

## New mineral names\*

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### EYSELITE\*

A.C. Roberts, T.M. Seward, E. Reusser, G.J.C. Carpenter, J.D. Grice, S.M. Clark, M.A. Marcus (2004) Eyselite, Fe<sup>3+</sup>Ge<sup>4+</sup><sub>3</sub>O<sub>7</sub>(OH), a new mineral species from Tsumeb, Namibia. *Can. Mineral.*, 42, 1771–1776.

Eyselite occurs as very fine-grained aggregates of platy to very thin prismatic, subhedral to euhedral, partly hollow crystals that are elongate [001] with a length-to-width ratio about 3:1 and up to 20 μm in length. Forms are {100} major, very thin {010}, rounded {011}, and very thin rounded {001} minor, with growth steps on {100}. Dirty brown-yellow (aggregates) to yellow-tan (crystals) color, opaque (aggregates) to transparent (crystals), brownish yellow streak, vitreous luster, brittle, nonfluorescent, uneven fracture, *H* soft, *D*<sub>calc</sub> = 3.639 g/cm<sup>3</sup> for *Z* = 2 and the empirical formula. The average of nine electron microprobe analyses is CaO 0.06, Fe<sub>2</sub>O<sub>3</sub> 18.54, Ga<sub>2</sub>O<sub>3</sub> 1.01, GeO<sub>2</sub> 77.75, H<sub>2</sub>O (by difference) 2.64, sum 100 wt%, corresponding to (Fe<sub>0.93</sub><sup>3+</sup>Ga<sub>0.04</sub><sup>3+</sup>)<sub>Σ0.97</sub>Ge<sub>2.98</sub><sup>4+</sup>O<sub>6.90</sub>(OH)<sub>1.17</sub> (based on 8 O atoms), ideally Fe<sup>3+</sup>Ge<sup>4+</sup><sub>3</sub>O<sub>7</sub>(OH). The IR spectrum shows structural (OH) and micro-XAS indicates that all Fe is trivalent and Ge atoms are probably in octahedral coordination. Optically biaxial positive, two indices of refraction exceed 1.80, 2*V*<sub>meas</sub> large, pale yellow, no pleochroism, low birefringence, moderate anisotropy, and length-fast. Combined CBED and Ito methods indicate orthorhombic symmetry, *P* lattice; *a* = 8.302(4), *b* = 9.718(4), *c* = 4.527(2) Å as refined from a Debye-Scherrer powder pattern (114.6 mm, CuKα radiation) with strongest lines of 4.105(40,011), 3.681(100,111), 3.121(60b,220,121), 2.921(100,211), 2.512(40,131), 2.403(90,320), 1.646(80,322) and 1.624(50,142).

The mineral occurs with no other secondary associations in a vug (4 × 5 mm) on a single specimen (1.6 × 2.3 × 3.5 cm) of renierite-germanite-tennantite ore from the Tsumeb mine, Tsumeb, Namibia. The new mineral name is for Professor Walter Hans Eysel (1935–1999) for his studies of germinates and his contributions to the Powder Diffraction File. Type material is in the Systematic Reference Series at the Geological Survey of Canada, Ottawa. **A.C.R.**

### GJERDINGENITE-MN\*

G. Raade, N.V. Chukanov, U. Kolitsch, S. Möckel, A.E. Zadov, I.V. Pekov, (2004) Gjerdingenite-Mn from Norway—a new mineral species in the labuntsovite group: descriptive data and crystal structure. *Eur. J. Mineral.*, 16, 979–987.

