NEW MINERAL NAMES*

John L. Jambor

CANMET, 555 Booth Street, Ottawa, Ontario K1A 0G1, Canada

Kenneth W. Bladh

Department of Geology, Wittenberg University, P.O. Box 720, Springfield, Ohio 45501, U.S.A.

T. Scott Ercit, Joel D. Grice

Mineral Sciences Division, National Museum of Natural Sciences,
Ottawa, Ontario K1A 0M8, Canada

Edward S. Grew

Department of Geological Sciences, University of Maine, Orono, Maine 04469, U.S.A.

Atlasovite*

V.I. Popova, V.A. Popov, N.S. Rudashevskiy, S.F. Glavatskikh, V.O. Polyakov, A.F. Bushsmakin (1987) Nabokoite $Cu_7TeO_4(SO_4)_5 \cdot KCl$ and atlasovite $Cu_6Fe^{3+}Bi^{3+}O_4(SO_4)_5 \cdot KCl$. New minerals of volcanic exhalations. Zapiski Vses. Mineralog. Obshch., 116, 358–367 (in Russian).

An average of four electron-microprobe analyses at three different laboratories using different standards gave Cu 30.48, Zn 0.82, Pb 2.04, Te 1.03, Fe 4.38, Bi 11.50, K 3.20, V 0.46, Cs 0.01, S 12.90, Cl 2.92, O 30.26 (by difference, to sum 100 wt%), corresponding to $(Cu_{5.90}Zn_{0.15})_{\Sigma 6.05}(Fe_{0.97}V_{0.11})_{\Sigma 1.08}(Bi_{0.68}Pb_{0.12}Te_{0.10})_{\Sigma 0.90}(SO_4)_{4.95}O_{4.19} \cdot K_{1.01}Cl_{1.01}$ for O + Cl = 25. The ideal formula is $Cu_6Fe^{3+}Bi^{3+}O_4(SO_4)_5 \cdot KCl$. No water was found. The mineral forms an isomorphous series with nabokoite in which Fe^{3+} and Bi^{3+} substitute for Cu and Te. Insoluble in water but soluble in HCl and HNO_3; reacts with KOH, Clerici solution, and immersion oils of high refractive index.

By analogy with nabokoite (which see), atlasovite is presumed to be tetragonal, space group $P4/ncc$. The unit cell from powder data is $a = 9.86(2)$, $c = 20.58(2)$ Å, Z = 4. Six of the strongest lines taken with unfiltered Fe radiation (66 α and β lines given) are 10.41(100)(002), 4.57(50)(014), 3.57(40)(024), 3.431(70)(006), 2.890(70)(224), 2.446(80)(226). A line at 10.75(90) was not indexed.

Atlasovite occurs as tabular crystals showing the forms {001}, {110}, {012}, and {014}; the crystals may consist predominantly of atlasovite, or atlasovite may occur as zones within nabokoite. Atlasovite is dark brown, transparent, with a vitreous luster and light brown streak. Perfect {001} cleavage, H = 2 to 2.5, D_{meas} = 4.20(5) g/cm³ (by suspension in Clerici solution), D_{calc} = 4.12 g/cm³. Optically uniaxial negative, ω = 1.783(3), ϵ = 1.776(3) (white light), dichroic with O = red brown and E = yellowish. In reflected light, light gray with yellow internal reflections.

The mineral is a sublimate from the Great Clefted Talbachik volcanic eruption, Kamchatka, USSR. The name is for the Russian explorer Vladimir Vasil'yevich Atlasov (circa 1661–1664 to 1711). A sample (as zones in nabokoite) is preserved in the Fersman Mineralogical Museum of the USSR Academy of Sciences, Moscow.

Discussion. The proposed formula needs further substantiation. No evidence is given to support the valences assigned to Fe

and Bi. As in the case with nabokoite, there is a discrepancy between the measured and calculated densities and a large spread of values for Zn, Pb, Te, K, and S among the microprobe analyses, which were simply averaged. Moreover, in the X-ray powder pattern, there is an intense peak at 10.75 Å that is not accounted for; a peak also occurs at 10.64 Å in the pattern for nabokoite. **E.S.G.**

Carbonate-vishnevite and hydroxyl vishnevite

Ye. I. Semyonov, A.P. Khomyakov, G.Ye. Cherepivskaya, N.G. Ugryumova (1984) Sodian cancrinites of the Lovozero alkaline massif. Mineralog. Zhurnal, 6, 50–54 (in Russian).

Four analyses of carbonate-vishnevite gave SiO_2 43.62, 43.11, 39.38, 38.87; Al_2O_3 24.57, 24.42, 26.19, 27.48; Fe_2O_3 0.38, 0.33, 0.84, 0.61; MnO —, —, 0.07, 0.09; MgO 0.12, 0.11, 0.50, 0.08; CaO 0.50, 0.68, 2.11, 1.32; Na_2O 20.91, 21.30, 22.79, 23.58; K_2O 0.40, 0.10, 0.37, 0.11; CO_2 4.04, 4.82, 5.72, 3.56; SO_3 —, 0.36, 0.44, 0.50; H_2O 5.80, 5.01, 2.46, 4.51; sums 100.34, 100.24, 100.37, 100.21 wt%. The first two analyses approximate $Na_7Al_5Si_7O_{24}CO_3 \cdot 2.5 \ H_2O$; the second two approximate $Na_8(AlSiO_4)_6CO_3 \cdot H_2O$.

Powder X-ray study of carbonate-vishnevite yields a = 12.582(4), c = 5.105(2) Å; space group could not be determined unambiguously, and splitting of several lines indicates that the unit cell could be a multiple of the above values. The mineral is uniaxial and, as a rule, negative with n_{max} = 1.512, n_{min} = 1.490, Δn = 0.022. Density 2.39 to 2.46 g/cm³; color variable from pale lilac and light blue to dark gray and black, the last attributed to included organic matter.

Carbonate-vishnevite occurs in poikilitic aegirine-nepheline-sodalite syenites and associated pegmatites and hydrothermalites of the Karnasurt and Alluayv Mountains and the River Chinglusuay (Kola Peninsula). The mineral occurs as veinlets 1 to 3 cm thick, as prismatic crystals in cavities, and as irregular granular aggregates that locally are replacements of sodalite.

Analysis of hydroxyl vishnevite gave SiO_2 36.32, Al_2O_3 31.15, Fe_2O_3 0.18, MnO 0.03, MgO 0.11, CaO 0.92, Na_2O 23.43, K_2O 0.45, CO_2 1.59, H_2O 5.41, sum 99.59 wt%, approximating $Na_4(AlSiO_4)_3(OH) \cdot H_2O$. Powder X-ray study gave a = 12.731(4), c = 5.180(2) Å, space group as $P6_32$. Refractive indices are 1.501 and 1.494. D = 2.32 g/cm³. Color light blue. The mineral occurs in the Karnasurt Mountains; the mode of occurrence is not specified, but presumably it is the same as for carbonate-vishnevite.

Discussion. In terms of chemical composition, the two minerals

---

described here are not any closer to type vishnevite than to two other members of the cancrinite group, cancrinite and sacrofanite. Thus the terms carbonate-vishnevite and hydroxyl vishnevite are misleading. The names have not been submitted to the IMA commission for appraisal. **E.S.G.**

Diomignite*

D. London, M.E. Zolensky, E. Roedder (1987) Diomignite: natural $Li_2B_4O_7$ from the Tanco pegmatite, Bernic Lake, Manitoba. Can. Mineral., 25, 173–180.

The mineral occurs as a clear, colorless daughter mineral, up to 30 μm in maximum dimension, in fluid inclusions in spodumene. The grains are euhedral to anhedral, commonly pseudorhombohedral to pseudocubic, the appearance derived from tetragonal forms {100} and {111}. No twinning or cleavage observed. A Gandolfi X-ray pattern (57.3-mm camera, Cu radiation) gave tetragonal cell dimensions of $a = 9.470(4)$, $c = 10.279(5)$ Å, and strongest powder-diffraction lines of 4.07(100)(112), 3.495(50)(022), 2.662(60)(123), 2.587(40)(132), 2.045(40)(322); the results are in excellent agreement with data for synthetic $Li_2B_4O_7$, space group $I4_1cd$, $Z = 8$, $D_{calc} = 2.437$ g/cm^3. The mineral is uniaxial negative, with a refractive index of about 1.6 and birefringence of about 0.05; synthetic $Li_2B_4O_7$ is uniaxial negative, $\omega = 1.612(1)$, $\epsilon = 1.554(2)$, birefringence 0.058(4). Energy-dispersion spectroscopic analysis of diomignite crystals confirmed that elements with an atomic number >11 were absent; thermometric properties of the inclusions also are consistent with $Li_2B_4O_7$ behavior.

