H (est.) about 4. D calc. 2.57, meas. 2.50. Very brittle. Luster vitreous. Cleavages: parallel to the length of the crystal; a second perpendicular to the optic normal; and a third perpendicular to *Bxa*. Optically biaxial (−), $2V$ = 80(5)°, α = 1.628(2), β = 1.682(calc.), γ = 1.723(4), $Z \wedge c \simeq$ 3–4°. Dispersion moderate and asymmetric. Absorption minimum parallel to Z. Pleochroism X = faint yellow-green, Z = faint red-yellow.

Ferrostrunzite is found as radiating sprays of fibrous prismatic crystals encrusting rockbridgeite which has replaced fossil belemnites. These fossils occur in Cretaceous sediments along Raccoon Creek near Mullica Hill. The mineral is named for its isostructural relationship with strunzite and its unique chemistry. Samples are preserved at the Smithsonian Institution in Washington. **J.E.S.**

Hingganite-(Yb)*

A. V. Voloshin, Ya. A. Pakhomovskii, Yu. P. Men'shikov, A. S. Povarennyk, E. N. Matvinenko, and O. V. Yakubovich (1983) Hingganite-(Yb), a new mineral from amazonite pegmatites of the Kola Peninsula, Doklady Akad. Nauk S.S.S.R. 270, 1188–1192 (in Russian).

Electron microprobe analyses of hingganite and hingganite-(Yb) gave, respectively, Y_2O_3 24.83, 8.56 ; Yb_2O_3 17.02, 34.07 ; Er_2O_3 6.47, 8.22; Dy_2O_3 2.13, 2.47; Lu_2O_3 1.87, 4.50; Tm_2O_3 1.38, 3.10; Ho_2O_3 0.21, 1.03; Tb_2O_3 0.33, 0.05; CaO 2.38, 1.14; PbO 0.52, − ; Fe_2O_3 1.46, − ; Al_2O_3 0.10, − ; SiO_2 26.43, 22.11 ; BeO 10.50, 10.90 ; H_2O (by difference) 3.92, 3.74%. For hingganite-(Yb), this gives $(Yb_{0.45}Y_{0.20}Er_{0.11}Lu_{0.06}Ca_{0.05}Tm_{0.04}Dy_{0.03}Ho_{0.01})H_{1.08}Be_{1.13}Si_{0.96}O_5$, or $(Yb,Y)BeSiO_4(OH)$ (for hingganite, $(Y,Yb)BeSiO_4(OH)$). The infra-red spectrum is given.

X-ray study showed the mineral to be monoclinic, space group $P2_1/a$, a = 9.888, b = 7.607, c = 4.740Å, β = 90.45°, Z = 4, D calc. 4.83. The X-ray pattern is similar to that of the synthetic compound $H_2Y_2Be_2Si_2O_{10}$ (Am. Mineral., 59, 700–708 (1974)). The strongest X-ray lines (62 given) are 6.06(7)(110), 3.13(10)$(211, 21\bar{1})$, 2.85(10)$(12\bar{1})$, 2.572(8)$(31\bar{1})$, 2.542(8)(311), 1.977(8)$(12\bar{2}, 122)$.

Colorless, transparent, luster vitreous, no cleavage. H 6 − 7. Optically biaxial, positive, *ns* α = 1.725, β = 1.738, γ = 1.760, $2V$ + 65°, $Z \wedge \mathbf{c}$ = 23°, $X \wedge \mathbf{c}$ = 20°, plane of optic axis (010). The mineral forms spherical aggregates of fine acicular crystals up to 2 mm long, width 0.1–0.2 mm. It grows on plumbomicrolite and in violet fluorite in amazonite pegmatites of the Kola Peninsula, U.S.S.R. and was formed by very late-stage replacement reactions.

The name is for the relation to hingganite (description not yet published). Type material is at the Fersman Museum, Acad. Sci. USSR, Moscow. **M.F.**

Katayamalite*

N. Murakami, T. Kato and F. Hirowatari (1983) Katayamalite, a new Ca–Li–Ti silicate mineral from Iwagi Islet, Southwest Japan. Mineralogical Journal, 11, 261–268.

Katayamalite (ideal composition $(K,Na)Li_3Ca_7(Ti,Fe^{+3},Mn)_2[Si_6O_{18}]_2(OH,F)_2$) is found as a fine-grained accessory mineral (0.3–0.5 percent by volume) in aegirine syenite (coexisting with albite, aegirine and pectolite). Analysis yields SiO_2 52.31, TiO_2 10.99, Fe_2O_3 0.29, MnO 0.22, CaO 28.25, Na_2O 0.22, K_2O 2.89, Li_2O 3.25, H_2O 1.21, F 0.34, $-0 = F_2$ 0.14; sum 99.83% (Si, Ti, Fe, Mn, Ca, Na and K determined by microprobe, Li by flame photometry, H_2O by gravimetry and F by specific ion electrode). This gives the formula $(K_{0.85}Na_{0.10})_{0.95}Li_{3.00}(Ca_{6.94}Mn_{0.04})_{6.98}(Ti_{1.90}Fe^{+3}_{0.05})_{1.95}Si_{12.00}O_{35.78}(OH)_{1.85}F_{0.25})_{2.10}$.

