

NEW MINERAL NAMES*

MICHAEL FLEISCHER, LOUIS J. CABRI, G. Y. CHAO, J. A. MANDARINO, AND ADOLF PABST

Arctite*

A. P. Khomyakov, A. V. Bykova, and T. A. Kurova (1981) Arctite, $\text{Na}_2\text{Ca}_4(\text{PO}_4)_3\text{F}$, a new mineral. *Zapiski Vses. Mineralog. Obsh.*, 110, 506-508 (in Russian).

Analysis of material containing rasvumite and a new unnamed potassium zirconium silicate gave P_2O_5 33.83, SiO_2 3.60, CaO 31.80, BaO 12.00, Na_2O 9.72, K_2O 1.64, Fe_2O_3 0.20, ZrO_2 3.25, S 0.22, F 5.25, H_2O 0.50, sum 102.01 - ($\text{O} = \text{F}_2$) 2.20 = 99.81%. After deducting all K, Fe, Zr, S, Si, and part of the F, this gave $\text{Na}_2(\text{Ca}_{3.5}\text{Ba}_{0.5})(\text{PO}_4)_3\text{F}$. The mineral is insoluble in water, dissolves readily in 5% HCl.

X-ray study showed it to be trigonal, $a_{\text{th}} = 14.32\text{\AA}$, $\alpha_{\text{th}} = 28^\circ 30'$, $Z = 2$, or in hexagonal setting, $a = 7.078$, $c = 41.203\text{\AA}$, $Z = 6$, D calc. 3.11, meas. 3.13. The strongest X-ray lines (47 given) are 13.80(25)(003), 3.54(21)(110), 3.43(32)(0.0.12, 113, 1.0.10), 3.06(25)(021), 2.804(25)(119), 2.746(100)(0.0.15), 2.719(21)(027).

The mineral is colorless, luster vitreous, pearly on the perfect cleavage {001}. H about 5. Optically uniaxial, negative, $\epsilon = 1.577$, $\omega = 1.578$, sometimes anomalously biaxial.

The mineral was found in a drill core in the valley of the Vuonnemi River, Khibina alkaline massif, Kola Peninsula, USSR, in pegmatitic veinlets, associated with rasvumite, villiaumite, aegirine, and thenardite.

The name is for the Arctic region. Type material is at the Fersman Mineralogical Museum, Acad. Sci. USSR, Moscow, and at the Geological Museum, Kola Branch Acad. Sci. USSR, Apatite. M.F.

Cesanite*

G. Cavarretta, A. Mottana and F. Tecce (1981) Cesanite, $\text{Ca}_2\text{Na}_3[(\text{OH})(\text{SO}_4)_3]$, a sulphate isotypic to apatite, from the Cesano geothermal field (Latium, Italy). *Mineral Mag.*, 44, 269-273.

Cesanite occurs both as a solid vein (1 cm thick) and as a cavity filling of an explosive breccia in core samples from Cesano I geothermal well, near the village of Cesano on the edge of the Baccano caldera. Other sulfates identified in the core samples include: gypsum, anhydrite, apthitalite, görgeyite, kalistrontite, and glauberite. Microprobe analysis supplemented by DTA gave the following results: CaO 18.8 SrO 0.72, Na_2O 23.3, K_2O 0.31, SO_3 52.6, Cl 0.44, F 0.25, H_2O 2.91, sum 99.33, $\text{O}/(\text{Cl}, \text{F}) = -0.21$, total 99.12%, leading to the formula given in the title with but minor substitutions. Cesanite is colorless, medium to coarse grained; $H = 2$ to 3; D meas. 2.786(2). It is uniaxial negative with $\epsilon = 1.564$, $\omega = 1.570$. The space group is

$P6_3/m$, $a = 9.442(6)$, $c = 6.903(3)\text{\AA}$. The principal lines in the X-ray powder pattern are 3.896(99)(1121), 3.448(87)(0002), 2.822(60)(2131), 2.727(100)(3030) and 1.844(71)(2133). The mineral has been named after the locality of occurrence. A.P.

Chabourneite*

Zdenek Johann, Joseph Mantiene, and Paul Picot (1981) Chabourneite, a new thallium mineral. *Bull. Mineral.* 104, 10-15 (in French).