The new name is derived from Homeric Greek *dios mignen* (divine mix) in allusion to the pronounced fluxing effects of the compound. Type samples are catalogued as USNM 164236 at the Smithsonian Institution, Washington, D.C., and AMNH 98089 at the American Museum of Natural History, New York, N.Y. **J.L.J.**

Hannebachite*

G. Hentschel, E. Tillmanns, W. Hofmeister (1985) Hannebachite, natural calciumsulfite hemihydrite, $CaSO_3 \cdot \frac{1}{2}H_2O$. Neues Jahrb. Mineral. Mon., 241–250.

Ten electron-microprobe analyses gave an average of CaO 43.1, SO$_2$ 49.5, H$_2$O (by difference) 7.4 wt%; TGA showed a weight loss 0.7 wt% between 108 and 141 °C, and 6.7 wt% between 375 and 467 °C, for a total of 7.4 wt%. The ideal formula $CaSO_3 \cdot \frac{1}{2}H_2O$ contains CaO 43.4, SO$_2$ 49.6, H$_2$O 7.0 wt%. The mineral occurs as crystals up to 1 mm long, elongate [010], flattened {001} and modified by {101} and {021}. Colorless, transparent, vitreous luster, white streak, H = 3.5, perfect {110} cleavage, $D_{meas} = 2.52$, $D_{calc} = 2.54$ g/cm^3 for Z = 8. Optically biaxial positive with $\alpha = 1.596(2)$, $\beta = 1.600(2)$, $\gamma = 1.634(2)$, $2V_{meas} = 38(5)°$, $2V_{calc} = 38°$; $X = \mathbf{a}$, $Y = \mathbf{c}$, $Z = \mathbf{b}$. Single-crystal study and refinement of the powder pattern (37 lines given) gave an orthorhombic cell with $a = 6.473(5)$, $b = 9.782(9)$, $c = 10.646(9)$ Å, space group $Pbna$. Strongest lines and indices of the X-ray powder pattern (114.6-mm camera, Cu radiation) are 5.54(40)(101), 3.79(80)(112), 3.15(100)(122), 2.617(90)(221), 1.950(40)(240), 1.843(50)(303), 1.671(40)(225). The infrared spectrum has absorption bands at 980, 940, and 650 cm^{-1} that are characteristic for SO$_3$.

Hannebachite occurs in cavities in melilite-nepheline-leucite lava at the Quarternary volcano of Hannebacher Ley near Hannebach, Eifel, West Germany. Associated minerals in the cavities are calcite, aragonite, gypsum, barite, celestite, various zeolites, and whewellite. Hannebachite is thought to be primary in origin. Type material is in the Naturhistorisches Museum Mainz, Federal Republic of Germany. **J.L.J.**

Johninnesite*

P.J. Dunn, D.R. Peacor, S.-C. Su, J.A. Nelen, O. von Knorring (1986) Johninnesite, a new sodium manganese arsenosilicate from the Kombat mine, Namibia. Mineral. Mag., 50, 667–670.

Electron-microprobe analysis gave SiO$_2$ 35.5, FeO 0.1, MgO 8.2, MnO 40.7, As$_2$O$_5$ 10.6, Na$_2$O 3.1, H$_2$O (Penfield method) 2.6, sum 100.8 wt%, corresponding to $Na_{2.06}Mg_{4.20}Fe_{0.03}Mn_{11.83}As_{1.90}Si_{12.18}O_{43.22}(OH)_{5.95}$, ideally $Na_2Mg_4Mn_{12}As_2Si_{12}O_{43}(OH)_6$. The analytical total and calculations of Gladstone-Dale values require that Mn is divalent and As pentavalent. The mineral occurs as light yellowish-brown, friable, acicular aggregates, elongate [001] and up to 4.5 cm long, with a vitreous luster, light brownish-yellow streak, and indeterminate hardness; good {100} and poor {010} cleavages. $D_{meas} = 3.48(4)$, $D_{calc} = 3.51$ g/cm^3 for Z = 1. Optically biaxial negative with $2V = 41.9(2)°$, $2V_{calc} = 40.9°$, $\alpha = 1.6742(4)$, $\beta = 1.6968(3)$, $\gamma = 1.6999(3)$ for Na light; $r > v$ distinct. Single-crystal study indicated triclinic symmetry, $P1$ or $P\bar{1}$. Cell dimensions refined from a Gandolfi X-ray powder pattern (114.6-mm camera, Fe radiation) are $a = 10.44(2)$, $b = 11.064(6)$, $c = 9.62(1)$ Å, $\alpha = 107.43(7)$, $\beta = 82.7(1)$, $\gamma = 111.6(1)°$. Strongest lines of the powder pattern are 9.8(60)(010), 5.99(40)(110), 3.38(40)(121, etc.), 3.23(60)(3$\bar{2}$0,300,01$\bar{3}$), 2.676(100), 2.479(40), 1.539(40).

Johninnesite is named for John Innes, senior mineralogist of the Tsumeb Corporation. The mineral occurs at the Kombat mine, 49 km south of Tsumeb, Namibia, but is in late-stage veins that cut iron-manganese lenses spatially separated from the copper-lead-silver sulfide ore. Type material is preserved at the Smithsonian Institution, Washington, D.C., under catalogue number NMNH 16320. **J.L.J.**

Kombatite*

R.C. Rouse, P.J. Dunn, J. Innes (1986) Kombatite, the vanadium analogue of sahlinite, from the Kombat mine, South West Africa. Neues Jahrb. Mineral. Mon., 519–522.

Electron-microprobe analysis gave PbO 92.4, V$_2$O$_5$ 5.9, Cl 4.2, O ≡ Cl 0.9, sum 101.6 wt%, corresponding to $Pb_{13.7}V_{2.1}O_{17.1}Cl_{3.9}$ for (O,Cl) = 21, ideally $Pb_{14}(VO_4)_2O_9Cl_4$. The mineral occurs as bright yellow anhedral grains, 0.2 mm in diameter, most of which are turbid. Light yellow streak, adamantine luster, soft (hardness possibly 2 to 3), perfect {010} cleavage, nonfluorescent in ultraviolet light. Optically biaxial negative with $n > 1.90$, not pleochroic.

Single-crystal study indicated monoclinic symmetry, space group $C2/c$ or Cc, $a = 12.552(1)$, $b = 22.495(6)$, $c = 11.512(7)$ Å, $\beta = 118.99(2)°$, D_{calc} 7.979 g/cm^3 for Z = 4. Strongest lines of the X-ray powder pattern (114.6-mm Gandolfi camera, Cu radiation): 3.006(100)(062,$\bar{3}$52), 2.958(100)(152), 2.812(100)(080), 2.253(70)(0.10.0), 2.011(40)($\bar{6}$04), 1.989(50)($\bar{5}$35), 1.756(70), 1.590(60). The pattern is similar to that of sahlinite, the isostructural arsenate analogue. The new name is derived from the type locality, the Kombat mine, a copper-lead-silver deposit 49 km south of Tsumeb. Type material is preserved in the National Mineral Collection (Canada) at the Geological Survey of Canada, Ottawa (catalogue number 64563). **J.L.J.**

Magnesiohulsite*

Yang Guangming, Peng Zhizhong, Pan Zhaolu (1985) Magnesiohulsite–A new tin-rich borate mineral. Acta Mineral. Sinica, 5, 97–101 (in Chinese with English abstract).

Wet-chemical analysis gave CaO 0.18, MnO 0.90, MgO 25.75, FeO 20.86, Fe_2O_3 20.97, Al_2O_3 0.05, TiO_2 0.05, SiO_2 0.45 (attributed to an impurity), SnO_2 12.90, B_2O_3 16.59, H_2O not found, sum 97.80 wt%, corresponding to $(Mg_{1.25}Fe^{2+}_{0.66}Mn_{0.03}Ca_{0.01})_{\Sigma1.95}$-$(Fe^{3+}_{0.60}Sn_{0.19}Mg_{0.19}Al_{0.01}Ti_{0.01})_{\Sigma1.00}B_{1.06}O_{5.00}$, ideally $(Mg,Fe^{2+})_2$-$(Fe^{3+},Sn,Mg)(BO_3)O_2$ with Mg > Fe. X-ray–SEM mapping shows homogeneous distributions of Mg, Fe, Mn, and Sn. The mineral occurs in aggregates consisting of tufts of divergent needles up to 0.4 × 0.08 × 0.08 mm, elongate [010], and twinned (101). Color black, submetallic luster, dark brown streak, brittle, no cleavage, VH_{50} = 689–825 kg/mm², D_{meas} (pycnometer) = 4.18(2), D_{calc} = 4.15 g/cm³ for Z = 2. Insoluble in sulfuric and nitric acids, but slowly soluble in concentrated HCl.