Single crystal X-ray diffraction shows the mineral to be a triclinic cyclosilicate, space group $C1$, $a = 9.721$, $b = 16.923$, $c = 19.942$Å, $\alpha = 91.43°$, $\beta = 104.15°$, $\gamma = 89.94°$, Z = 4, D calc. = 2.899, meas. 2.91±0.02. (If a standard $P1$ space group is chosen then $a = 9.763$, $b = 9.721$, $c = 19.942$Å, $\alpha = 104.15°$, $\beta = 81.76°$, $\gamma = 119.92°$, Z = 2). The strongest X-ray lines (28 given) are 3.48(20)$(025,\bar{2}05,203)$, 3.30(20)$(\bar{1}\bar{3}5,1\bar{3}4)$, 3.23(100)$(006,0\bar{4}4)$, 3.06(30)$(\bar{2}\bar{4}3,2\bar{4}1)$, 2.943(30)$(\bar{3}\bar{1}4,3\bar{1}1,152)$, 2.898(30) $(\bar{2}\bar{4}4,\bar{1}\bar{3}6)$, 2.730(20)$(153,\bar{1}54)$, 2.417(30)(008), 1.933(40)(00.10), 1.841(25) $(190,\bar{4}\bar{6}2,\bar{1}91)$, 1.382(25)(00.14).

The mineral is white with a brilliant bluish white fluorescence (short wave). Its streak is white and its luster is vitreous. The hardness (Mohs) is 3.5–4.0. Katayamalite occurs as single crystals, twins (parallel with composition plane (001)-common), or granular aggregates. It has a tabular form with perfect (001) cleavage, in part gently bent. Its optical properties are: $\alpha = 1.670$, $\beta = 1.671$, $\gamma = 1.677$, $\gamma - \alpha = 0.007$, $2V(+)$ = about 32°, **b** is near Y, Z is about 36° from normal to (001). It exhibits strong absorption, weak double refraction and has strong dispersion ($r > v$). The authors mention the coexistence of an apparent polymorph of the mineral with similar properties, this may give some problems in identification.

In occurrence and properties katayamalite resembles baratovite. Compositionally this mineral differs from baratovite by lacking Zr and by having OH dominant over F.

The name is for Emeritus Professor Nobuo Katayama, an eminent Japanese mineralogist. Type material is at Yamaguchi University; National Science Museum, Tokyo; and Sakurai Museum, Tokyo. **R.H.L.**

Kostylevite*

A. P. Khomyakov, A. A. Voronkov, L. I. Polezhaeva, and N. N. Smolyaninova (1983) Kostylevite, $K_4Zr_2Si_6O_{18} \cdot 2H_2O$, a new mineral. Zapiski Vses. Mineralog. Obshch. 112, 469–474 (in Russian).

Ilyushin, G. D., Khomyakov, A. P., Shumyatskaya, N. V., Voronkov, A. A., Nevskii, N. N. Ilyukhin, V. V., and Belov, N. V. (1981) Crystal structure of a new natural zirconosilicate, $K_4Zr_2Si_6O_{18} \cdot 2H_2O$. Doklady Akad. Nauk SSSR, 256, 860–863 (in Russian).

Microprobe analysis gave SiO_2 42.01, ZrO_2 23.90, HfO_2 0.61, TiO_2 2.06, Fe_2O_3 0.02, K_2O 22.14, sum 90.74%. Na and Ca were absent. H_2O is present, as shown by strong infrared absorption bands at 1680 and 3430 cm^{-1}. The analysis gives $K_{2.03}(Zr_{0.87}Ti_{0.12}Hf_{0.01})Si_{3.01}O_9$ or $K_2ZrSi_3O_9$. The H_2O content is given as $1H_2O$ to fit the structural requirements and to give a calculated D close to that measured; this however, gives a summation of about 95%. The mineral is readily decomposed by cold 10% HCl. Material heated to 600°C gave an X-ray pattern similar to that of wadeite.