Microprobe analyses of 5 samples from Jas Roux and 5 samples from Abuta gave Tl 12.81-23.87, Pb none to 18.72, Sb 25.88 to 32.92, As 14.83 to 17.72, S 24.73 to 26.05%, corresponding to $\text{Tl}_{21-x}\text{Pb}_{2x}(\text{Sb}, \text{As})_{91-x}\text{S}_{1.47}$ where $x = 0$ to 17.15.

X-ray study shows the mineral to be triclinic, space group probably $P1$, $a = 16.346$, $b = 42.602$, $c = 8.534\text{\AA}$, $\alpha = 95.86^\circ$, $\beta = 86.91^\circ$, $\gamma = 96.88^\circ$, $Z = 1$, D calc. 5.121, meas. 5.10. The strongest X-ray lines (43 given) 4.067(6)(042, 420), 3.928(440, 2.10.0); 3.573(16)(262, 2.10.0); 3.358(2.12.0), 2.853(7)(0.10.2, 422); 2.808(8)(4.12.0), 2.709(600), 2.345(622, 0.14.2, 642, 0.18.0, 0.16.2), 2.135(9)(0.18.2, 6.14.0, 4.18.0, 024).

The mineral is black, luster submetallic to greasy, microhardness 78-124, average 95 kg/sq.mm (load 25 g). In reflected light white, strongly anisotropic, red internal reflections; reflectances are given in *Am. Mineral.* 64, 272 (1979). It occurs at the Jas Roux mine, Hautes-Alpes, France, in dolomitic limestones, associated with pierrotite, parapierrrotite, and many other sulfides and sulfosalts, also at Abuta, Hokkaido, Japan, associated with getchellite, sphalerite, and barite.

The name is for the Chabourneou glacier, near the type locality, the Jas Roux deposit. Type material is at the Ecole Nationale Supérieure des Mines, Paris. M.F.

Chatkalite*

V.A. Kovalenker, T.L. Evstigneeva, V.S. Malov, and L.N. Vyal'sov (1981) Chatkalite, $\text{Cu}_6\text{FeSn}_2\text{S}_8$, a new mineral. *Mineralog. Zhurnal.*, 3, 79-86 (in Russian).

Microprobe analyses of 8 grains gave Cu 41.17-46.87, Ag none-0.68, Fe 1.44-4.31, Zn 0.82-4.89, Sn 10.75-19.11, Sb 2.97-7.25, As 0.80-2.58, Mo 0.41-1.08, S 27.70-28.88, sum 98.17-101.33%, corresponding to the formula $(\text{Cu}, \text{Ag})_{6.00}(\text{Fe}, \text{Zn}, \text{Cu})_{0.92-1.21}(\text{Sn}, \text{Sb}, \text{As}, \text{Mo})_{1.79-1.93}\text{S}_{7.95-8.20}$. In the (Fe, Zn, Cu) position, Fe is dominant in nos. 1-4, Zn in no. 5, and Cu in nos. 6-8. Probably these represent minerals that are dominantly $\text{CuZnSn}_2\text{S}_8$ and $\text{CuCuSn}_2\text{S}_8$; X-ray patterns could not be obtained, so that they are not named.

X-ray data show that chatkalite is tetragonal, space group $P4m2$, $a = 7.61 \pm 0.01$, $c = 5.373 \pm 0.05$, $Z = 1$, D calc. 5.00. The strongest X-ray lines (18 given) are 3.11(8)(021), 1.904(10)(040, 222), 1.625(4)(241, 023), 1.568(4b)(042). The pattern is practically identical with that of mawsonite, $\text{CuFe}_2\text{SnS}_8$; in chatkalite $\text{Fe}^{+2}\text{Sn}_2^{+4}$ replaces $\text{Fe}_2^{+3}\text{Sn}$ of mawsonite.

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

Chatkalite occurs as rounded grains (30–100 μm), associated with cassiterite, hemusite, and hessite, in tetrahedrite in sulfide-quartz veins of the Chatkal-Kuramin Mts., eastern Uzbekistan. Under the microscope it is pale rose. The birefringence is low, barely discernible. Anisotropy weak, mostly in shades of brown. Reflectances are given at 16 more wavelengths, (R'g and R'p): 460 nm, 25.6, 25.1; 540, 27.6, 27.1; 580, 28.6, 28.0; 660, 29.4, 28.6%. Hardness by micro-impression (20 g load) 258–287, av. 274 kg/sq.mm.