In reflected light, bluish gray to grayish white with strong anisotropism. Reflectance values for R_1, R_2 (in air, SiC standard) are 405(10.11,12.45), 436(9.55,12.13), 480(8.67,11.22), 526(8.24,11.69), 546(7.61,11.85), 589(6.78,11.54), 644-(6.21,11.67), 656(5.87,11.38), 700(5.29,10.93). Transparent in thin section with α = 1.88, γ = 1.95, length slow, strongly pleochroic from dark brown (Z) to dark green (X).

Magnesiohulsite occurs in a magnesian skarn borate deposit at Qiliping, Changning County, Hunan Province, China. The mineral is a major constituent in the contact zone between granite and calcite-dolomite host rocks. Associated borates are szaibelyite, kotoite, fluoborite, ludwigite, and sakhaite. The new name is for the analogy to hulsite. **J.L.J.**

Mattheddleite*

A. Livingstone, G. Ryback, E.E. Fejer, C.J. Stanley (1987) Mattheddleite, a new mineral of the apatite group from Leadhills, Strathclyde region. Scottish J. Geol., 23, 1–8.

Electron-microprobe analysis of two grains gave PbO 83.5, 83.7, SiO_2 7.3, 8.0, SO_3 6.1, 5.9, Cl 2.5, 2.3, sum 98.8, 99.4 after deduction of O ≡ Cl 0.6, 0.5 wt%. The average corresponds to $Pb_{10.14}(Si_{3.45}S_{2.03})O_{22.17}Cl_{1.83}$, ideally $Pb_{20}(SiO_4)_7(SO_4)_4Cl_4$. The mineral occurs in cavities in quartz as creamy-white linings consisting of radiating hexagonal prisms, up to 100 μm by 10–20 μm, that form aggregates about 0.2 mm in diameter. The mineral has an adamantine luster, white streak, and a basal cleavage or fracture; colorless and transparent in transmitted light, length fast, uniaxial negative with ω = 2.017(5), ϵ = 1.999(5) for Na light. Fluoresces dull yellow in short-wave ultraviolet light. Single-crystal study and the refined X-ray powder pattern gave a = 9.963(5), c = 7.464(5) Å, D_{calc} = 6.96 g/cm³ for the empirical formula and Z = 1. The strongest lines of the X-ray powder pattern (114.6-mm camera, Cu radiation) are 4.32(40)(200), 4.13(40)(111), 3.41(20)(102), 3.26(30)(210), 2.988(100)(112,211), 2.877(40)(300), 2.072(20)(222), 1.871(20)(004,402). The 00l absences are compatible with the space group $P6_3/m$. The infrared spectrum has similarities to that of hydroxyellestadite.

The new name is for Matthew Forster Heddle (1827–1897), a famous Scottish mineralogist. The mineral occurs with lanarkite, cerussite, hydrocerussite, caledonite, leadhillite, susanite, and macphersonite in museum specimens from Leadhills Dod, Strathclyde region, Scotland. Type material is at the Royal Museum of Scotland, Edinburgh, Scotland (RMS GY 721.34) and

at the British Museum (Natural History), London, England (MM 344).

Discussion. The ideal formula with Z = 1 is not compatible with the space group and gives D_{calc} = 13.76 g/cm³, a substantial contrast to the value obtained from the empirical formula. **J.L.J.**

Nabokoite*

V.I. Popova, V.A. Popov, N.S. Rudashevskiy, S.F. Glavatskikh, V.O. Polyakov, A.F. Bushmakin (1987) Nabokoite $Cu_7TeO_4(SO_4)_5 \cdot KCl$ and atlasovite $Cu_6Fe^{3+}Bi^{3+}O_4(SO_4)_5KCl$– New minerals of volcanic exhalations. Zapiski Vses. Mineralog. Obshch., 116(3), 358–367 (in Russian).

An average of five electron-microprobe analyses at three different laboratories with different standards and two oxygen determinations by a chromatographic method gave Cu 36.15, Zn 1.01, Pb 0.24, Te 11.02, Fe 0.06, Bi 0.44, K 3.27, V 0.05, Cs 0.10, S 13.48, Cl 2.92, O 28.80–29.1, sum 97.54–97.84 wt%, corresponding to $(Cu_{6.74}Zn_{0.18})_{\Sigma6.92}(Te_{1.02}Bi_{0.02}Pb_{0.01}Fe_{0.01}V_{0.01})_{\Sigma1.07}$-$(SO_4)_{4.98}O_{4.10} \cdot (K_{0.99}Cs_{0.01})_{\Sigma1.00}Cl_{0.98}$ for O + Cl = 25 and assuming O = 31.26 wt% to bring the analytical sum to 100.0%. Nabokoite forms an isomorphous series with atlasovite in which Fe^{3+} and Bi^{3+} substitute for Cu and Te. Insoluble in water, soluble in HCl and HNO_3, and reacts with KOH, Clerici solution, and immersion oils of high refractive index. The DTA curve shows a weak endothermic effect at 720 °C, corresponding to a weight loss of about 30% and breakdown to tenorite and other products, but no water was found. The infrared spectrum over the interval 400–1500 cm⁻¹ is close to those for anhydrous sulfates and is characterized by absorption bands near 510, 625, 680, and 1060–1180 cm⁻¹ (split into several peaks).

X-ray study shows the mineral to be tetragonal, space group $P4/ncc$; the unit cell from powder data is a = 9.84(2), c = 20.52(2) Å, Z = 4. Six of the strongest lines taken with unfiltered Fe radiation (52 α and β lines given) are 10.35(100)(002), 4.57(40)(014), 3.56(40)(024), 3.421(60)(006), 2.881(50)(224), 2.439(70)(226).

The mineral forms thin tabular (001) crystals, up to 1 mm across, commonly with darker zones or as intergrowths with anglesite crystals; these occur as sublimates on porous basalt with chalcocyanite, dolerophanite, chloroxiphite, and atacamite from a crevice near the fumarole "Yadovitaya," formed during the Great Clefted Tolbachik eruption, Kamchatka, USSR. Crystals have the main forms {001} and {110}; of secondary importance are {102} and {014}. Nabokoite is light yellow-brown to yellow-brown, yellow-brown streak, transparent, vitreous luster. Perfect {001} cleavage, H = 2 to 2.5. D_{meas} = 4.18(5) (by suspension in concentrated Clerici solution), D_{calc} = 4.02 g/cm³ from X-ray data and Z = 5. Optically uniaxial negative, ω = 1.778(3), ϵ = 1.773(3) in white light. In reflected light, light gray with yellow internal reflections. Reflectance values (13 given, Si standard) for R_1 and R_2 are 6.7,6.3(475 nm); 6.8,6.4(550); 6.8,6.5(600); 6.0,6.6(650).

The name is for Sof'ya Ivanovna Naboko (1909–). A sample is preserved in the Fersman Mineralogical Museum of the USSR Academy of Sciences, Moscow.

Discussion. The proposed formula needs further substantiation. Analytical difficulties and compositional heterogeneity contributed to the spread of values reported for Cu, Zn, Pb, Bi, and Te, and thus simple averaging of the analytical data does not seem to be justified. Moreover, there is a marked discrepancy between the measured and calculated densities. **E.S.G.**

Nickelaustinite*

F.P. Cesbron, D. Ginderow, R. Giraud, P. Pelisson, F. Pillard (1987) Nickelaustinite $Ca(Ni_2Zn)(AsO_4)(OH)$: A new mineral species from the Co-Ni district of Bou-Azzer, Morocco. Can. Mineral., 25, 401–407 (in French).

Electron-microprobe analyses of Ni-rich crystals gave CaO 23.32, NiO 20.40, CoO 1.22, ZnO 6.88, MgO 1.00, CuO 0.06, FeO 0.10, As_2O_5 43.70, H_2O (by difference) 3.32 wt%, which yields a formula (based on 2 metal cations) $Ca_{1.02}(Ni_{0.67}Zn_{0.21}Mg_{0.06}Co_{0.04})_{\Sigma0.98}As_{0.91}O_{3.82}(OH)_{0.90}$.