X-ray study showed kostylevite to be monoclinic, space group $P2_1/a$, $a = 13.171(4)$, $b = 11.717(4)$, $c = 6.565(2)$Å, β 105.26°, Z = 2 $(K_4Zr_2Si_6O_{18} \cdot 2H_2O,)$. D calc. 2.79, meas. 2.74. The strongest X-ray lines (67 given) are 6.42(47)(200), 5.60(60)(210,011), 3.336(53)$(\bar{1}31,230,031)$, 3.087(100)$(\bar{1}11,\bar{2}12,410)$, 2.802(53)$(\bar{2}22)$. The structure consists of a framework of $Zr[Si_6O_{18}]^{-4}$ in which each ring of Si-tetrahedra rests on 6 Zr-octahedra and each octahedron is bonded to three rings. Along the **c**-axis is a wide channel in which half the atoms of K and all the H_2O is located. The formula is therefore doubled to give Si_6O_{18}; the mineral is dimorphous with umbite (see below). Kostylevite is colorless, transparent, luster vitreous, occurring in crystals elongated on **c**, showing forms {001}, {010}, {100}, and {011}. Twinned on (100). Cleavage (110) perfect. H 428–535 kg/sq.mm (~ 5 Mohs). Optically biaxial, positive, $2V = 48°$, dispersion weak $r < v$, X = **b**, $Y \wedge$ **c** = 45°, ns (±0.002) $\alpha = 1.595$, $\beta = 1.598$, $\gamma = 1.610$.

The mineral occurs in alkalic pegmatite in the valley of the Vuonnemiok River, Khibina massif, Kola Peninsula, intergrown with umbite and wadeite, and associated with eudialyte, K feldspar, and aegirine.

The name is for Ekaterina E. Kostyleva-Labuntsova (1894–1974), Soviet mineralogist. Type material is in the Fersman Mineralogical Museum, Acad. Sci. USSR (Moscow) and the Geol. Museum, Kola Branch, Acad. Sci. USSR, Apatite. **M.F.**

Munirite*

K. A. Butt and K. Mahmood (1983) Munirite, naturally occurring sodium vanadium oxide hydrate, a new mineral. Mineral. Mag., 47, 391–392

Munirite is partially dehydrated $NaVO_3 \cdot 2H_2O$. Chemical analysis by atomic absorption spectrophotometry gave V_2O_5 67.46, Na_2O 22.91 and H_2O 10.26 (Penfield method), sum 100.63 wt.%. It dehydrates completely at 100°C, the product yielding an X-ray diffraction pattern similar to β-$NaVO_3$. It is soluble in H_2O and HNO_3.

It is orthorhombic, $a = 10.4330$, $b = 15.7220$, $c = 7.4809$Å Z = 12, D meas. 2.43, D calc. 2.54. The strongest X-ray powder lines (22 reported) are 7.851(100)(020), 4.1344(70)(211), 3.2973(90) (141), 2.9843(70)(212), 2.6847(80)(250), 1.8200(50)(024).

Munirite occurs as pearly white radiating fibrous aggregates of 2–3 mm crystals on outcrops and walls of trenches of the Siwalik sandstone in the Bhimber area of Azad Kashmir, Pakistan. It is optically biaxial, negative, $2V = 75°$, $\alpha = 1.692$, $\beta = 1.757$, $\gamma = 1.800$; X = **c**, Y = **a**, Z = **b**.

The name honors Mr. Munir Ahmad Khan, Chairman of the Pakistan Atomic Energy Commission. Type material is deposited with the Hardrock Division, Atomic Energy Minerals Centre, Peshawar, Pakistan and the British Museum (Natural History). **C.A.F.**

Nefedovite*

A. P. Khomyakov, G. N. Nechelyustov, and G. I. Dorokhova (1983) Nefedovite, $Na_5Ca_4(PO_4)_4F$, a new mineral. Zapiski Vses. Mineralog. Obshch., 112, 479–483.

Analysis by electron microprobe gave Na_2O 22.7, K_2O 0.8, CaO 33.7, P_2O_5 42.1, F ≈ 2.5, sum 101.8 − $(0 = F_2)$ 1.0 = 100.8%. This gives the formula based on Σ Na,K,Ca,P = 13 of $(Na_{4.90}K_{0.11})Ca_{4.02}P_{3.97}O_{16.01}F_{0.88}$. The mineral is insoluble in water, but dissolves readily with no residue at room temperature in 10% HCl.

X-ray study shows the mineral to be triclinic, space group $P1$ or $P\bar{1}$, unit cell $a = 5.401(6)$, $b = 11.647(8)$, $c = 16.484(7)$Å, $\alpha = 134.99(3)°$, $\beta = 90.04(6)°$, $\gamma = 89.96(7)°$, Z = 2. It is pseudotetragonal with pseudocell $a = 11.65$, $c = 5.40$Å. The strongest lines (45 given) are 3.73 (80b) (211,310), 2.772(100)(321); 2.703(70)(002), 2.508(80)(411), 2.290(80)(510), 1.877(60)(422) (tetragonal *hkl* given).

