New Mineral Names*

Pete J. Dunn and Michael Fleischer

Ardaite*

V. V. Breskovska, N. N. Mozgova, N. S. Bortnitov, A. I. Gorskov and A. I. Tsepin (1982) Ardaite—a new lead–antimony chlorosulphosalt. Mineral. Mag., 46, 357–361.

The average of six electron microprobe analyses yielded Pb 56.50, Ag 0.04, Sb 22.48, S 15.56, Cl 3.78, sum = 98.36%. These data are in agreement with the formulas $Pb_{20}Sb_{12}S_{34}Cl_8$ and $Pb_{19}Sb_{13}S_{35}Cl_7$, the latter of which is preferred by the authors. Previous descriptions of this phase by some of the same authors had referred to it as "chlorine falkmanite".

Electron diffraction study indicated that ardaite is isostructural with a synthesized "A-phase" and the diffraction data fit a monoclinic cell with $a = 21.97$, $c = 8.05$Å with a subcell $C = 2c'$ and $\beta = 103°$; b was determined to be 21.3Å on the synthetic material only. X-ray powder diffraction data yield $a = 22.09$, $b = 21.11$, $c = 8.05$Å, $\beta = 103°01'$, $V = 3657.776$Å^3, $Z = 2$. The strongest lines in two X-ray powder patterns are: 3.47*, ---(10)(341); 3.40,3.38(10)(621); 2.98*, ---(10)(361); 2.83, 2.83(3,7)(171); 2.11*, 2.00(10,4)(---); (*denotes galena reflections).

Ardaite occurs as fine-grained 50 μm aggregates of acicular crystals associated with galena, pyrostilpnite, anglesite, nadorite, and Cl-bearing robinsonite and semseyite, in the Madjarovo polymetallic ore deposit in Bulgaria. Optically, ardaite is anisotropic, greenish-gray, with distinct bireflectance. The reflectances are; nm (%) 440(31.3–33.2), 480(32.1–34.4), 520(32.3–35.1), 580(31.7–34.7), 620(31.1–33.9), 660(30.6–32.8), 700(30.3–31.8), 740(30.2–30.9). Ardaite is named for the Arda River, which flows through the Madjarovo deposit.

Discussion

A second occurrence of ardaite, published in 1981 (Can. Mineral., 19, 419–422, Burke et al.), from Gruvasen, Bergslagen, Sweden, favored the formula $(Pb,Fe)_{20}Sb_{12}S_{34}Cl_8$. Microprobe analyses yielded: (mean and range) Pb 57.94 (55.25–58.55), Fe 0.31 (0.1–1.65), Sb 21.44 (21.2–21.55), S 15.44 (15.3–15.6), Cl 4.39 (4.25–4.55), sum = 99.52% (97.8–100.15%).

Additional data on the chlorine-bearing sulfosalts, including ardaite, has been published by Breskovska et al. (1981) in Bull. Mineral., 104, 757–762. **P.J.D.**

Bannermanite*

J. M. Hughes, L. W. Finger, and R. M. Hazen (1981) The crystal structure of bannermanite. Ann. Rept. Geophys. Lab, Carnegie Institution, Washington, D. C., p. 379–380.

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

Crystal structure study of a fumarolic vanadium mineral from Izalco Volcano, El Salvador, yielded the chemical formula $(Na,K)_{1-x}V^{4+}_{1-x}V^{5+}_{3+x}O_{15}$, where $0.10 \leq \times \leq 0.46$, Na > K. No other description is provided.

Discussion

The publication of a new name with no description beyond the chemical formula is regrettable. **P.J.D.**

Dwornikite*

C. Milton, H. T. Evans Jr., and R. G. Johnson (1982) Dwornikite, $(Ni,Fe)SO_4 \cdot H_2O$, A member of the kieserite group from Minasragra, Peru. Mineral. Mag., 46, 351–355.

The average of 4 chemical analyses (by EDAX-XRF) yielded NiO 39.0, FeO 9.3, SO_3 42.4, sum = 90.7% with H_2O undetermined. The composition $(Ni_{0.8}Fe_{0.2})SO_4 \cdot H_2O$ requires NiO 34.7, FeO 8.3, SO_3 46.4, H_2O 10.6, sum = 100.0%.