Single-crystal and X-ray powder-diffraction studies show the mineral to be orthorhombic, space group $P2_12_12_1$, unit cell $a = 7.455(3)$, $b = 8.955(3)$, $c = 5.916(2)$ Å, $Z = 4$. The strongest X-ray lines (39 given) are 3.151(9)(301), 3.769(9)(130), 2.626(10)(112), 2.577(8)(331), 2.508(8)(131), 2.058(7)(222), 1.605(9)(332), and 1.480(7)(004). The crystal structure, refined to $R = 6.8\%$ for 761 independent reflections, consists of an assemblage of $[AsO_4]$ tetrahedra, $[Ni(O_4(OH)_2)]$ octahedra, and $[Ca(O_7OH)]$ square-based antiprisms, sharing corners and edges.

The mineral occurs as flattened, fibrous crystals associated with roselite and calcite on dolomite. Crystals are yellowish-green to grass-green with a silky luster. The blades are flattened on (110) (good cleavage) and elongate [001] to 0.2 mm, $H = 4$, $D_{calc} = 4.27$ g/cm³. Optically biaxial positive, $\alpha = 1.770(2)$ and $\gamma' = 1.778(3)$, measured in (110); no pleochroism, $X = c$.

The name reflects the compositional and structural relationship to austinite. Type specimens are preserved at the École National Supérieure des Mines de Paris. **J.D.G.**

Palenzonaite*

R. Basso (1987) The crystal structure of palenzonaite, a new vanadate garnet from Val Graveglia (Northern Apennines, Italy). Neues Jahrb. Mineral. Mon., 136–144.

The average of three similar electron-microprobe analyses gave CaO 23.70, Na_2O 3.40, MnO 25.19, V_2O_5 39.34, As_2O_5 5.14, SiO_2 3.32, sum 100.05 wt%, corresponding to $(Ca_{2.374}Na_{0.616})_{\Sigma2.992}Mn_{1.994}(V_{2.430}As_{0.251}Si_{0.310})_{\Sigma2.991}O_{11.999}$. The theoretical formula is $(Ca_2Na)Mn_2V_3O_{12}$. The mineral occurs as wine-red anhedral grains and as dodecahedral crystals up to 6 mm in diameter; streak brownish-red, luster adamantine, $H = 5$ to 5.5, fracture subconchoidal, nonfluorescent in ultraviolet light, $D_{meas} = 3.63(2)$, $D_{calc} = 3.78–3.79$ g/cm³ for $Z = 8$. Optically isotropic, red-wine in thin section, $n = 1.965(5)$. Soluble in strong acids. Crystal-structure study ($R = 2.6\%$) indicated the space group to be $Ia3d$, $a = 12.534(2)$ Å. Strongest lines of the X-ray powder pattern are 5.12(11)(211), 3.132(55)(400), 2.803(100)(420), 2.558(60)(422), 2.458(11)(431), 1.738(20)(640), 1.675(40)(642).

Palenzonaite occurs in veinlets, about 1 mm thick, which cut quartz-braunite ore, and as crystals in a manganoan calcite vein 2 cm wide, in the Molinello manganese mine, Val Graveglia, eastern Lugiria, Italy. The new name is for the original collector of the mineral, Prof. A. Palenzona. Type material is at the Instituto di Mineralogia dell'Università di Genova, Italy, and at the Royal Ontario Museum, Toronto, Canada. **J.L.J.**

Qandilite*

H.M. al-Hermezi (1985) Qandilite, a new spinel end-member, Mg_2TiO_4, from the Qala-Dizeh region, NE Iraq. Mineral. Mag., 49, 739–744.

Electron-microprobe analyses of four grains gave an average of SiO_2 0.02, TiO_2 26.41, Al_2O_3 4.83, MnO 0.76, MgO 29.62, Fe_2O_3 28.27, and FeO 10.32 by wet chemistry, sum 100.23 wt%, corresponding to $(Mg_{1.20}Ti_{0.60})(Fe^{2+}_{0.26}Mg_{0.12}Mn_{0.02})(Fe^{3+}_{0.64}Al_{0.17})O_4$. The mineral occurs as iron-black, magnetic grains up to 2.3 mm; streak black, luster metallic, perfect {111} cleavage, $VHN_{100} = 998(960–1045)$, $D_{meas} = 4.03(3)$, $D_{calc} = 4.04$ g/cm³ for $Z = 8$. Soluble in hot HCl. The X-ray powder pattern (114.6 mm camera, Co radiation) has strongest lines at 2.971(30)(220), 2.533(100)(311), 2.101(45)(400), 1.617(50)(333,511), 1.486-(60)(440), 1.0928(30)(553,731); cubic, $a = 8.4033(14)$ Å, consistent with space group $Fd3m$ and synthetic $MgTiO_4$ (PDF 3-858). In reflected light, light gray with a pinkish tint. Reflectance values (in air, SiC standard) are 400, 14.8; 440, 13.8; 480, 13.3; 520, 13.1; 560, 13.0; 600, 13.0; 640, 13.0; 680, 12.9; x 0.307, y 0.311, Y (%) 13.1, P_e (%) 2.0, λd 465. Color parameters for oil also are given, and reflectance data in air and oil are listed for 20-nm steps.

Qandilite occurs in a forsterite skarn in the Qandil Group at Dupezeh Mountain, Hero Town, Qala-Dizeh region, northeastern Iraq. The new name relates to the rocks of the Qandil Group. An incomplete description of qandilite in a periclase-forsterite skarn from the Kangerdlugssuaq region of Greenland was reported by Gittins et al. in 1982 (Mineral. Mag., 45, 135–137). Type qandilite is preserved at Strathclyde University, Glasgow, Scotland, at the National Science Museum, Tokyo, Japan, and at other repositories. **J.L.J.**

Strontiopyrochlore

A.V. Lapin, A.A. Malyshev, V.V. Ploshko, G.Ye. Cherepivskaya (1986) Strontiopyrochlore from lateritic weathering crusts of carbonatites. Doklady Akad. Nauk SSSR, 290, 1212–1217 (in Russian).

Chemical analysis gave Nb_2O_5 71.72, Ta_2O_5 0.31, TiO_2 0.03, Al_2O_3 0.21, Fe_2O_3 1.53, SrO 16.08, BaO 0.37, CaO 0.42, REE_2O_3 1.86, Na_2O 0.11, K_2O 0.28, H_2O 7.56, sum 100.48 wt%, corresponding to $(Sr_{0.55}REE_{0.04}Ca_{0.03}Ba_{0.01}K_{0.02}Na_{0.01})_{\Sigma0.66}(Nb_{1.91}Fe_{0.07}Al_{0.01}Ta_{0.01})_{\Sigma2.00}(O_{4.09}OH_{2.97})_{\Sigma7.06}$ on a basis of $2(Nb + Ta + Ti + Al + Fe)$. The mineral is homogeneous as regards Nb and Sr.

Powder X-ray study indicates the mineral is isostructural with pyrochlore, but has a slightly larger unit cell: $a = 10.53$ Å (the powder pattern is not reported). The mineral occurs as pale yellow octahedral crystals to 0.5 mm in diameter; some crystals are white to slightly bluish along cleavage planes; friable and powders easily. $D = 3.80$ g/cm³, $n = 2.08$, VHN = 246 (less than pyrochlore). The reflectivity ranges from 12.6 to 17% over the 300- to 700-nm range (greater than pyrochlore).

The mineral occurs in dolomitic carbonatites in the western wing of the central anticlinorium of the Yenisei Ridge, USSR. Concomitant ion exchange and cation leaching are considered responsible for the formation of the mineral from a hypothetical pyrochlore precursor.

Discussion. The formula calculation may be incorrect in assuming no molecular H_2O. Sr makes up 83% of the A cations; hence, by the IMA-sanctioned nomenclature for pyrochlore-group minerals, this mineral should be named strontiopyrochlore. However, a description of the mineral has not been sent to the IMA. **T.S.E.**

Thometzekite*

K. Schmetzer, B. Nuber, O. Medenbach (1985) Thometzekite, a new mineral from Tsumeb, Namibia, and symmetry relations in the tsumcorite-helmutwinklerite family. Neues Jahrb. Mineral. Mon., 446–452.

An average of six electron-microprobe analyses gave PbO 36.04, CaO 0.18, CuO 19.18, ZnO 5.63, FeO 0.30, As_2O_5 33.13, SiO_2 0.06, H_2O (by TGA) 4.9, sum 99.42 wt%. The thermogravimetric loss occurs in one distinct step between 350 and 500 °C. The analytical data correspond to an ideal formula of $Pb(Cu,Zn)_2(AsO_4)_2\cdot2H_2O$ with Cu > Zn; the idealized Zn-free end member, $PbCu_2(AsO_4)_2\cdot2H_2O$, contains PbO 34.44, CuO 24.54, As_2O_5 35.46, H_2O 5.56 wt%. The mineral was found on a specimen of massive gypsum, from Tsumeb, Namibia, as bluish-green to green tabular crystals up to 20 μm long and about 1 μm thick. The luster of the aggregates is earthy. Light gray in transmitted light, nonpleochroic; $2V$ and optic sign not determinable; average refractive index 1.855; wavy extinction.