The mineral occurs as irregular grains from 0.01 to 0.5 mm, in aggregates up to 5 mm, and as a fine-grained replacement apatite. It is associated with nacaphite (Na_2CaPO_4F), adularia, nepheline, alkali amphibole, and sphene, and occurs in pegmatitic segregations in agpaitic nepheline syenites of the Khibinskii massif, Kola peninsula. It is colorless, transparent, vitreous luster, conchoidal fracture. H about 4.5. D 3.01±0.01 (hydrostatic suspension), 3.05 calc. Optically uniaxial, positive, *n*s $\omega = 1.571$, $\varepsilon = 1.590$ (both ±0.002).

The name is for Ye. I. Nefedov (1910–1976). Samples are preserved in the Mineralogical Museum, Acad. Sci. USSR, Moscow, and the Geol. Inst. Museum, Kola Branch Acad. Sci. USSR, Apatite. **D.A.V.**

Sobolevite*

A. P. Khomyakov, T. A. Kurova, and N. I. Chistyakova (1983) Sobolevite, $Na_{14}Ca_2MnTi_3P_4Si_4O_{34}$, a new mineral. Zapiski Vses. Mineralog. Obshch., 112, 456–461 (in Russian).

Analysis by electron microprobe by N.I.C. of 4 samples gave (average) SiO_2 17.1, P_2O_5 19.9, TiO_2 15.2, Nb_2O_5 4.4, Fe_2O_3 0.6, MnO 4.0, MgO 0.6, CaO 6.4, Na_2O 29.7, F 0.7, sum 98.6 -(O = F_2) 0.3 = 98.3%. Compositions were uniform except for TiO_2 and Nb_2O_5, which varied inversely, TiO_2 from 15.2 to 13.2, Nb_2O_5 4.2 to 5.1%. This is calculated to $Na_{13.47}(Ca_{1.60}Mg_{0.21})(Mn_{0.79}Fe_{0.11})(Ti_{2.67}Nb_{0.46})P_{3.94}Si_{4.00}(O_{33.19}F_{0.52})$ or $Na_{14}Ca_2MnTi_3P_4Si_4O_{34}$, or, by analogy to other members of the lomonosovite group, to $Na_2CaMnTi_3Si_4O_{18} \cdot 4Na_3PO_4$. The deficit of Na may be due to its partial leaching; like the others, sobolevite given an alkaline reaction with H_2O (leaching of sodium phosphate). Readily decomposed by cold 10% HCl. The infrared spectrum shows SiO_4 and PO_4 groups.

X-ray study shows sobolevite to be monoclinic, $a = 7.074(1)$, $b = 5.4087(7)$, $c = 40.606(9)$ Å β 93.18°, Z = 2, D calc. 3.00, meas. 3.03. The strongest lines (54 given) are 2.913(50)$(21\bar{3})$, 2.896(100)(0.0.14), 2.691(70)$(21\bar{7})$, 1.671(50)$(2.0.\overline{22})(41\bar{4})$.

Sobolevite occurs in platy masses up to 5 mm wide, flattened on (001). Color brown, luster metallic or pearly on (001), resinous. Cleavages (001) perfect, (110) distinct. H 342–712 kg/sq.mm (~4.5–5 Mohs). Optically biaxial, negative, dispersion $r < v$ strong, $2V$ 25° (red), 29° (yellow), 33° (blue), *n*s (±0.002) α 1.627, β 1.686, γ 1.690, $Y = \mathbf{b}$, $X = \mathbf{b}$, $X \wedge \mathbf{c}$ 32°, pleochroic: X nearly colorless, Y and Z yellowish-brown, absorption $Z = Y > X$. Does not luminesce in ultra-violet light.

The mineral occurs in alkalic pegmatite of Mt. Alluaiv, N. W. Lovozero massif, Kola Peninsula, cutting sodalite- and cancrinite-syenite. It is intergrown with lamprophyllite and lomonosovite.

The name is for Vladimir S. Sobolev (1908–1982), distinguished Soviet petrologist, former president of I.M.A. Type material is at the Fersman Mineralogical Museum, Acad. Sci. USSR (Moscow), and the museum of the Geol. Inst., Acad. Sci. USSR, Apatite.

Note—not to be confused with Sobolevskite, PdBi. **M.F.**

Tristramite*

D. Atkin, I. R. Basham and J. F. W. Bowles (1983) Tristramite, a new calcium uranium phosphate of the rhabdophane group. Mineral. Mag., 47, 393–396.