No single crystals were found. Least-squares refinement of powder data, based on known crystallographic data for synthetic material, yielded a monoclinic cell, space group $C2/c$ with $a = 6.839$, $b = 7.582$, $c = 7.474$Å, $\beta = 117.85°$. The strongest lines in the powder pattern are 4.754(50)($\bar{1}11$), 4.732(70)(110), 3.342(100) ($\bar{1}11$), 3.293(35)(021), 3.024(70)(200), 2.4912(35)(022).

Dwornikite is white with a possible green tint. The refractive index is 1.63 (mean). The density is 3.34 (calc.); hardness and fracture could not be measured. Dwornikite forms aggregates of very fine-grained particles associated with patronite, sulfur, bitumen and other sulfates in a vanadium sulfide ore from Minasragra, Peru.

The name is for Edward J. Dwornik, mineralogist of the U.S. Geological Survey. **P.J.D.**

Gobbinsite*
Unnamed Zeolite

R. Nawaz, and J. F. Malone (1982) Gobbinite, a new zeolite mineral from Co. Antrim, N. Ireland. Mineral. Mag., 46, 365–369.

Gobbinsite

Wet chemical analyses, after deduction of carbonates of Ca and Cu, yielded: SiO_2 52.17, 51.15; Al_2O_3 20.52, 21.09; Fe_2O_3 0.55, 0.32; MgO n.d., 0.50; CaO 1.00, 0.66; Na_2O 10.71, 10.02; K_2O n.d., 0.98; H_2O 15.04, 15.29; sums = 100.00, 100.00%. These yield the chemical formula $Na_4(Cu,Mg,K_2)Al_6$ $Si_{10}O_{32} \cdot 12H_2O$.

X-ray data, obtained using Weissenberg and rotation methods,

showed gobbinsite to be tetragonal with $a = 10.145$, $c = 9.788$Å. Gobbinsite is related to gismondine, merlinoite, phillipsite, garronite and related synthetic Na–P zeolites. The strongest lines in the X-ray powder diffraction pattern are: 7.11(100)(110,101), 4.116(100b)(211), 3.201(100)(310,301), 3.106(80)(103), and 2.699(80b)(321,312).

Gobbinsite occurs as white, chalky clusters of fibrous crystals, elongate on c and associated with gmelinite. D calc. = 2.147; D meas. − 2.194 (mixture). Optically, gobbinsite has parallel extinction, length slow, with indices of refraction $\varepsilon = 1.489$, ω 1.494 (both ±0.003). Gobbinsite is found near Hills Port, south of the Gobbins area in Co. Antrim, N. Ireland.

Gobbinsite is named for the Gobbins area.

Type material is preserved in the Ulster Museum, Belfast.

Unnamed Zeolite

An impurity in gobbinsite and garronite which occurs as intergrowths parallel to c, can be indexed on an orthorhombic cell with $a = 14.22$, $b = 14.29$, and $c = 9.83$Å. These data are similar to, but different from, those of merlinoite. This phase is probably related to a synthetic Ba–H phase of Taylor and Roy (Am. Mineral., 49, 656–682). **P.J.D.**

Korshunovskite*

S. V. Malinko, A. E. Lisitsyn, S. P. Purusova, B. P. Fitsev, and T. A. Khruleva (1982) Korshunovskite, $Mg_2Cl(OH)_3 \cdot nH_2O$, a new hydrous magnesium chloride. Zapiski Vses. Mineral. Obsh., 111, 324–329 (in Russian).

Microchemical analysis on 100 mg by S.P.P. gave MgO 37.62, CaO 4.69, CO_2 8.78, Cl 14.84, H_2O^+ 27.06, H_2O^- 9.36, Fe_2O_3 0.10, SiO_2 0.09, Ti, Al, Mn, Na, K − none, total 102.54 − (O = Cl_2) 3.35 = 99.19%. The sample contained about 16% magnesite and dolomite and a little magnetite and antigorite. After deducting these, the analysis corresponds to $Mg_2Cl(OH)_3 \cdot 3.5H_2O$. The mineral is slowly soluble in water, readily soluble in weak acids. The DTA curve shows a weak endothermic effect at 87° and a strong one at 198° (total loss of weight 23.88%), a weak one at 383° and a strong one at 447°C. At 1000°, the residue is MgO. The infra-red spectrum indicates the presence of hydroxyl and molecular H_2O and also vibrations corresponding to the group Mg–(OH,Cl).