The name is for the locality. Type material is at the Fersman Mineralogical Museum, Acad. Sci. USSR, Moscow. **M.F.**

Comancheite*

A. C. Roberts, H. G. Ansell and P. J. Dunn (1981) Comancheite, a new mercury oxychloride-bromide from Terlingua, Texas. *Can. Mineral.*, 19, 393–396.

Comancheite occurs as anhedral red masses and as orange-red to yellow acicular crystals. The masses are said to have a resinous luster and the crystals a vitreous luster. (Because luster is a function of refractive index and absorption, two different lusters for the same substance seem contradictory, J.A.M.) The mineral has an orange-yellow streak, a hardness of 2 and does not fluoresce in ultraviolet light. It is brittle and has fair cleavages parallel to {001} and {110}. Comancheite is not affected by cold concentrated HCl, H₂SO₄ or HNO₃ but slowly turns dull orange-brown in 40% KOH. D meas. 7.7(4); calc. 8.0. (Using an empirical formula based on O + Cl + Br = 17, D calc. is 7.93, J.A.M.). Complete optical data could not be determined because of strong absorption and small crystal size, but crystals exhibit parallel extinction, are length-fast and refractive indices lie between 1.78 and 1.79. The authors point out that these refractive indices are much lower than those predicted by the Gladstone-Dale relationship (~2.1–2.3) and that the reason for the discrepancy is unknown.

X-ray single crystal study shows that comancheite is orthorhombic, space group *Pnmm* or *Pnn2*. Unit cell parameters refined from the powder data are: $a = 18.41(1)$, $b = 21.64(1)$, $c = 6.677(2)\text{\AA}$, $V = 2660.1\text{\AA}^3$, $a:b:c = 0.851:1:0.309$, $Z = 4$. The strongest lines in the X-ray powder diffraction pattern are: 5.68(70)(230), 5.42(6)(121), 2.878(80)(232), 2.710(50)(242,080,402), 2.669(100)(640), 2.457(50)(512) and 1.415(50)(644)\text{\AA} for CuK α radiation.

Electron microprobe analysis gave HgO 89.7, Cl 5.1, Br 8.9, total 103.7, less O = Cl + Br 2.0, sum 101.7 wt.%. Hg was assumed to be divalent. The empirical formula based on 13 Hg ions, is Hg_{13.00}(Cl_{4.51}Br_{3.50})_{28.01}O_{9.07} (Based on O + Cl + Br = 17, the empirical formula is Hg_{12.93}(Cl_{4.49}Br_{3.48})_{27.97}O_{9.03}, J.A.M.) or, ideally, Hg₁₃(Cl,Br)₈O₉ with Cl:Br = 1:0.77.

Comancheite occurs on two specimens labeled montroydite (no montroydite was found on either specimen) from Terlingua, Brewster Co., Texas (One specimen was labeled Mariposa mine, Terlingua, Texas). Associated minerals on the type specimens are: calcite, goethite, hematite and quartz.

The name is for the Comanche Indians who were the first miners at Terlingua. Type material is preserved in the National Mineral Collection of the Geological Survey of Canada and at the Smithsonian Institution. **J.A.M.**

Dreyerite*

G. Dreyer and E. Tillmanns (1981) Dreyerite, natural, tetragonal bismuth vanadate from Hirschhorn, Pfalz. *Neues Jahrb. Mineral. Monatsh.*, 151–154 (in German).

0003–004X/82/0506–0622\$00.50

Electron microprobe analyses by K. Abraham (2 series) gave Bi₂O₃ 71.9, 69.3; V₂O₅ 28.55, 28.8; CaO 0.9, 1.0, sum 101.3, 99.1%, corresponding to BiVO₄.

X-ray study showed the mineral to be tetragonal, structure of zircon type, space group *I4₁/amd*, $a = 7.303$, $c = 6.458\text{\AA}$. The powder pattern is practically identical with that of synthetic tetragonal BiVO₄. The strongest lines (10 given) are 4.85(40)(101), 3.656(100)(200), 2.739(60)(112), 1.878(40)(312).