Tristramite is a new member of the rhabdophane group with the ideal formula $(Ca,U^{4+})(PO_4) \cdot 1.5\text{–}2.0\ H_2O$. Electron microprobe analysis gave CaO 13.74, UO_2 35.08, Fe_2O_3 5.99, P_2O_5 25.09, SO_3 4.31, sum 84.21 wt.%. Wet chemical analysis on an impure concentrate gave H_2O about 15%. Effervesces in HCl. By analogy to rhabdophane, 1.46 wt.% CO_2 was added for charge balance and 14.33 wt.% H_2O determined by difference. The resulting empirical formula is: $(Ca_{0.54}U^{4+}_{0.29}Fe^{3+}_{0.17})_{\Sigma 1.00}[(PO_4)_{0.79}(SO_4)_{0.12}(CO_3)_{0.07}]_{\Sigma 0.98} \cdot 1.77\ H_2O$.

The mineral is hexagonal, $a = 6.913(3)$, $c = 6.422(6)$Å. Systematic absences are consistent with $P6_222$, the space group of rhabdophane. Z = 3, D meas. 3.8–4.2, D calc. 4.18. The strongest X-ray lines (41 reported) are 5.99(40)$(10\bar{1}0)$, 4.37(40)$(10\bar{1}1)$, 2.99(100)$(20\bar{2}0)$, 2.83(100)$(10\bar{1}2)$, 2.14(50)$(0003,21\bar{3}1)$ and 1.850(50)$(21\bar{3}2)$.

Acicular to fibrous tristramite crystals from 5 to 80 μm in length occur intergrown with goethite in fine fractures in pitchblende at six mines in Cornwall, the type locality being Wheal Trewavas. It is pale yellow to greenish yellow, optically uniaxial, positive, $\omega = 1.644(2)$, $\varepsilon = 1.664(2)$.

The name is derived from Arthurian mythology. Type material is lodged with the Institute of Geological Sciences and British Museum (Natural History). **C.A.F.**

Umbite*, Paraumbite*

A. P. Khomyakov, A. A. Voronkov, Yu. S. Kobyashev, and L. I. Polezhaeva (1983) Umbite and paraumbite, new potassium zirconosilicates from the Khibina alkalic massif. Zapiski Vses. Mineralog. Obshch., 112, 461–469 (in Russian).

Ilyushin, G. D., Pudovkina, Z. V., Voronkov, A. A., and others (1981) Crystal structure of a new natural modification of $K_2ZrSi_3O_9 \cdot H_2O$. Doklady Akad. Nauk SSSR 257, 622–624.

Umbite

Analysis of 3 samples by L.I.P. by electron microprobe (H_2O and F on separate portions) gave (average) SiO_2 42.36, ZrO_2 22.28, HfO_2 0.43, TiO_2 3.33, Fe_2O_3 0.12, K_2O 22.41, Na_2O 0.16, CaO none, H_2O 5.03, F 2.00, sum 98.12 -(O = F_2) 0.84 = 97.28%. This corresponds to $(K_{2.02}Na_{0.02})(Zr_{0.77}Ti_{0.18}Hf_{0.01}Fe_{0.01})Si_{3.00}H_{2.38}F_{0.45}O_{9.92}$, or $K_2(Zr_{0.8}Ti_{0.2})Si_3O_9 \cdot H_2O$. The infrared spectrum shows bands of molecular H_2O at 3170 and 3320 cm^{-1}. The mineral is readily decomposed by cold 10% HCl, leaving a silica skeleton. In UV light shows a weak yellow-white photoluminescence at room-temperature, bright whitish-green at the temperature of liquid N. The X-ray pattern of material heated to 500°C is that of wadeite.

X-ray study showed umbite to be orthorhombic, space group $P2_12_12_1$, $a = 10.208(2)$, b = 13.241(4), c = 7.174(1)Å., Z = 4, D meas. 2.79, calc. 2.79. The strongest X-ray lines (59 given) are 6.56(6b)(020,011) 5.91(9)(101), 3.31(7)(040,310), 3.02(10b), (231,320,122,041), 2.87(8)(141,212), 1.797(b)(717,004,531). The structure consists of wollastonite-like chains $(Si_{2.11}O_9)_\infty$ with 4 chains bonded to one Zr-octahedron.

Umbite forms platy crystals, flattened on **b** with principal face (010), also (101), (110), and (001). Colorless or yellowish, luster vitreous. H 305–401, av. 381 kg/sq.mm (~4.5 Mohs). Optically biaxial negative, $2V = 80°$, *ns* α 1.596, β 1.619 (±0.002), β calc. = 1.610, $X = \mathbf{c}$, $Y = \mathbf{b}$, cleavages (010) micaceous, (100) less perfect.

The mineral occurs with its dimorph kostylevite (see above). The name is for Lake Umba, Kola Peninsula, 20 km from the locality.