The X-ray pattern agrees with that of the compound $Mg_2Cl(OH)_3 \cdot 4H_2O$, synthesized by Wolf and Walter-Levy, Acta Cryst. v. 6, no. 1 (1953). It is indexed on a triclinic cell with $a = 8.64\pm0.03$, $b = 6.25\pm0.01$, $c = 7.42\pm0.01$Å, $\alpha = 101.4\pm0.3$, $\beta = 103.9\pm0.1$, $\gamma = 72.7\pm0.6°$, $Z = 2$, D calc. 1.787, meas. 1.798. The strongest lines (42 given) are 8.04(10)(100), 4.032(7)(200), 3.843(7–8)(20$\bar{1}$), 2.873(6b)(012), 2.703(6)(30$\bar{1}$), 2.439(9–10)(202).

Colorless, transparent, elongated prismatic grains, tenths of a mm long. H about 2. Biaxial, negative, $2V$ −62°, extinction 6–8° to the elongation, ns (±0.001), $\alpha = 1.516$, $\beta = 1.538$, $\gamma = 1.547$, elongation negative.

The mineral occurs in the Korshunov iron-ore deposit, Irkutsk region, in a drill core from depth 770 meters as veinlets 1–2 mm wide, in dolomitic marble, also containing the chloro-borates ekaterinite and shabynite.

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

Luddenite*

S. A. Williams (1982) Luddenite, a new copper-lead silicate from Arizona. Mineral. Mag., 46, 363–364.

Chemical analysis by wet methods yielded: CuO 13.2, PbO 35.1, TiO_2 4.7, SiO_2 25.7, H_2O 20.5, sum = 99.2%. These data lead to ratios for Cu:Pb:Si of 3:3:8 or 2:2:5 and the latter was chosen on the basis of a superior analysis for Cu. This leads to the formula $Cu_2Pb_2Si_5O_{14} \cdot 14H_2O$; some of the water may be non-essential.

Refinement of X-ray powder data (by the Ito method) gave a monoclinic cell with $a = 7.85$, $b = 20.06$, $c = 14.72$Å, $\beta = 90.78°$, $Z = 4$. The strongest lines in the X-ray powder diffraction pattern are: 7.361(10)(002), 5.218(7)(11$\bar{2}$), 4.226(5)(140), 3.515(5)(043,052,133), 3.411(5)(21$\bar{2}$,212), 3.173(10)(12$\bar{4}$) 2.918(8)(015,223).

Luddenite forms rosettes and fan-shaped aggregates of crystals <0.01 mm in size, and nickel green (RHS-130B). The Mohs hardness (massive material) is 4. D (meas.) = 4.45. Optically, luddenite has indices of refraction $\alpha = 1.852$, $\gamma = 1.867$, $2V = 40°$ (estimated). Pleochroism: γ = rich emerald green, $\alpha = \beta$ = yellow green.

Luddenite occurs associated with galena, chalcopyrite, fluorite, alamosite, melanotekite and hyalotekite, in a few samples from dumps at a Pb–Ag–Cu prospect near Artillery Peak, Mohave Co., Arizona. The assemblage is severely oxidized.

The name is for Raymond W. Ludden, chief geologist for Western Exploration, Phelps-Dodge Corporation. **P.J.D.**

Nabaphite*

A. P. Khomyakov, M. F. Korobitsyn, Yu. P. Men'shikov, and L. I. Polezhaeva (1982) Nabaphite, $NaBaPO_4 \cdot 9H_2O$, a new mineral. Doklady Akad. Nauk SSSR, 266, 707–710 (in Russian).

S. V. Baturin, Yu. A. Malinovskii, and N. V. Belov (1982) Crystal structure of nabaphite, $NaBaPO_4 \cdot 9H_2O$. Doklady Akad. Nauk SSSR, 266, 624–627 (in Russian).