The mineral occurs in plates parallel (001), 20–50 μm thick, and up to 0.5 mm in diameter. Color orange-yellow to brownish-yellow, streak yellow; luster adamantine. H 2-3, D calc. 6.25. Optically uniaxial, positive, n_s greater than 2.0, dichroic with O bright yellow, E brownish-yellow.

The mineral occurs in rhyolitic ash tuff, associated with quartz, barite, hematite, native silver, bismite, and carnotite. The name is for the late Gerhard Dreyer, Assistant Professor of Johannes Gutenberg Univ., Mainz, Germany, who found the mineral. Type material is at that university. **M.F.**

Ferrottychite*

A.P. Khomyakov, Yu.A. Malinovskii, and S.M. Sandomirskaya (1981) Ferrottychite, Na₆Fe₂(SO₄)(CO₃)₄, a new mineral. *Zapiski Vses. Mineralog. Obshch.*, 110, 600–603 (in Russian).

Analysis by X-ray spectrography (CO₂ calculated) gave Na₂O 32.30, FeO 15.26, MnO 4.35, MgO 2.77, SO₃ 14.00, CO₂ 30.75, sum 99.43%, corresponding to Na_{6.01}(Fe_{1.23}Mg_{0.40}Mn_{0.35})S_{0.98}C_{4.03}O₁₆, or Na₆(Fe_{1.24}Mg_{0.40}Mn_{0.36})(SO₄)(CO₃)₄, the Fe⁺² analogue of tychite. The mineral is readily decomposed by cold water with the formation of a fibrous brown material that is amorphous to X-rays, and an aqueous solution that is alkaline. The infra-red spectrum shows absorption maxima characteristic of sulfate and carbonate.

X-ray study showed ferrottychite to be isometric space group *Fd3*, $a = 13.962\text{\AA}$, $Z = 8$, D. calc. 2.794, meas. 2.79. The strongest X-ray lines (35 given) are 4.18(9)(311); 2.68(10)(511,333); 2.47(8)(440); 1.614(6)(751,555).

The mineral occurs in small grains (0.5–1 mm) that are colored gold-brown by a surface film of alteration product. On fresh surfaces, it is colorless to light yellow, luster vitreous, fracture conchoidal. H (micro-impression) 213.8–246.6, av. 228 kg/sq.mm (= 4 on the Mohs scale). Optically isotropic, $n = 1.550$. Strongly magnetic. The mineral was found in a drill core at depth 539 m in the southeastern part of the Khibina alkalic massif, Kola Peninsula. It is associated with shortite and the Fe-analogue of sidorenkite in a vein of analcime that cuts ijolite-urtite.

The name is for the composition and relation to tychite. Samples are preserved in the Fersman Mineralogical Museum, Acad. Sci. USSR, Moscow, and the Geological Museum, Kola Branch, Acad. Sci. USSR, Apatite. **M.F.**

Gormanite*

B.D. Sturman, J.A. Mandarino, M.E. Mrose and P.J. Dunn (1981) Gormanite, Fe₃⁺Al₄(PO₄)₄(OH)₆·2H₂O, the ferrous analogue of souzalite, and new data for souzalite. *Can. Mineral.*, 19, 381–387.

Gormanite occurs as blue-green elongate crystals (up to 3 × 0.5 × 0.1 mm) in radial aggregates and as blade-like crystals. It has a pale green streak, vitreous luster and is non-fluorescent under ultraviolet light. The hardness of 4 to 5 may be low due to breaking of individuals in the aggregates. There is a single poor cleavage parallel to {001}. D meas. 3.13(2). Gormanite is biaxial

(-), $2V = 53(2)^\circ$ meas. and 56° calc., $\alpha = 1.619(3)$, $\beta = 1.653(3)$, $\gamma = 1.660(3)$; dispersion very strong, $r > v$; absorption $X = Z < Y$, pleochroism X colorless, Y blue, Z colorless; orientation, X nearly normal to composition plane $\{001\}$, $Z \wedge b$ (elongation axis) 14° .