Paraumbite

Paraumbite occurs in alkalic pegmatite of Mt. Eveslogchorr, eastern Khibina massif, with K feldspar and eudialyte, the latter partly replaced by wadeite, gaidonnayite, and paraumbite. Microprobe analysis gave SiO_2 39.58, K_2O 15.39, Na_2O 0.12, CaO none, ZrO_2 27.87, HfO_2 0.32, TiO_2 0.89, Fe_2O_3 0.10, H_2O (diff.) 15.73%, corresponding to $(K_{2.92}Na_{0.03})(Zr_{2.02}Hf_{0.01}Ti_{0.10}Fe_{0.01})H_{0.94}Si_{5.89}O_{18.00} \cdot 7.34H_2O$, or $K_3Zr_2H(Si_3O_9)_2 \cdot nH_2O$. H_2O by difference corresponds to $n = 7$, but the calculated density corresponds to $n = 3$. The mineral is readily decomposed by cold 10% HCl.

X-ray study shows the mineral to be orthorhombic, $a = 10.34 \pm 0.04$, $b = 13.29 \pm 0.05$, $c = 14.55 \pm 0.06$Å, Z = 4, G. 2.59. The strongest X-ray lines (52 given) are 6.46(8)(012), 5.95(10b)(021,102), 3.34(7)(230,301,310), 3.01(9b)(042,321), 2.90(7)(214,142), 2.56(6)(150,332).

Paraumbite is colorless to white, luster vitreous to pearly on cleavage planes. Cleavages (010) micaceous, (100) less perfect. H 280-504, av. 384 kg/sq.mm (~4.5 Mohs). Optically biaxial negative, $2V = 82°$, *ns* (±0.002) α 1.588, β 1.601, γ 1.610, $X = \mathbf{c}$, $Y = \mathbf{b}$.

The name is for the close structural similarity to umbite, with *a* and *b* nearly idential, *c* twice that of umbite.

Type material of both minerals are at the Fersman Mineralogical Museum, Acad. Sci. USSR (Moscow) and the museum of the Geol. Inst., Kola Branch Acad. Sci. USSR (Apatit). **M.F.**

Unnamed Cu_3FeSnS_5

A. M. Podol'skii, E. G. Ryabeva, and L. S. Dubakina (1982) A new variety of rose stannite. Doklady Akad. Nauk SSSR, 264, 182–187 (in Russian).

A rose-colored mineral of composition Cu 37.5, Fe 10.6, Sn 22.6, S 29.2, Zn none; sum 99.9 corresponding to Cu_3FeSnS_5 was found in low-temperature veins associated with stannite, löllingite, native Bi, pyrrhotite, chalcopyrite, and pyrite. The mineral occurs within stannite as elongate spindle-shape grains from a few to 40-60 μm. The mineral displays strong reflection pleochroism and is strongly anisotropic. VHN 50g = 265, and bireflectance is distinct (nm, %) with 460, 22.1, 21.0; 540, 26.7, 25.4; 580, 28.5, 27.5; 640, 30.4, 29.6. The strongest X-ray lines (18 given) are 3.053(10)(112), 1.897(9) unindexed, 1.628(7)(116,033), 1.245(8)(143,136), 1.100(7)(244), 1.086(7)(228), based on a stannite structure. The mineral is believed to have formed as part of an isomorphous series with stannite by addition of a molecule of Cu_2S to Cu_2FeSnS_4. The authors propose that members of the isomorphous series be called covellostannite.

Discussion

The composition of the mineral is very close to that of zinc-free stannodite, and may be subject to error due to the use of pure element standards in microprobe analysis. The mineral is clearly not isomorphous with stannite, as its pattern contains both extra reflections and absences as compared to the pattern for stannite. However, the pattern is not a good match with that of stannoidite either, and more detailed analysis may reveal that it is a polymorph of stannodite. On the other hand, recent work on stannite and related minerals has cast considerable doubt on the existence of natural isomorphous series based on the stannite structure. **S.A.K.**

Unnamed Fe^{3+} analogue of hematolite

P. J. Dunn and D. R. Peacor (1983) A ferric iron equivalent of hematolite from Sterling Hill, New Jersey and Långban, Sweden. Mineralogical Magazine, 47, 381–385.

The empirical formula $(Mn_{8.90}Mg^{3.98}Fe^{3+}_{2.05}Al_{0.07})_{\Sigma 15.00}(AsO_3)_{1.01}(AsO_4)_{2.01}(OH)_{23.06}$ calculated from K. Johanssen's analysis in Wickman (1950) is in good agreement with six new electron microprobe analyses of Långban specimens. Two analyses of specimens from the Sterling Mine, Ogdensberg, New Jersey are also reported.