Microprobe analyses by L.I.P. (standards, analyzed lorenzenite, apatite, barite) gave P_2O_5 20.89, 20.62, 21.28; Na_2O 6.90, 7.15, 6.96; BaO 39.24, 41.63, 42.33; SrO 0.84, 1.19, 0.83; CaO 0.04, 0.04, 0.04, H_2O (loss of wt. to 300°) 36.94%, corresponding to $Na_{0.80}(Ba_{0.95}Sr_{0.03})(PO_4)_{1.05} \cdot 8.07H_2O$. The structural study shows that the formula should be $NaBaPO_4 \cdot 9H_2O$. The low water content is due to its ready dehydration in air and the low sodium to the fact that the mineral is decomposed by cold water, giving an alkaline solution. The mineral is dissolved by cold dilute HCl or HNO_3. It is the Ba analogue of nastrophite.

X-ray study shows it to be cubic, space group $P2_13$, $a = 10.711(9)$Å., $Z = 4$, D meas. 2.3, calc. 2.26. The strongest X-ray lines (70 given) are 5.36(8)(200), 4.81(8)(210), 3.575(7)(221), 2.866(9)(321), 2.598(10)(410), 2.102(8)(510).

The mineral is colorless, transparent, luster dull vitreous. Brittle, H. about 2. Cleavage (100) distinct, frature step-like, semi-conchoidal. Optically isotropic, $n = 1.504\pm0.001$. Luminesces pale white in UV.

Nabaphite occurs in cavities in ijolite–urtite pegmatite, Yukspor Mt., Khibina massif, Kola Peninsula. It is a mineral of very late stage of agpaitic magma.

The name is for the composition and the relation to nastro-

phite. Type material is at the Fersman Mineralogical Museum, Moscow, and the Geological Museum, Kola Branch, Acad. Sci. USSR, Apatite. **M.F.**

Rebulite

T. Balić-Žunić and S. Šćavničar (1982) The crystal structure of rebulite, $Tl_5Sb_5As_8S_{22}$. Zeit. Kryst., 160, 109–125.

Chemical analyses (AAS and EMS respectively) gave Tl 32.41, 32.76; Sb 21.90, 22.88; As 20.00, 20.46; S–, 24.33; sum = —, 100.43%, which is interpreted as $Tl_5Sb_5As_8S_{22}$.

Rebulite is dark gray with metallic luster, brownish red streak. D (meas.) 4.81, D (calc.) 4.40. Crystals exhibit the forms {100}, {001} and {111}. Single crystal X-ray study showed rebulite to be monoclinic, space group $P2_1/c$, with $a = 17.441$, $b = 7.363$, $c = 32.052$Å, $\beta = 105.03°$, $Z = 4$. No powder data are given. Rebulite is associated with small, light-red crystals of $TlHgAs_3S_6$ and $TlHgAsS_3$ at Allchar, Macedonia, Yugoslavia.

Discussion

The publication of the name of a species whose full description has not been published, and which was not submitted to the IMA for approval, is regrettable. **P.J.D.**

Shafranovskite*

A. P. Khomyakov, Z. V. Vrublevskaya, B. B. Zvyagin, N. A. Mateeva, and G. O. Piloyan (1982) Shafranovskite $(Na,K)_6(Mn,Fe)_3Si_9O_{24} \cdot 6H_2O$, a new mineral. Zapiski Vses. Mineral. Obsh., 111, 475–480 (in Russian).