The mineral is triclinic, space group $P1$ or $\bar{P}1$; the unit cell parameters refined from the powder data are $a = 11.77(1)$, $b = 5.11(1)$, $c = 13.57(1)\text{\AA}$, $\alpha = 90^\circ 45(5)'$, $\beta = 99^\circ 15(5)'$, $\gamma = 90^\circ 05(5)'$; $V = 805.48\text{\AA}^3$, $Z = 2$. The strongest lines in the X-ray powder diffraction pattern (in \AA for $\text{CuK}\alpha$ using a Guinier camera) are: 4.761(60)(011), 3.395(100)(0 $\bar{1}$ 3), 3.154(60)(1 $\bar{1}$ 3,302), 3.062(40)($\bar{2}$ 13), 2.925(80)(311) and 2.554(90)(020). Crystals of gormanite are blades elongated parallel to [010], the plane of the blade is $\{001\}$. Other forms are: $\{\bar{1}00\}$, $\{102\}$, $\{\bar{1}02\}$ and $\{010\}$ for which θ and ρ angles are given.

Chemical analysis (E.J. Brooker, analyst) gave: MgO 6.65, CaO 0.26, MnO 0.31, FeO 14.68, Al_2O_3 25.51, Fe_2O_3 3.82, P_2O_5 37.23, H_2O 11.45, total 99.91 wt.% (After correction for 7.0 wt.% quartz). Electron microprobe analysis gave very similar results. The empirical formula derived from the analysis on the basis of 24 oxygen ions is $(\text{Fe}_{1.56}^{2+}\text{Mg}_{1.26}\text{Ca}_{0.04}\text{Mn}_{0.03})_{\Sigma 2.89}(\text{Al}_{3.82}\text{Fe}_{0.36}^{3+})_{\Sigma 4.18}(\text{PO}_4)_{4.00}(\text{OH})_{6.32} \cdot 1.69\text{H}_2\text{O}$ or, ideally, $(\text{Fe}^{2+}\text{Mg})_3(\text{Al},\text{Fe}^{3+})_4(\text{PO}_4)_4(\text{OH})_6 \cdot 2\text{H}_2\text{O}$. Density calculated from the cell parameters and empirical formula is 3.12.

DTA-TGA indicated a weight loss beginning at 390°C and continuing to 700°C with a strong endothermic peak at 510°C , a broad exothermic peak at 720°C and a small exothermic peak at 850°C .

The mineral is common in many outcrops in the phosphate-ironstone occurrence in the Rapid Creek and Big Fish River areas, Yukon. In thin-section it resembles a chlorite group mineral. It occurs with quartz, siderite, ludlamite, arrojadite, kryzhanovskite, oxidized vivianite and souzalite. Many crystals show strong chemical zoning with the mineral changing from gormanite to souzalite. Unanalyzed specimens are best referred to as gormanite-souzalite because the two species can only be differentiated by chemical analysis.

Gormanite is the ferrous analogue of souzalite and is named in honor of Prof. D.H. Gorman of the Department of Geology, University of Toronto. Type material is preserved at the Royal Ontario Museum and the Smithsonian Institution. All numerical data cited in this abstract are for ROM specimen M35123. J.A.M.

Hydrohonessite*

E.H. Nickel and J.E. Wildman (1981) Hydrohonessite—a new hydrated Ni-Fe hydroxy-sulphate mineral; its relationship to honessite, carrboydite, and minerals of the pyroaurite group. *Mineral. Mag.*, 44, 333–337.

D.L. Bish and A. Livingstone (1981) The crystal chemistry and paragenesis of honessite and hydrohonessite: the sulphate analogues of reevesite. *Mineral. Mag.* 44, 339–343.

Honessite, until recently an inadequately characterized species, has been redefined by Bish and Livingstone as the sulphate analogue of reevesite, *i.e.*, with SO_4^{2-} taking the place of CO_3^{2-} , and a basal spacing of 8.8\AA . Based on microprobe analyses of honessite from the chromite deposits of Hagdale, Unst, Shetland, a structural formula analogous to that of reevesite is assigned, $(\text{Ni}_{1.55}\text{Mg}_{0.10}\text{Fe}_{2.35}^{3+})(\text{OH})_{16}(\text{SO}_4)_{1.18} \cdot x\text{H}_2\text{O}$, where x is about 4.