The mineral is hexagonal with $a = 8.28$Å. The *c* parameter is uncertain due to a mixed layer structure. Intense diffractions define lattices with $c = 48.46$ and $c = 72.69$Å which are approximately integral multiples of the basic 12.2Å unit of hematolite. The strongest lines in the unindexed X-ray powder pattern (22 reported) are 6.09(80), 5.13(50), 4.10(50), 3.42(50), 2.400(100), 1.563(100). **C.A.F.**

NEW DATA

Birnessite, Rancieite, and Takanelite

S. J. Kim (1980) Birnessite and rancieite problem: their crystal chemistry and new classification. Journal of the Geological Society of Korea, 16, 105–113.

Chemical and X-ray diffraction analyses and crystal chemical considerations have clarified the differences between birnessite and rancieite and their relationship to takanelite. Both birnessite and rancieite were found to be solid solution series, displaying variable compositions, cell dimensions and X-ray diffraction patterns. The general formula for both series may be expressed as $(R)_{2-2x}Mn^{4+}_{5+x}O_{11}(OH)_2 \cdot nH_2O$. For the rancieite series, R represents Ca or Mn^{2+}, with n ≈3, while the birnessite series consists of Ca-, Mn^{2+}, and Na-end members, with n ≤1.5. Although "takanelite" [characterized as $(Mn^{2+},Ca)Mn^{4+}_4O_9 \cdot nH_2O$, with n = 1.3, by Nambu and Tanida (1971) J. Japan Assoc. Min. Petr. Econ. Geol., 46, 48–56] should be the same mineral as the Mn^{2+}-analogue of rancieite, their crystal chemical properties and X-ray diffraction patterns do not agree. It is suggested that takanelite may be a member of a more hydrated series, or it may not be a valid species. (One sample of "takanelite" proved to be rancieite admixed with todorokite and nsutite.) It is also proposed that rancieite and birnessite be classified as mineral groups, and that Ca-rancieite, Mn^{2+}-rancieite, Ca-birnessite, Mn^{2+}-birnessite, and Na-birnessite be recognized as separate end-member species. **J.A.Z.**

Discussion

The proposed nomenclature should be formally presented to the Commission on New Minerals and Mineral Names for approval. **P.J.D.**

Georgiadesite

R. C. Rouse and P. J. Dunn (1983) New data on georgiadesite. Mineral. Mag., 47, 219–220.

The chemical formula and crystallographic data for georgiadesite have been revised upon re-examination of the holotype and three newly discovered specimens from the type locality. Electron microprobe analysis gave PbO 81.3, As_2O_5 11.2, Cl 11.3, sum 103.8 − (0 = Cl_2) = 101.2 wt.%. The revised formulae, $Pb_{16}(AsO_4)_4Cl_{14}O_2(OH)_2$ or $Pb_{16}(AsO_4)_4Cl_{14}(OH)_6$, are more consistent with the redetermined density (6.3±0.3g/cm^3) and space group.

Georgiadesite is monoclinic, $P2_1/c$, $a = 13.803(10)$, $b = 7.910(2)$, $c = 10.812(4)$Å, $\beta = 102.68(3)°$ with strongest lines (53 given): 3.096(100)(302,410), 3.955(50)(112,020), 3.164(50)(022), 6.33(30)(011), 5.30(30)($10\bar{2}$,002), 4.031(30)($21\bar{2}$). It occurs with nealite, laurionite, and phosgenite in cavities in the ancient slags at Laurion, Attike, Greece. **C.A.F.**

Fedorite

G. V. Sokolova, A. A. Kashaev, V. A. Drits, and V. V. Ilyukhin (1983) The crystal structure of fedorite. Sov. Phys. Crystallogr., 28, 95–96.

The layer calcium sodium silicate, fedorite, named for academician E. S. Fedorov, is triclinic, space group $C\bar{1}$, $a = 9.676(2)$, $b = 16.706(1)$, $c = 13.233(2)$Å; $\alpha = 93.35$, $\beta = 114.96$, $\gamma = 90.03°$; Z = 2; D meas. = 2.43 g/cm^3. Combined chemical and structural analyses indicate the following idealized formula: $(K_{1.65}Na_{0.83})_{2.48}(Ca_{4.52}Na_{2.48})_{7.0}Si_{16}O_{38}(OH,F)_2 \cdot H_2O$. Least squares refinement of the structure (2500 reflections, anisotropic $R = 0.095$) located the interlayer octahedral cations (Na,K) and the oxygen of the water molecules within the silicate framework, two-layer networks of six-membered silicate tetrahedral rings. **J.A.Z.**

Murdochite

E. Dubler, A. Vedani and H. R. Oswald (1983) New structure determination of murdochite, Cu_6PbO_8. Acta Cryst., C39, 1143–1146.