Analysis by N.A.M. gave SiO_2 47.52, TiO_2 0.12, Al_2O_3 0.39, Fe_2O_3 1.85, (1.70), FeO 6.10 (6.00), MnO 14.50, (14.17), MgO 0.34, CaO 0.61, Na_2O 10.24, K_2O 7.82, H_2O 9.78, sum 99.27%. The figures in parentheses are from partial analysis of the same sample by M. E. Kazakova. This corresponds to the formula $(Na_{3.63}K_{1.82}Ca_{0.12}Mn^{+2}_{0.29})_{5.86}(Mn^{+2}_{1.95}Fe^{+2}_{0.93}Mg_{0.09}Ti_{0.02}Fe^{+3}_{0.01})_{3.00}$ $(Si_{8.68}Fe^{+3}_{0.24}Al_{(0.01)8.93}O_{24} \cdot 5.96H_2O$, or $(Na,K)_6(Mn^{+2},Fe^{+2})_3$ $Si_9O_{24} \cdot 6H_2O$ with Na > K, Mn > Fe. A possible variant is $H_6(Na,K)_8(Mn,Fe)_3Si_9O_{27} \cdot 3H_2O$. Decomposed by 10% HCl; reacts with water at room temperature and gives an alkaline solution.

DTA study shows that the mineral loses its water in 3 stages at 80–120°, 120–350°, and 350–550°. The mineral sinters at about 700°.

Electron diffraction patterns indicate trigonal symmetry, space group $P31m$ or $Pmm1$, $a = 14.58$, $c = 21.01$Å, $Z = 6$, D. 2.78 meas. and calc. The strongest X-ray lines (21 given) are 10.54(100)(0002), 3.51(70)(0006,13$\bar{4}$0), 2.975(50b)(03$\bar{3}$5), 2.787(60)(23$\bar{5}$2).

The mineral is dark green to olive-green or yellowish-green, luster vitreous. Strongly electromagnetic. H of aggregates 2–3. Optically uniaxial, negative, $\omega = 1.587$, $\varepsilon = 1.570$ (both ±0.002).

The mineral occurs in alkalic pegmatites of the Khibina and Lovozero massifs, Kola Peninsula, as fine-grained aggregates up to 3–5 mm in diameter. Associated minerals include thermonatrite, natrophosphate, nacaphite, olympite, sidorenkite, rasvumite, and other sulfides.

The name is for Ilarion Ilarionovich Shafranovskii, mineral-

ogist and crystallographer, Professor of the Leningrad Mining Institute. Type material is in the Fersman Mineralogical Museum, Moscow, the Mining Institute, Leningrad, and the Kola Branch, Acad. Sci. USSR, Apatite. **M.F.**

Sosedkoite*

A. V. Voloshin, Yu. P. Mel'nikov, and Ya. A. Pakhomovskii (1982) Sosedkoite, $(K,Na)_5Al_2(Ta,Nb,Sb)_{22}O_{60}$, a new mineral from granite pegmatites. Doklady Akad. Nauk SSSR, 264, 442–445 (in Russian).

Microprobe analysis (standards lorenzenite, wadeite, diopside, pyrope, hematite, metallic Ta and Nb, synthetic Sb_2S_3, PbS, and PbSe) gave Ta_2O_5 91.25, Nb_2O_5 2.71, Sb_2O_3 0.47, Al_2O_3 1.96, CaO 0.10, Na_2O 1.15, K_2O 2.79, sum 100.43% corresponding to $(K_{3.06}Na_{1.85}Ca_{0.09})_{5.00}Al_{1.92}(Ta_{20.65}Nb_{1.03}Sb_{0.14})_{21.82}O_{60}$, or $(K,Na)_5Al_2(Ta,Nb)_{22}O_{60}$. Li is less than 0.1% by atomic absorption analysis.

The X-ray pattern was indexed by analogy to that of the synthetic compound $K_3Li_2Ta_5O_{15}$ as orthorhombic with $a = 17.25$, $b = 17.73$, $c = 3.95$Å., $Z = 1$, D. calc. 6.90. The strongest lines (45 given) are 6.1(5)(220), 3.95(10)(001,240); 3.47(5)(150); 3.03(9)(350,530); 2.79(5)(260), 1.974(6)(002,480).

The mineral is colorless, luster adamantine. No cleavage. Microhardness 800–860 kg/sq.mm at 20 g load. Strongly anisotropic and birefringent. Reflectances (max. and min.): 486 nm, 13.5, 12.8, 589, 13.3, 12.3; 656, 11.3, 11.3%. In cathode rays, luminesces weak blue.

The mineral occurs in granitic pegmatites, Kola Peninsula, as acicular crystals up to 0.1 mm long in microlite and in cesstibtantite and along grain boundaries of these minerals with simpsonite and stibiotantalite.