Hydrohonessite is described by Nickel and Wildman on the basis of material from the Otter Shoot nickel mine at Kambalda, from the Otter Shoot ore dump and from the Carr Boyd nickel 0003–004X/82/0506–0623\$00.50

mine, all in Western Australia. Microprobe analysis of hydrohonessite from Kambalda yielded Ni 25.7, Fe 10.3, SO_4 15.6%. Based on the assumption that iron is all trivalent and other assumptions appropriate for a mineral of pyroaurite-type structure, a generalized formula is assigned, $[\text{Ni}_{8-x}^{2+}\text{Fe}_x^{3+}(\text{OH})_{16}]\frac{1}{2}(\text{SO}_4)^{2-} \cdot y\text{H}_2\text{O} \cdot z\text{NiSO}_4$, where x , y , and z are approximately 2.6, 7.0 and 1.0 respectively. Hydrohonessite is too fine-grained for hardness or density determination. It occurs as tiny hexagonal crystals encrusting botryoidal quartz and magnesite in a fracture in supergene Ni-Fe sulphides. Cell dimensions derived by least squares from a powder diffraction pattern are $a = 3.09$, $c = 10.80\text{\AA}$. Strongest lines in the powder pattern are 11.0(10)(001), 5.36(5)(002), 3.68(4)(003), 2.709(3)(004,100). The mineral is bright yellow, uniaxial negative, with $\epsilon = 1.59$ and $\omega = 1.63$. Hydrohonessite also occurs with honessite at Unst, Shetland and at Linden, Wisconsin, the type locality for honessite. A.P.

Kinichilite*

Hidemichi Hori, Eiji Koyama, and Kozo Nagashima, Kinichilite, a new mineral from the Kawazu mine, Shimoda City, Japan (1981) *Mineralog. Journal* (Tokyo) 10, 333–337 (in English).

Analysis by ICP emission spectroscopy on 1.02 mg gave TeO_2 67.6, SeO_2 0.53, FeO 11.6, MgO 2.70, ZnO 4.97, MnO 1.72, Na_2O 0.93, H_2O (by difference) 9.9, corresponding to the formula $(\text{Fe}_{1.13}^{2+}\text{Mg}_{0.47}\text{Zn}_{0.43}\text{Mn}_{0.17}^{2+})(\text{Te}_{2.97}\text{Se}_{0.03})\text{O}_{9.00}(\text{H}_{1.38}\text{Na}_{0.22})$, the zinc analogue of zemannite. The mineral dissolves readily in HCl and HNO_3 .

X-ray study shows the mineral to be hexagonal, space group $P6_3$ or $P6_3/m$ (the latter more probable), $a = 9.419$, $c = 7.665\text{\AA}$, $Z = 2$, D calc. 3.96. The strongest X-ray lines (24 given) are 8.15(90)(10 $\bar{1}$ 0), 4.079(100)(2020), 2.861(50)(21 $\bar{1}$ 1), 2.790(85)(20 $\bar{2}$ 2).

Color dark brown, streak brown, luster subadamantine. H low, no cleavage. Optically uniaxial, positive; n_s could not be measured because of rapid reaction with immersion liquids, but both ω and ϵ are >1.80 . Weakly dichroic, from light brown to yellowish brown.

The mineral occurs as a hexagonal prism less than 2 mm long in a quartz vein at the Kawazu mine, Izu Peninsula, Japan.

The name is for Dr. Kin-ichi Sakurai, a well-known amateur mineralogist, for whom Sakuraiite was named. M.F.

Mapimite*, Ojuelaite*

Fabien Cesbron, Miguel Romero S., and S.A. Williams (1981) Mapimite and ojuelaite, two new hydrated arsenates of zinc and iron, from the Ojuela mine Mapimi, Mexico. *Bull. Mineral.*, 104, 582–586 (in French).

Mapimite

Analysis by Marjorie Duggan gave As_2O_5 35.6, Fe_2O_3 25.6, ZnO 15.8, FeO 0.9, H_2O 21.6, sum 99.5%, corresponding to $(\text{Zn}_{1.88}\text{Fe}^{+2})_{0.12}\text{Fe}_{3.10}^{3+}(\text{AsO}_4)_{3.0} \cdot 11.61\text{H}_2\text{O}$ or $\text{Zn}_2\text{Fe}_3^{+3}(\text{AsO}_4)_3(\text{OH})_4 \cdot 10\text{H}_2\text{O}$. The DTA curve shows a sharp endothermic break at 190° , a smaller one at 343° , and an exothermic break at 638°C . Readily soluble in dilute acids. Fuses readily to a brown scoria.