Crystal structure analysis of murdochite from Hansonburg, New Mexico indicate that the formula may best be described as $Cu_6PbO_{8-x}(Cl,Br)_{2x}$ with $x \leq 0.5$ instead of Cu_6PbO_8 or $Cu_{6\pm x}Pb_{1\pm x}(O,Cl,Br)_8$ as proposed previously. The crystal studied is cubic, $Fm3m$, $a = 9.224(2)$Å, Z = 4, final $R = 0.027$ for 255 unique observed reflections.

There are several differences between this structure and that reported previously (Christ and Clark, 1955). The structure is not sodium chloride type based with a statistical arrangement of Cu and vacancies. The Pb ions lie on the 4(a)(0,0,0) special positions and are cubically coordinated by eight oxygens. The Cu ions are also on special positions (24(d), (¼,¼,0)). The Cu^{+2} ions have a square planar coordination by four oxygens plus two halogen ions to complete a distorted octahedral (4 + 2) coordination. The oxide ions and vacancies are distributed over the 32(f) sites (oxygen occupancy 0.94) and the halide ions occupy statistically the 4(b) sites. Thus the unit cell contents may be described as $Pb_4Cu_{24}O_{30}\square_2(Cl,Br)_4$. **R.A.L.**

Vashegyite

Z. Johan, E. Slansky, and P. Povondra (1983) Vashegyite, a sheet aluminum phosphate: new data. Can. Mineral., 21, 489–498.

Examination of vashegyite from the type locality and two other occurrences shows it to be an orthorhombic sheet phosphate with variable properties. At Vashegy (Zeleznik), Czechoslovakia, it occurs as white polycrystalline aggregates associated with variscite and limonite. Wet chemical analysis gave Al_2O_3 29.11, P_2O_5 33.44, H_2O 37.45, sum 100.0%, corresponding to $Al_{10.958}(PO_4)_{9.042}(OH)_{5.748} \cdot 37.02H_2O$ (on the basis of 20(Al + Fe + P)). Ideal formula $Al_{11}(PO_4)_9(OH)_6 \cdot 37–38H_2O$. X-ray study yielded cell dimensions of $a = 10.773(3)$, $b = 14.971(5)$, $c = 20.626(6)$Å, $V = 3326.6$Å^3, Z = 2, D. calc. 1.934, meas. 1.930(1). Strongest X-ray lines (20 given) are 10.3(100)(002), 7.49(90)(020), 7.04(90)(021), 2.919(90)(330), 3.455(50)(232), and 2.417(50)(062).

Vashegyite from Chvaletice, Czechoslovakia occurs as hemispheric aggregates of pale greenish white crystals that possess perfect basal cleavage. Wet chemical analysis gave Al_2O_3 27.09, Fe_2O_3 0.12, P_2O_5 31.83, H_2O 40.01, insol. 0.50, sum 99.55%, corresponding to $(Al_{5.956}Fe^{3+}_{0.017})(PO_4)_{5.027}(OH)_{2.838} \cdot 23.47\ H_2O$ (on the basis of 11 (Al + Fe + P)). Ideal formula $Al_6(PO_4)_5(OH)_3 \cdot 23H_2O$. Cell dimensions $a = 10.754(3)$, $b = 14.971(5)$, $c = 22.675(6)$Å, $V = 3650.6$Å^3, space group $Pnam$ or $Pna2_1$, Z = 4, D. calc. 2.005, meas. 1.994(2). Strongest X-ray lines (22 given) are 11.3(100)(002), 2.912(90)(330), 7.50(80)(020), 6.26(70)(022), 3.297(60)(312), and 5.385(40)(200). Optically biaxial negative, colorless, $\alpha = 1.470(8)$, $\beta = 1.477(2)$, $\gamma = 1.482(2)$, $2V = 74\pm5°$, $X = \mathbf{c}$, $Y = \mathbf{b}$, $Z = \mathbf{a}$, axial plane parallel to (010).

The DTA curve shows an endothermic feature between 140 and 190°C (dehydration) and an exothermic feature at 860°C (loss of OH and structural rearrangement). Infrared absorption spectra resemble those of variscite. Differences in cell dimensions and physical properties due to variations in water content and crystal structure (in particular stacking sequence). A polytypoid relationship between several apparent varieties is suggested. **J.E.S.**

DISCREDITED MINERALS

Badenite, Epigenite = mixtures

Bayliss, P. (1983) Comments on the validity of badenite and epigenite. Mineral. Mag., 47, 411–412.

Electron microprobe and X-ray powder diffraction analysis of the only available specimens (not type) of badenite and epigenite showed both to be mixtures. Badenite = bismuth + safflorite + modderite. Epigenite = tennantite + chalcopyrite + pyrite. Both have been discredited as species by the IMA Commission. **C.A.F.**