The X-ray powder pattern (114.6-mm camera, Fe radiation) has strongest lines of 4.694(80), 4.495(50), 3.273(100), 2.961(70), 2.870(70), 2.729(60), 2.516(70). The X-ray pattern is similar to those of tsumcorite and helmutwinklerite, but the cell dimensions of thometzekite were not calculated because the unit cells of the tsumcorite-helmutwinklerite family require clarification, especially as to monoclinic or triclinic symmetry. Thometzekite is named for W. Thometzek, Tsumeb mining director from 1912 to 1922. Type material is in the collection of the Mineralogische-Petrographische Institut, Heidelberg University, Federal Republic of Germany. **J.L.J.**

Thornasite*

V.E. Ansell, G.Y. Chao (1987) Thornasite, a new hydrous sodium thorium silicate from Mont St-Hilaire, Quebec. Can. Mineral., 25, 181–183.

An average of five similar electron-microprobe analyses gave SiO_2 57.93, Al_2O_3 1.42, ThO_2 22.45, UO_2 0.88, Na_2O 1.55, K_2O 1.10, CaO 0.17, F 0.40, Cl 0.05, H_2O^- 8.62, H_2O^+ 5.14 (H_2O by simultaneous thermogravimetric and evolved-gas analysis), O ≡ (F + Cl) = 0.18, sum 99.53 wt%. The water is evolved in three steps, at 105, 275, and 600 °C. The calculated formula based on 11(Si + Al) is $(Na_{0.56}K_{0.26}Ca_{0.03})_{\Sigma0.85}(Th_{0.94}U_{0.04})_{\Sigma0.98}(Si_{10.69}Al_{0.31})_{\Sigma11.00}$-$O_{24.12}F_{0.23}Cl_{0.02}\cdot8.5H_2O$, simplified as $(Na,K)ThSi_{11}(O,H_2O,F,Cl)_{33}$. The mineral occurs as transparent to transluscent anhedral grains up to 0.7 mm in diameter. Colorless with a pale green tint, white streak, vitreous to waxy luster, brittle, hardness indeterminate, fracture subconchoidal to uneven, slightly metamict, $D_{meas} = 2.62(2)$, $D_{calc} = 2.627$ g/cm³ for Z = 18. Fluoresces bright apple-green under long- and short-wave ultraviolet light. Optically uniaxial positive, $\omega = 1.510(1)$, $\epsilon = 1.512(1)$ in Na light. Extinction is generally not sharp and is patchy for some crystals; interference figures are diffuse. Single-crystal study and pyroelectric behavior indicated rhombohedral symmetry, space groups $R3m$ or $R32$. Cell dimensions refined from the X-ray powder pattern (114.6-mm Gandolfi pattern, Cu radiation) are $a = 29.08(1)$, $c = 17.30(1)$ Å. The powder pattern has strongest lines at 14.54(20)(110), 8.17(30)(012), 7.27(100)(220), 5.09(20)(042), 4.17(70)(422), 3.239(30)(262), 2.959(20)(802), 2.890(25)(900,182,633).

Thornasite occurs at the De-Mix quarry, Mont St-Hilaire, Quebec, Canada, embedded in 4- to 8-mm patches of white, powdery brockite associated with yofortierite and analcime. The new name alludes to the composition of the mineral. Type specimens are in the Royal Ontario Museum, Toronto, Canada (catalogue number M42070), and at the National Museum of Natural Sciences, Ottawa, Canada (catalogue number 50770). **J.L.J.**

Vantasselite*

A.-M. Fransolet (1987) Vantasselite, $Al_4(PO_4)_3(OH)_3\cdot9H_2O$, a new mineral species from the Stavelot massif, Belgium. Bull. Minéral., 110, 647–656 (in French).

The average of nine electron-microprobe analyses gave Al_2O_3 30.46, Fe_2O_3 5.22, P_2O_5 33.47, SO_3 0.35, H_2O 30.83 (TGA), total 100.33 wt%, which yields $(Al_{3.61}Fe_{0.39})_{\Sigma4}[(PO_4)_{2.97}(SO_4)_{0.03}](OH)_{3.03}\cdot8.98H_2O$ (based on a cation sum of 4). Single-crystal and X-ray powder-diffraction studies show the mineral to be orthorhombic, space group $Pmam$, $Pma2$ or $P2_1am$, with $a = 10.528(4)$, $b = 16.541(3)$, $c = 20.373(6)$ Å, Z = 8, $D_{meas} = 2.30$, $D_{calc} = 2.312$ g/cm³. The strongest X-ray lines (38 given) are 10.22(100)(002), 4.87(30)(211,014), 3.720(30)(223), 3.395(40)(006), 3.210(40)-(044,241), 2.892(50)(036), 2.741(30)(244,027), and 2.394-(40)(335). The mineral has a sheet structure similar to that of matulaite and vashegyite.

Vantasselite occurs as rosettes (up to 8 mm) of thin, white, transparent lamellae. The luster is pearly on the perfect {001} cleavage. Crystals are elongate [100], flattened [001], and terminated by {120}. H = 2 to 2.5. Optically biaxial negative, $\alpha_{calc} = 1.511$, $\beta = 1.560(2)$, $\gamma = 1.579(2)$, $2V_{meas} = 61(2)°$; X = c, Y = b, Z = a.

Vantasselite was found on the dumps of a quartzite quarry, 1 km north of Bihain, Stavelot massif, Belgium. The mineral lines the schistosity planes or occurs as lamellae in quartz veinlets within metapelites; it is associated with wavellite, variscite, cacoxenite, turquoise, clinochlore, muscovite, and lithiophorite. The new name honors Professor R. Van Tassel. Type specimens are preserved in the Institut de Minéralogie de l'Université de Liège. **J.D.G.**

Zincochromite*

A.R. Nesterov, Ye.V. Rumyantseva (1987) Zincochromite $ZnCr_2O_4$—A new mineral from Karelia. Zapiski Vses. Mineralog. Obshch., 116(3), 367–371 (in Russian).

Energy-dispersive microprobe analyses of four zones in six grains gave the following ranges of average composition for each zone: ZnO 34.09–37.72, Cr_2O_3 52.64–54.7, Al_2O_3 0.51–1.44, SiO_2 2.44–3.36, TiO_2 0–0.82, V_2O_3 1.42–7.67, Fe_2O_3 1.36–4.21, and sums 100.00–100.01, corresponding to an average formula (weighted for thickness of zones) $Zn_{1.04}(Cr_{1.61}V_{0.11}Si_{0.11}$-$Fe^{3+}_{0.06}Al_{0.05})_{\Sigma1.94}O_4$.

Powder X-ray data were indexed for a cubic mineral by analogy with synthetic $ZnCr_2O_4$ and Zn-bearing chromite, giving $a = 8.352(1)$ Å. The strongest lines (9 given) are 2.954(50)-(220), 2.519(100)(311), 2.088(25)(400), 1.607(30)(511), 1.476(35)-(440). The mineral forms tiny brownish-black euhedra (generally 2 to 10 μm across, rarely to 50 μm) with quartz and amorphous Cr-V-Fe oxides and hydroxides, formed from the breakdown of chromian aegirine, in micaceous metasomatites in the Onega trough (South Karelia, USSR). Translucent (brown) in thin slivers, brown streak, semimetallic luster, cleavage absent, weakly paramagnetic. H = 5.8; D_{calc} from X-ray data, 5.434 g/cm³; isotropic, rare brown internal reflections. In reflected light, brownish gray. Reflectance values (measured in air with Si and STF-3 tellurite glass): 13.0(440); 12.4(460); 12.1(480); 12.0(500);

11.9(520); 11.8(540); 11.7(560); 11.6(580,600,620,660, 680,720,740).

The name is for the composition. Specimens are preserved in the Mineralogical Museum of the Leningrad Mining Institute. **E.S.G.**

Zincroselite*

P. Keller, J. Innes, P. J. Dunn (1986) Zincroselite, $Ca_2Zn(SO_4)_2 \cdot 2H_2O$, a new mineral from Tsumeb, Namibia. Neues Jahrb. Mineral. Mon., 523–527.