The mineral is monoclinic, space group Cm , $a = 11.425$, $b = 11.296$, $c = 8.667\text{\AA}$, $\beta = 107^\circ 44'$, $Z = 2$, D meas. 2.95, calc. 3.00. The strongest X-ray lines (64 given) are 8.24(100)(001), 7.83(94)(110), 4.662(61)(021), 3.883(46)(221), 3.217(41)(22 $\bar{2}$).

Color variable in shades of blue, bluish-green, and green.

Luster vitreous. $H = 3$. Optically biaxial, positive, $2V = 50^\circ$, ns $\alpha = 1.672$, $\beta = 1.678$, $\gamma = 1.712$, $Y = b$, $Z \Delta a = 13^\circ$, $r < v$ strong, pleochroism strong, X pale yellow, Y greenish-yellow, Z deep Prussian blue.

Ojuelaite

Analysis by Marjorie Duggan gave As_2O_5 40.5, Fe_2O_3 27.5, ZnO 14.6, H_2O 16.8, sum 99.4%, corresponding to $Zn_{1.02}Fe_{1.96}^{+3}(AsO_4)_{2.00} \cdot 5.29H_2O$ or $ZnFe_2^{+3}(AsO_4)_2(OH)_2 \cdot 4H_2O$. Readily soluble in dilute acids. The DTA curve shows a sharp endothermic break at 198° , a small one at 250° , and one at 1057° (fusion); there is an exothermic break at $607^\circ C$.

Ojuelaite is monoclinic, space group $P2_1/c$, with $a = 10.247$, $b = 9.665$, $c = 5.569 \text{ \AA}$, $\beta = 94^\circ 22'$, $Z = 2$, D meas. and calc. 2.39. The strongest X-ray lines (44 given) are 10.23(65)(100), 7.03(82)(110), 4.83(78)(020), 4.521(54)(210), 4.251(100)(111), 3.043(46)(221), 2.901(62)(221), 2.871(90)(311), 2.630(63)(102). It is isostructural with Whitmoreite and perhaps with Arthurite.

Both minerals occur, associated with scorodite, adamite, and smithsonite, in the zone of oxidation of the Ojuela mine, Mapimi, Durango State, Mexico. The names are for the mine and the district. Type material is at the Laboratory of Mineralogy, C.N.R.S., Paris, and the Smithsonian Institution, Washington. M.F.

Mountkeithite*

D. R. Hudson and M. Russell (1981) Mountkeithite, a new pyroaurite-related mineral with an expanded interlayer containing $MgSO_4$. Mineral. Mag., 44, 345–350.

Mountkeithite $[(Mg,Ni)_9(Fe^{3+},Cr,Al)_3(OH)_{24}]^{3+}[(CO_3,SO_4)_{1.5}(Mg,Ni)_2(SO_4)_2(H_2O)_{11}]^{3-}$ occurs with pyrite, magnetite, magnesite, hexahydrite and morenosite in a low-temperature hydrothermal vein system in the Mount Keith disseminated nickel sulphide deposit, Western Australia. Microprobe analyses gave the following average composition: MgO 31.7, NiO 6.1, CuO 0.1, Cr_2O_3 6.1, Fe_2O_3 8.3, Al_2O_3 2.6, SO_3 14.7; microanalysis for C and H gave CO_2 3.9, H_2O 30.6; total 104.1%. The hexagonal cell dimensions are $a = 10.698$, $c = 22.545 \text{ \AA}$, obtained from a powder diffraction pattern with the strongest lines 11.30(10)(002), 5.63(8)(004), 3.765(6)(006), 2.645(4)(207), 2.545(4)(311,305).

Mountkeithite occurs as friable aggregates and rosettes of soft, pearly to translucent, pale pink to white flakes with perfect basal cleavage. It is uniaxial negative with $\epsilon = 1.51$ and $\omega = 1.52$; weakly pleochroic, colorless to pale pink. D meas. 2.12, calc. 1.95, $Z = 2$. Mountkeithite is soluble, with effervescence, in HCl. It changes to a pyroaurite-like phase with 7.8 \AA basal spacing when immersed in water, but can be changed back to an 11.3 \AA phase by immersion in 1M $MgSO_4$ solution. Phases similar to mountkeithite have been synthesized by immersing stichtite in 1M $MgSO_4$ solution.