The name is for the Russian mineralogist A. F. Sosedko (1901–1957). Type material is in the Fersman Mineralogical Museum, Acad. Sci. USSR, Moscow, and in its Kola Branch, Apatite. **M.F.**

Discussion

It is hard to see how $K_{12}Li_8Ta_{20}O_{60}$ and $(K,Na)_5Al_2Ta_{22}O_{60}$ can be indexed on the same basis. **M.F.**

Stanleyite*

A Livingstone (1982) Stanleyite, a new vanadium sulphate mineral from Peru. Mineral. Mag., 45, 163–166.

The average of 9 microprobe analyses yields: V_2O_4 36.6, SO_3 34.7, SiO_2 0.4, Al_2O_3 0.3, TiO_2 0.1, FeO 0.3, MgO 0.2, NiO 0.4, CaO 0.1, K_2O 0.5, Cl 0.1, sum = 73.7%, with H_2O (determined by TGA) = 38.0%. These results, normalized on the basis of directly determined SO_3 and H_2O values (due to H_2O volatilization during microprobe analysis) yield a calculated formula $V_{1.01}O_{1.01}S_{0.99}O_{3.99} \cdot 5.78 H_2O$, or ideally, $VOSO_4 \cdot 6H_2O$.

X-ray powder data (31 lines given) are indexed on an orthorhombic cell with $a = 12.12$, $b = 9.71$, and $c = 14.92$Å, $V = 1755.8$Å^3 with $Z = 8$. The strongest lines in the powder diffraction pattern are: 4.98(90)(003), 4.69(80)(202), 4.41(60)(013), 4.20(100)(212), 3.81(60)(220), 3.73(60)(310,004).

Stanleyite is blue and occurs as 1.5 mm fragments or efflores-

cences with patronite, pyrite and an unknown V–K–S-bearing phase at Cerro de Pasco, Minasragra, Peru. The mineral has a hardness of 1–1½; no cleavage was observed; D calc. 2.01, meas. 1.95. Optically, stanleyite is biaxial positive, with large $2V$ and no dispersion. Indices of refraction are $\alpha = 1.505$, $\beta = 1.519$, and $\gamma = 1.533$. Pleochroism is moderate: $X = Y =$ blue, $Z =$ pale blue to colorless; absorption: $X = Y > Z$.

A note added in proof indicates a recent study of $VOSO_4 \cdot 6H_2O$ by Tachez and Theobald (Acta Cryst., B36, 2873–2880) indicates that it is triclinic with $a = 7.47$, $b = 10.137$, $c = 6.20$Å, $\alpha = 101.9°$, $\beta = 95.54°$, $\gamma = 92.12°$, yielding a cell volume of 456.8Å^3, which gives a calculated density of 1.94, suggesting stanleyite may be a triclinic polymorph.

The name is for Henry Morton Stanley (1841–1904), who found Dr. David Livingstone in Africa in 1871. Type material is deposited in the Royal Scottish Museum, Edinburgh. **P.J.D.**

Vozhminite*

N. S. Rudashevskii, Yu. P. Men'shikov, A. A. Lentsi, N. I. Shumskaya, A. B. Lobanova, G. N. Goncharov, and A. G. Tutov (1982) Vozhminite, $(Ni,Co)_4(As,Sb)S_2$, a new mineral. Zapiski Vses. Mineralog. Obsh., 111, 480–485 (in Russian).

Microprobe analyses (standards metallic Ni, Co, Fe, As, and Sb and analyzed pyrite and troilite) of 22 points in 2 samples gave (range and average) Ni 48.9–57.1, 52.7; Co 1.78–9.09, 5.56; Fe 0.01–0.36, 0.05; Sb 10.8–11.9, 11.3; As 12.8–13.4, 13.1; S 15.5–17.4, 16.8; sum 98.13–100.35, 99.51%, corresponding to $(Ni_{3.43}Co_{0.36})(As_{0.67}Sb_{0.35})S_{2.00}$ or $(Ni,Co)_4(As,Sb)S_2$.