Electron-microprobe analysis gave MgO 0.4, CaO 25.0, MnO 0.9, FeO 0.2, ZnO 15.9, As_2O_5 49.3, H_2O (by weight loss at 700 °C) 7.7, sum 99.4 wt%, corresponding to $Ca_{2.06}(Zn_{0.90}Mn_{0.06}Mg_{0.05}Fe_{0.01})_{\Sigma 1.02}As_{1.98}O_{10}H_{3.94}$, ideally $Ca_2Zn(AsO_4)_2 \cdot 2H_2O$. The mineral occurs as aggregates, up to $12 \times 5 \times 4$ mm, consisting of intergrown lathlike crystals, elongate and strongly striated [001], commonly twinned on (100), with $\{hk0\}$ and $\{hk1\}$ present but not specifically determinable. Colorless to white, brittle, H = 3, not fluorescent in ultraviolet light, $D_{meas} = 3.75$, $D_{calc} = 3.77$ g/cm^3 for Z = 2 with the ideal formula. Soluble in HNO_3. Optically biaxial positive, $\alpha = 1.703(3)$, $\beta = 1.710(4)$, $\gamma = 1.720(3)$, $2V_{meas} = 50°$, $2V_{calc} = 57°$, strong dispersion with $r < v$; $Y = \mathbf{b}$, $X \wedge \mathbf{c} = 0\text{--}5°$ in the acute angle of β. Single-crystal study indicates monoclinic symmetry, space group $P2_1/c$; cell dimensions refined from the X-ray powder pattern (114.6-mm camera, Fe radiation) are $a = 5.832(2)$, $b = 12.889(4)$, $c = 5.644(2)$ Å, $\beta = 107.72(3)°$. Strongest lines of the powder pattern are 6.44(50)(020), 5.10(60)(110), 3.40(50)(130), 3.36(50)(031), 3.22(80)(040), 3.13(50)(13$\bar{1}$), 3.00(100)(121), 2.78(21$\bar{1}$,200,10$\bar{2}$).

The new mineral, found in a small cavity in oxidized copper ore at the Tsumeb mine, Namibia, is the zinc analog of roselite, $Ca_2Co(AsO_4)_2 \cdot 2H_2O$. Type material is in the Institut für Mineralogie und Kristallchemie, Universität Stuttgart, Federal Republic of Germany, and in the Smithsonian Institution, Washington, D.C. (catalogue number NMNH 163340). **J.L.J.**

Unnamed $Cu_2Fe_3S_5$

E.R. Rambaldi, R.S. Rajan, R.M. Housley, D. Wang (1986) Gallium-bearing sphalerite in a metal-sulphide nodule of the Quingzhen (EH3) chondrite. Meteoritics, 21, 23–31.

An energy-dispersive X-ray analysis of inclusions associated with gallium-bearing sphalerite in a nodule in the Quingzhen meteorite gave Fe 36.4, Mn 0.64, Cu 27.5, S 35.1, sum 99.64 wt%, reported as $Cu_2Fe_3S_5$ (the analysis corresponds to $Cu_{1.98}Fe_{2.98}Mn_{0.05}S_5$). No other properties are given. **J.L.J.**

Unnamed Pb-Au-Bi sulfotelluride

J. Pašava, K. Breiter, J. Malátek, P. Rajlich (1986) Cu-rich rucklidgeite and an unnamed Pb-Au-Bi sulphotelluride from the gold deposit Jílové u Prahy. Věstník Ústřed. Ústavu Geol., 61, 217–221 (in English).

The range of six electron-microprobe analyses gave Pb 37.09–39.16, Au 16.03–17.43, Bi 9.56–15.43, Sb 0.96–2.48, As 0.07–1.79, Cu 0.95–4.42, Te 20.40–21.71, Se 0.11–1.09, S 7.95–8.57, sum 98.27–102.72 wt%. For Au = 1, the empirical formula is $(Pb,Cu)_{2.3\text{--}3.1}(Bi,Sb,As)_{0.7\text{--}1.0}(Te,Se,S)_{4.2\text{--}5.1}$; for (Bi,Sb,As,Te) = 4, the formula is $(Pb,Cu)_{3.4\text{--}4.3}Au_{1.4\text{--}1.5}(Bi,Sb,As,Te)_4(S,Se)_{4\text{--}4.8}$. Aggregates, up to 0.1 mm, consist of longitudinally twinned elongate

crystals up to 0.015 mm in length. In reflected light, light gray and strongly anisotropic with bluish to brownish polarization colors. R'_{max} and R'_{min} values (WTiC standard), given in 20-nm steps from 420 to 700 nm, are 420 (46.6, 41.4), 460 (45.1, 40.5), 500 (44.5, 39.8), 540 (43.3, 39.5), 580 (41.9, 38.6), 620 (41.5, 38.3), 660 (40.7, 37.9), 700 (39.2, 37.2). $VH_{10} = 92084.4$ (68 156.2–133 370.4) Pa.

The mineral forms graphic intergrowths with tetrahedrite and rucklidgeite and less frequently is intergrown with chalcopyrite and other bismuth tellurides. These occur in dumps from the Pepř mine of the Jílové u Prahy gold deposit, Czechoslovakia.

Discussion. The authors tentatively suggest that the mineral is the bismuth analogue of nagyite, $Pb_5Au(Te,Sb)_4S_{5\text{--}8}$. Supporting X-ray data are needed. **J.L.J.**

Unnamed $(Pb,Bi,Ag)_9Sb_{11}As_{11}S_{42}$

B. Duval, Y. Moëlo, P. Picot (1986) Discovery of an As- and Bi-rich derivative of zinkenite, associated with orpiment, Sb-rich sartorite and zinkenite from the Julcani deposit, Peru. Bull. Minéral., 109, 649–644 (in French).

An average of 5 microprobe analyses of mineral "AZ" yielded Pb 29.75, Ag 0.83, Bi 3.81, Sb 24.98, As 15.54, S 24.76, sum 99.67 wt%, which corresponds to $Pb_{7.7}Ag_{0.4}Bi_{1.0}Sb_{10.9}As_{11.1}S_{41.2}$ (based on 31 metallic-element atoms). The mineral was observed in polished section associated with zinkenite and sartorite in an orpiment-rich sample from the Julcani deposit, Peru. Small grain size (<40 μm) precluded obtaining any X-ray data. **J.D.G.**

Unnamed K-V-Ba titanate

R.H. Mitchell, S.E. Haggerty (1986) A new K-V-Ba titanate related to priderite from the New Elands kimberlite, South Africa. Neues Jahrb. Mineral. Mon., 376–384.

The range of five electron-microprobe analyses listed is SiO_2 0.19–0.81, TiO_2 75.41–78.47, ZrO_2 0.06–0.33, Cr_2O_3 0.0–0.50, V_2O_3 1.65–4.51, Ce_2O_3 0.70–1.76, Fe_2O_3 3.52–7.10, MnO 0.0–0.17, MgO 0.53–1.80, CaO 0.0–0.53, BaO 1.19–4.47, K_2O 8.30–9.63, Na_2O 0.0–0.03 wt%. Individual grains are homogeneous, but considerable composition variation is found from grain to grain; the average composition of twelve individual grains is reported to be $A_{1.49}B_{0.97}C_{6.9}O_{16}$, where A = K,Ba; B = V,Cr,Ce,Fe^{3+},Mn,Mg,Ca; C = Ti,Zr,Si. The mineral occurs as stellate clusters of prismatic crystals, and as smaller anhedral grains. In thin section, opaque with reddish internal reflection at thin edges; in reflected light, gray with medium reflection pleochroism and strong anisotropism from light to dark gray. H = 6. The mineral occurs in the groundmass of the New Elands kimberlite, Boshof District, South Africa.

Discussion. As the authors have pointed out, the composition of the mineral is similar to that of priderite, $(K,Ba)(Ti,Fe^{3+})_8O_{16}$; one of the analyses, however, has V > Fe^{3+}, corresponding to a theoretical end member $K_2V_2Ti_6O_{16}$. All of the titanate grains are reported to be too small to obtain X-ray data, but a photomicrograph illustrates stellate clusters at least 0.1 mm in maximum dimension. **J.L.J.**

Unnamed Al sulfate

C. Sabelli, A. Santucci (1987) Rare sulfate minerals from the Cetine mine, Tuscany, Italy. Neues Jahrb. Mineral. Mon., 171–182.

Electron-microprobe analyses of aggregates of delicate platy crystals, which collapse under the microprobe beam, gave K_2O 0.11–0.20, SO_3 27.28–30.53, Al_2O_3 24.77–27.97 wt%. Thermogravimetric analysis of a 10.5-mg sample gave a water loss (to 700 °C) of 42.64 wt%. Omitting K, the empirical formula is $Al_{2.9}(SO_4)_2(OH)_{4.7} \cdot 9H_2O$. Single-crystal studies gave unreliable, but possibly triclinic, results. The mineral is mixed intimately with gypsum; the strongest lines of the X-ray powder pattern (excluding lines identified by the authors as belonging to gypsum contamination) are 11.45(100), 10.99(36), 5.72(22), 4.46(30), 3.991(20), 3.347(27). The mineral occurs with numerous iron and aluminum sulfates in the Cetine antimony mine, Tuscany, Italy.