The structure of mountkeithite is interpreted as consisting of positively charged brucite-like hydroxyl layers with both di- and trivalent cations, separated by about 7 \AA -thick, negatively charged interlayers containing carbonate and sulphate anions,

magnesium sulphate and water. Carrboydite, motukoreaite, and hydrohonessite are similar with 10–11 Å basal spacing. A.P.

Mundite*

Michel Deliens and Paul Piret (1981) Phosphates of uranyl and aluminum from Kobokobo, V. Mundite, a new mineral. Bull. Mineral., 104, 669–671 (in French).

Microprobe analysis by J. Wantier gave (av. of 4) UO_3 72.20, Al_2O_3 4.45, P_2O_5 12.55, H_2O (by difference) 10.80, corresponding to $Al_2O_3 \cdot 6UO_3 \cdot 2P_2O_5 \cdot 14H_2O$ or $Al(UO_2)_3(PO_4)_2(OH)_3 \cdot 5\frac{1}{2}H_2O$. It is structurally related to phosphuranylite.

X-ray study (Weissenberg and precession) show the mineral to be orthorhombic, space group $P2_1cn$ or $Pmcn$, $a = 17.08$, $b = 30.98$, $c = 13.76 \text{ \AA}$, $Z = 16$, D calc. 4.295. The strongest X-ray lines (30 given) are 7.80(100)(040), 5.74(40)(240), 3.87(60)(080), 3.37(70)(024,163), 3.06(50)(502), 3.00(40)(522).

The mineral occurs as rectangular plates, flattened on {010}, elongated on {001}. Cleavages {010}, {100}, {001} perfect. Color pale yellow. Optically biaxial, negative, $2V = 33^\circ$, ns α (calc.) = 1.62, $\beta = 1.682(2)$, $\gamma = 1.688(2)$, pleochroism very weak, elongation negative, $X = b$, $Y = c$.

The mineral occurs at Kobokobo, Kivu, Zaire, with phuralumite, upalite, and ranunculite (65, 208, 407, (1980). The name is for Walter Mund (1892–1956), radiochemist and Professor at the University of Louvain. Type material (6 samples) is at the Musee Royale Afrique Centrale, Tervuren, Belgium. M.F.

Murunkite*

M. G. Dobrovolskaya, A. I. Tsepin, T. L. Evstigneeva, L. N. Vyal'sov, and A. O. Zaozerina (1981) Murunkite, $K_2Cu_3FeS_4$ a new sulfide of potassium, copper, and iron. Zapiski Vses. Mineral. Obsh., 110, 468–473.

Microprobe analyses gave S 28.14, Cu 44.38, Fe 12.07, K 14.57, sum 99.16%, corresponding to $K_{1.72}Cu_{3.23}Fe_{1.09}S_{4.05}$, the potassium analogue of thalcosite.

X-ray data by G. V. Basova are indexed on a tetragonal cell with $a = 3.88$, $c = 13.10 \text{ \AA}$. Space group $I4m2$, $I42m$, $I4mm$, $I422$, or $I4/mmm$. The strongest lines (16 given) are 6.52(10)(002), 2.90(6)(103), 2.53(8)(112), 1.940 (5)(200), 1.715(4)(116,121).

Color like that of bornite, with characteristic iridescence, luster metallic. Oxidizes quickly in air and becomes covered with a black, sooty film. Soft, brittle, cleavage imperfect. Hardness 92.1–123.3, av. 109.4 kg/sq.mm. Reflectances are given at 16 wave lengths, av. for 2 grains; 460 nm, 14.75; 540 nm, 18.9; 580 nm, 20.7; 640 nm, 23.05%. Fresh surfaces have grayish-orange-cream color in reflected light, anisotropy less than for idaite with color effects from gray to brownish-gray with a bluish tint.

The mineral occurs in small grains (less than $1 \mu m$) or as aggregates up to 0.2 mm with charoite, aegirine, and K feldspar in rocks of the Murunskii alkaline massif that have undergone intensive K metasomatism.

The name is for the locality. Type material is at the Fersman Mineralogical Museum, Acad. Sci. USSR, Moscow. M.F.