The X-ray pattern was indexed on a hexagonal cell with $a = 17.46 \pm 0.04$, $c = 7.20 \pm 0.01$Å, $Z = 18$, D calc. $= 6.2$ The strongest lines (Fe$K\alpha$ radiation, 40 lines given) are 8.7(10)(11$\bar{2}$0), 3.07(9)(30$\bar{3}$2), 2.717(6)(55$\bar{6}$0), 2.303(7)(61$\bar{7}$0), 2.111(9)(22$\bar{4}$2); 1.776(10b)(81$\bar{9}$0).

Color yellowish with a brown tint, streak black, luster metallic. In reflected light rose-orange color. Reflectances, Rε and Rω, resp.; 460 nm, 45.0, 39.2; 540 nm, 50.9, 47.5; 640 nm, 55.0, 52.8; 720 nm, 57.7, 54.6%. Microhardness (load 100 g) 240–300, av. 270 to 376–480, av. 436 kg/sq.mm, depending on the orientation. One distinct cleavage was noted.

The mineral occurs in serpentinites of the Vozhmin massif, N. E. Karelia, in heazlewoodite ore, associated also with tucekite, magnetite, geversite, and native Cu.

The name is for the locality. Type material is at the Museum of the Leningrad Mining Institute. **M.F.**

Unnamed Mg$_2$TiO$_4$

J. Gittins, J. J. Fawcett, J. C. Rucklidge, and C. K. Brooks (1982) An occurrence of the spinel end-member Mg_2TiO_4 and related spinel solid solutions. Mineral. Mag., 45, 135–137.

Electron microprobe analysis yielded TiO$_2$ 38.58, Al$_2$O$_3$ 2.75, FeO 6.26, Fe$_2$O$_3$ 11.82, MnO 0.41 MgO 39.09, CaO 0.31, sum = 99.21%, with Fe^{2+} and Fe^{3+} apportioned on the basis of spinel stoichiometry. This corresponds to ~86% of the Mg_2TiO_4 end member. This is the Mg analogue of ulvöspinel.

This phase occurs as <0.1 mm opaque, black grains, the size of which precluded determination of optical and physical properties. The mineral occurs in a thermally metamorphosed limestone in east Greenland, and is associated with calcite, forsterite, periclase, spinel and geikelite, **P.J.D.**

Unnamed Ni$_4$S (Sn,Te,Sb)

D. R. Hudson and G. A. Travis (1981) A native nickel-heazlewoodite-ferroan trevorite assemblage from Mount Clifford, Western Australia. Econ. Geol., 76, 1686–1697.

Electron microprobe analysis of an inclusion in heazlewoodite yielded: Ni 51.3, Fe 0.7, Co 0.1, Cu 2.7, Sn 14.3, As nil, Sb 7.1, Te 12.3, S 7.9, sum = 96.4%. This gives the formula $(Ni_{3.76}Fe_{0.05}Co_{0.01}Cu_{0.18})_{\Sigma4.00}S_{1.02}(Sn_{0.52}Te_{0.41}Sb_{0.25})_{\Sigma1.18}$. Its gray color and extreme anisotropy are close to mackinawite. **P.J.D.**

Unnamed CaFCl

I. V. Kulikov, V. E. Devyatov, and A. V. Gromov (1982) A new natural compound—calcium fluoride-chloride. Izvest. Vyssh. Uchebn. Zaved. Geol. Razved., 25, 120–122 (in Russian).

Fluorite crystals from the Tyrny Auz Mo-W deposit, northern Caucasus, contain inclusions containing brine (mostly CaCl$_2$, NaCl, KCl, FeCl$_2$) and also solid inclusions of a colorless, birefringent mineral up to 0.12 mm in diameter, which was separated by means of a steel needle. Its X-ray pattern corresponded to that of synthetic CaFCl (ASTM no. 24-186). The strongest lines (24 given) are 2.75(3), 2.57(10), 2.14(5), 1.94(4), 1.565(3), 1.550(5). The material is unstable in air, leaving a residue of fluorite.

Synthetic CaFCl is tetragonal, isostructural with matlockite, $P4/nmm$, $a = 3.891$, $c = 6.823$Å., $Z = 2$, D 3.039 (calc.). **M.F.**