Discussion. The presence of diffraction lines for gypsum in the X-ray pattern makes questionable the purity of the 10.5-mg sample used to derive the H_2O value. **J.L.J.**

Unnamed garnets $Ca_3Ga_2(GeO_4)_3$, $Ca_3Al_2[(Ge,Si)O_4]_3$ and an Fe-Ge-Ga equivalent of sapphirine

Z. Johan, E. Oudin (1986) Occurrence of garnets $Ca_3Ga_2(GeO_4)_3$, $Ca_3Al_2[(Ge,Si)O_4]_3$, and of an iron-, germanium- and gallium-equivalent of sapphirine, $Fe_4(Ga,Sn,Fe)_4(Ga,Ge)_6O_{20}$, in sphalerite from deposits of the Pyrenean axial zone. Conditions of formation of germaniferous and galliferous phases. C. R. Acad. Sci. Paris, 303 (series II), 811–816 (in French).

Electron-microprobe analysis of trace minerals gave SnO_2 0.87, GeO_2 46.45, SiO_2 1.69, Al_2O_3 0.08, Ga_2O_3 26.11, FeO 3.18, MnO 0.60, CaO 25.21, ZnO 4.52, sum 108.71 wt%; GeO_2 28.53, SiO_2 15.28, Al_2O_3 16.58, Ga_2O_3 4.97, FeO 2.99, MnO 3.23, CaO 26.19, ZnO 3.11, sum 100.88 wt%; and ZnO 4.07, FeO 17.61, MnO 0.80, Fe_2O_3 5.36, Ga_2O_3 51.30, SnO_2 14.14, GeO_2 6.19, sum 99.47 wt%, which yield the three simplest formulae given above. These phases occur as 10- to 15-μm grains in sphalerite, and their size precludes a full description as new mineral species at this time.

This area has been metamorphosed to the greenschist facies and 78 species to date have been reported. Conditions of formation were such that Ga, Ge, and Sn were released from sphalerite and combined to form these new phases. **J.D.G.**

Unnamed U-Fe silicates

F.G. Simova (1985) Uranium-iron-silicate phases from the Balkan metallogenic zone and the Lenz im Kaltenegg (Styria, Austria) deposit. Doklady Bolg. Akad. Nauk, 38, 1171–1174.

Analysis by electron microprobe gave UO_2 76.43, TiO_2 0.09, SiO_2 14.34, FeO 5.37, CaO 1.46, MnO 0.06, Al_2O_3 0.71, Na_2O 0.05, sum 98.59 wt%; the ratio U:Fe:Si is 4:1:3 for unidentified phase 1. For unidentified phase 2, UO_2 73.69, TiO_2 0.03, SiO_2 16.04, FeO 7.62, CaO 1.79, MnO 0.02, Al_2O_3 0.60, sum 99.83 wt%; the ratio U:Fe:Si is 5:2:5. For unidentified phase 3, UO_2 62.15, TiO_2 0.01, SiO_2 13.10, FeO 21.28, CaO 1.36, PbO 0.11, Al_2O_3 0.47, sum 98.56 wt%, and U:Fe:Si = 1:1:1. A fourth unidentified phase from Austria gave UO_2 24.50, SiO_2 12.80, FeO 49.00, CaO 0.05, PbO 1.24, Al_2O_3 1.60, Na_2O 0.03, sum 89.30 wt%; the ratio of U:Fe:Si is 1:6:2.

These U-Fe silicate phases are gray in reflected light and of small (up to 0.1 mm) isometric to irregular shape; hardness, 320–405 kg/mm. The phases occur along cracks in layered aggregates

that are up to 1 mm thick and consist mainly of uraninite, nasturan (pitchblende), and "hydronasturan." Other minerals present in lesser amounts include pyrite, hematite, chalcopyrite, sphalerite, and galena.

Discussion. The lack of X-ray data or structural characterization is regrettable. Inadequate description of physical and optical properties. **K.W.B.**

Unnamed epistolite intergrowths

S. Karup-Møller (1986) Epistolite from the Ilimaussaq alkaline complex in South Greenland. Neues Jahrb. Mineral. Abh., 155, 289–304.

Single-crystal studies of some epistolite grains from the Ilimaussaq complex show the presence of an unidentified triclinic phase with $a = 5.42$, $b = 7.13$, $c = 13.02$ Å, $\alpha = 94.04$, $\beta = 96.44$, $\gamma = 89.32°$. X-ray powder-diffraction patterns of the intergrowths are indistinguishable from those of epistolite, and electron-microprobe analyses do not show any systematic compositional variations.

In another sample, lamellar intergrowths consist of epistolite and a different unidentified phase for which the average of two electron-microprobe analyses gave Na_2O 3.65, K_2O 0.24, CaO 1.26, ZnO 9.06, FeO 0.26, TiO_2 14.48, Nb_2O_5 51.24, SiO_2 10.95, sum 91.14 wt%. For Si = 1, the formula is $(Na_{0.65}K_{0.03}Ca_{0.12}Zn_{0.61}Fe_{0.02})_{\Sigma1.43}(Ti_{0.99}Nb_{2.11}Si_{1.00})_{\Sigma4.10}O_{10.37} \cdot 2.70H_2O$. Single-crystal X-ray examination of two flakes gave results identical to those for epistolite. **J.L.J.**

New Data

Crookesite

Johan, Z. (1987) Crookesite, $TlCu_7Se_4$: New data and isotypism with $NH_4Cu_7S_4$. C.R. Acad. Sci. Paris, 304 (series II), 1121–1124 (in French).

Electron-microprobe analysis of crookesite from Bukov, Czechoslovakia, gave Cu 46.89, Ag 0.06, Tl 21.03, Se 32.43, sum 100.41 wt%, which yields $Tl_{0.98}Cu_{7.07}Ag_{0.01}Se_{3.94}$ (calculated on 12 atoms per formula unit). Single-crystal Weissenberg photographs show the mineral to be tetragonal; space group $I4/m$, $I4$, or $I\bar{4}$; $a = 10.435$, $c = 3.954$ Å, $Z = 2$ (in contrast to the previous monoclinic, pseudotetragonal, cell). $D_{meas} = 6.90$, $D_{calc} = 7.443$ g/cm³. No structure refinement was done, but it is proposed, on the basis of similarities in space group, cell parameters, and empirical formula, that crookesite is isostructural with $NH_4Cu_7S_4$.

This is the third locality for crookesite. In this vein-replacement deposit, crookesite is associated with bukovite and sabatierite. **J.D.G.**

Ferropyrosmalite*

J.P. Vaughan (1986) The iron end-member of the pyrosmalite series from the Pegmont lead-zinc deposit, Queensland. Mineral. Mag., 50, 527–531.
J.P. Vaughan (1987) Ferropyrosmalite and nomenclature in the pyrosmalite series. Mineral. Mag., 51, 174.

Two electron-microprobe analyses gave SiO_2 34.71, 34.17, Al_2O_3 0.22, 0.00, FeO 48.61, 49.54, MnO 4.37, 4.36, MgO 0.76, 0.64,

Cl 4.25, 400, H_2O (by difference) 8.04, 8.19, less O $\equiv$ Cl 0.96, 0.90 wt%, corresponding to $(Si_{5.95}Al_{0.05})_{\Sigma6.00}(Fe_{6.97}Mn_{0.64}$-$Mg_{0.19})_{\Sigma7.80}O_{14.56}(OH_{9.20}Cl_{1.24})_{\Sigma10.44}$ and $Si_{5.89}(Fe_{7.14}Mn_{0.64}$-$Mg_{0.16})_{\Sigma7.94}O_{14.42}(OH_{9.41}Cl_{1.17})_{\Sigma10.58}$, ideally $Fe_8^{2+}Si_6O_{15}(OH_2Cl)_{10}$. An X-ray powder pattern (57.3-mm camera) gave calculated cell dimensions of $a = 13.33(3)$, $c = 7.11(2)$ Å and strongest lines of 7.13(80)(001), 3.564(60)(002), 2.675(100)(401), 2.243(60)(402), 1.833(40)(403,431), and 1.667(40)(440). Optically uniaxial negative with $\omega = 1.677(2)$ and $\epsilon = 1.652(2)$ at 589 nm. Habit platy to radiating, subhedral to euhedral, grain size typically 0.2 to 1 mm; cleavage {001}; colorless in thin section. The mineral occurs in the sulfide-rich central part of the Pegmont stratiform lead-zinc deposit, 175 km southeast of Mt. Isa, Queensland, Australia, and probably formed during prograde metamorphism.

The Pegmont mineral indicates that the pyrosmalite series extends well into Fe-rich compositions. The name pyrosmalite is now used for the series $Fe_8Si_6O_{15}(OH,Cl)_{10}$–$Mn_8Si_6O_{15}(OH,Cl)_{10}$ when the specific composition of the mineral in the series is not known. The Fe-rich half of the series is designated ferropyrosmalite, and the existing name manganpyrosmalite is retained for the Mn-rich other half. **J.L.J.**

Murmanite

S. Karup-Møller (1986) Murmanite from the Ilímaussaq alkaline complex, South Greenland. Neues Jahrb. Mineral. Abh., 155, 67–88.

Single-crystal X-ray study of murmanite from the Ilímaussaq intrusion gave $a = 5.44 \times 2$, $b = 7.06 \times 2$, $c = 11.71$ Å, $\alpha = 93.44$, $\beta = 98.52$, $\gamma = 89.49°$. The presence of a superstructure has not been reported previously for murmanite. **J.L.J.**

Sakuraiite

M. Shimizu, A. Kato, T. Shiozawa (1986) Sakuraiite: chemical composition and extent of (Zn,Fe)In-for-CuSn substitution. Can. Mineral., 24, 405–409.

S.A. Kissin, D.R. Owens (1986) The crystallography of sakuraiite. Can. Mineral., 24, 679–683.

Five representative electron-microprobe analyses of sakuraiite from the Senju-hon vein in the Ikuno mine, Hyogo Prefecture, Japan, including the holotype specimen, gave compositions consistent with the ideal formula $(Cu,Zn,Fe)_3(In,Sn)S_4$; in three of the analyses the formula Cu exceeds Zn, whereas in the other two, Zn exceeds Cu. The Ag contents of 3.5 and 4 wt% originally reported for sakuraiite require revision to <0.2 wt%. The samples used for the study are in the National Science Museum, Tokyo, Japan, and in the University Museum, University of Tokyo, Tokyo, Japan.

In the Kissin and Owens paper, two homogeneous areas of a metatype specimen of sakuraiite from the Ikuno mine gave electron-microprobe compositions corresponding to $(Cu,Zn,Fe,Cd,Ag)_{2.87}(In,Sn)_{1.12}S_{4.01}$ and $(Cu,Zn,Fe,Cd)_{2.91}(In,Sn)_{1.09}S_{3.99}$ based on 8 atoms. Single-crystal study indicates that the mineral is cubic, $a = 5.4563(24)$ Å, space group $P432$, $P\bar{4}3m$, or $Pm3m$, $Z = 4$. $VHN_{100} = 265$ (mean of 3; range 243–282). Reflectance values (WTiC standard) are given in 20-nm steps from 400 to 700 nm: 400, 22.5; 440, 22.5; 480, 22.6; 520, 22.6; 560, 22.6; 600, 22.5; 640, 22.6; 680, 22.6; with CIE illuminant C, x 0.310, y 0.317, Y (%) 22.6, λ_d 503, P_e 0.1. The unit-cell

data, hardness, optical properties, and the structural formula, concluded to be $(Cu,Zn,Fe,In,Sn)_4S_4$, are new.

Discussion. Each of the two papers presents a different structural formula for sakuraiite: $(Cu,Zn,Fe)_3(In,Sn)S_4$ versus $(Cu,Zn,Fe,In,Sn)_4S_4$. The former is reported to be tetragonal, and the latter, cubic. Presumably the authors will collaborate in the future to resolve the disparate results. **J.L.J.**

Volkonskoite*

E.E. Foord, H.C. Starkey, J.E. Taggart, Jr., D.R. Shaw (1987) Reassessment of the volkonskoite–chromian smectite nomenclature problem. Clays and Clay Minerals, 35, 139–149.

Volkonskoite was first used in 1830 to describe a bright blue-green, Cr-bearing, dioctahedral smectite from Efimyatsk, Okhansk region of the Perm Basin, USSR. Since then, many smectites have been called volkonskoite in the literature even though their Cr content was minor. Re-examination of type material from Efimyatsk (now designated the neotype, USNM 16308), and another sample from the same region (designated as a cotype, USNM R4820), gave the following respective chemical results obtained with a variety of analytical techniques, including Mössbauer spectroscopy to distinguish Fe^{2+} from Fe^{3+}: Cr_2O_3 20.4, 23.5, SiO_2 41.5, 40.4, Al_2O_3 5.16, 4.13, MgO 7.07, 5.95, CaO 1.39, 2.56, Fe_2O_3 4.52, 5.16, FeO 0.40, 0.1, TiO_2 0.07, 0.05, MnO 0.10, 0.05, K_2O 0.15, 0.21, Na_2O <0.15, <0.15, P_2O_5 0.10, <0.05, C_{total} 1.94, 2.60, loss on ignition 19.2, 18.0, sum 100.37, 100.11 wt%, corresponding to $(Ca_{0.11}Mg_{0.11}Fe_{0.03}^{2+}K_{0.02})_{\Sigma0.27}(Cr_{1.18}$-$Mg_{0.78}Fe_{0.29}^{3+}Ca_{0.02})_{\Sigma2.27}(Si_{3.50}Al_{0.51})_{\Sigma4.01}O_{10}(OH)_2 \cdot 3.64H_2O$, and $(Ca_{0.25}Mg_{0.05}K_{0.03}Fe_{0.01}^{2+}Mn_{0.01})_{\Sigma0.35}(Cr_{1.07}Mg_{0.75}Fe_{0.35}^{3+})_{\Sigma2.17}$-$(Si_{3.59}Al_{0.43})_{\Sigma4.02}O_{10}(OH)_2 \cdot 4.22H_2O$. Volkonskoite is defined as a dioctahedral member of the smectite group in which Cr is dominant in the octahedral position. The Cr content, therefore, is likely to exceed 15 wt%. Volkonskoite is known only from the USSR and from Nevrokop, Bulgaria. Type specimens are in the Smithsonian Institution, U.S. National Museum, Washington, D.C. **J.L.J.**

Wakefieldite-(Ce)

C. Baudracco-Gritti, S. Quartieri, G. Vezzalini, F. Permingeat, F. Pillard, R. Rinaldi (1987) A non plumboan wakefieldite-(Ce): New data on the mineral species corresponding to cerium orthovanadate. Bull. Minéral., 110, 657–663 (in French).

Electron-microprobe analysis gave Ce_2O_3 33.07, La_2O_3 11.59, Nd_2O_3 9.53, Y_2O_3 2.99, Pr_2O_3 3.5, Sm_2O_3 1.7, V_2O_5 32.69, As_2O_5 3.73, sum 98.80 wt%, which yields $(Ce_{0.52}La_{0.18}Nd_{0.15}Y_{0.07}Pr_{0.05}$-$Sm_{0.02})_{\Sigma0.99}(V_{0.92}As_{0.08})_{\Sigma1.00}O_4$. The crystal structure, refined to an R index of 1.4% in space group $I4_1/amd$, is a zircon-type structure. The study specimen from the Tifernine plateau, central Anti-Atlas, Morocco is the second locality. **J.D.G.**

Discredited Minerals

Calciocelsian = armenite*

B. Mason (1987) Armenite from Broken Hill, Australia, with comments on calciocelsian and barium anorthite. Mineral. Mag., 51, 317–318.

Armenite, $BaCa_2Al_6Si_9O_{30} \cdot 2H_2O$, known previously only from Kongsberg, Norway, occurs at Broken Hill, Australia, and at

Purnamoota, 30 km north of Broken Hill. Re-examination of a type specimen of calciocelsian, which came originally from the same outcrops that have yielded the Broken Hill armenite, shows that no mineral corresponding to calciocelsian is present. Instead, the type specimen contains armenite, celsian, and bytownite; the original analysis of calciocelsian is concluded to have been done on a mixture of celsian and armenite. **J.L.J.**

Tagilite = Pseudomalachite*

G. Wappler (1984) On so-called tagilite from Ullersreuth. Zeitschrift Geol. Wiss., 12, 705–709 (in German).

X-ray powder-diffraction patterns of A. Breithaupt's (1841) original samples of tagilite from Ullersreuth, Germany, confirm that tagilite is identical to pseudomalachite. **J.L.J.**

Errata

Xinganite, yttroceberysite

In the **Discussion** of these minerals (*Am. Mineral.,* 73, 441–442, 1988) both xinganite and yttroceberysite were incorrectly designated as synonymous with gadolinite-(Y). The appropriate designation is hingganite-(Y), a member of the gadolinite group. **J.L.J.**