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

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Gjerdingenite-Mn occurs as orange-yellow to brown, prismatic crystals up to 1 mm in length and elongate along [010] and showing the forms {001}, {100}, {201} and {021}. Twinning on {001} is present. The mineral is translucent to transparent, has a vitreous luster, and a Mohs hardness of 5. It does not show fluorescence in either long- or shortwave UV radiation, has no discernible cleavage or parting, is brittle and shows uneven fracture. Quantitative EDS analyses by electron microprobe (average of four analyses) gave Na<sub>2</sub>O 1.45, K<sub>2</sub>O 5.83, BaO 0.69, Mg 0.05, Mn 2.59, FeO 2.03, ZnO 0.54, Al<sub>2</sub>O<sub>3</sub> 0.18, SiO<sub>2</sub> 38.55, TiO<sub>2</sub> 7.07, Nb<sub>2</sub>O<sub>5</sub> 31.74, H<sub>2</sub>O 9.9(4), sum 100.62 wt%, corresponding to (K<sub>3.07</sub>Na<sub>1.16</sub>Ba<sub>0.11</sub>)<sub>Σ4.34</sub>(Mn<sub>0.91</sub>Fe<sub>0.70</sub>Zn<sub>0.16</sub>Mg<sub>0.03</sub>)<sub>Σ1.80</sub>(Nb<sub>5.92</sub>Ti<sub>2.19</sub>)<sub>Σ8.11</sub>(Si<sub>15.91</sub>Al<sub>0.09</sub>O<sub>48</sub>)<sub>Σ6.32</sub>(OH)<sub>1.68</sub>]<sub>Σ8.00</sub>·12.8H<sub>2</sub>O, based on 16(Si + Al) and *Z* = 1. The ideal formula (*Z* = 2) is (K,Na)<sub>2</sub>(Mn,Fe)[(Nb,Ti)<sub>4</sub>(Si<sub>4</sub>O<sub>12</sub>)<sub>2</sub>(O,OH)<sub>4</sub>]-6H<sub>2</sub>O. The IR spectrum of the mineral has absorption bands at 3625, 3470, 1640, 1600, 1104, 1089, 1022, 945, 920, 779, 693, 650, 597, 490 and 467 cm<sup>-1</sup>, confirming the presence of both OH and H<sub>2</sub>O. Gjerdingenite-Mn is biaxial positive, α = 1.670(2), β = 1.685(2), γ = 1.775(5), 2*V*<sub>obs</sub> = 52(8)°, 2*V*<sub>calc</sub> = 46(5)°, weak axial dispersion, *r* < *v*, *Z* = *a*, *Y* = *b*. It is pleochroic yellowish brown (β) to colorless (α and γ).

The crystal structure of gjerdingenite-Mn was solved and refined by single-crystal X-ray diffraction methods, using a fragment 0.03 × 0.05 × 0.08 mm, to *R*<sub>1</sub> = 0.079 for 1207 reflections with *I* > 4σ(*I*). The mineral is monoclinic, *C*2/*m*, *a* = 14.563(3), *b* = 13.961(3), *c* = 7.851(2) Å, β = 117.62(3)°, *V* = 1414.3(6) Å<sup>3</sup>, *Z* = 2, *D*<sub>calc</sub> = 2.93 g/cm<sup>3</sup>, μ = 2.52 mm<sup>-1</sup>. The strongest lines on the X-ray powder diffraction pattern (Debye-Scherrer camera, camera diameter 57 mm, FeKα radiation, 18 lines) include 6.96(100,020), 6.40(20,200), 4.94(80,021), 3.22(90,421), 3.10(80,041), 2.510(40,441), 1.431(20,483). Gjerdingenite-Mn is a member of the labuntsovite-group, isostructural with gjerdingenite-Fe, the Ti-analogue of kuzmenkoite-Mn, and a dimorph of organovaitite-Mn.

Gjerdingenite-Mn was discovered in miarolitic cavities in the sodic alkaline granite at Gjerdingsetva, Lunner, Oppland, Norway. It is associated with aegirine, albite, elpidite, janhaughite, kupletskite, monazite-(Ce), orthoclase, pyrochlore and ralstonite. Unlike many of the other labuntsovite-group minerals which are always the result of late-stage hydrothermal alteration of previous minerals, both gjerdingenite-Mn and gjerdingenite-Fe are found in cavities that exhibit little or no late-stage alteration. Gjerdingenite is widespread in the pluton, but is a minor mineral. It is also one of the few K-rich minerals to crystallize in the alkali granite. The name is given based on its composition, being the Mn-analogue of gjerdingenite-Fe. The type material has been deposited in the Mineralogical Collection at the Freiberg University of Mining and Technology, Bergakademie Freiberg, Germany (catalogue no. 80250). **P.C.P.**

**GRENMARITE\***

M. Bellezza, M. Franzini, A.O. Larsen, S. Merlino, N. Perchiazzi, (2004) Grenmarite, a new member of the götzenite-seidozerite-rosenbuschite group from the Langesundsfjord district, Norway: definition and crystal structure. *Eur. J. Mineral.*, 16, 971–978.

Grenmarite occurs as semi-parallel aggregates of elongated, flattened crystals up to 1 cm in length. Crystals are striated parallel to [010] and are dominated by the pinacoids {201} and {20 $\bar{3}$ }. It is translucent, yellow brown (brown when altered), with a vitreous luster and a pale yellowish-brown streak. It is brittle, with a good {001} cleavage, uneven fracture, and a Mohs hardness of 4.5. Electron microprobe analyses (average of 15 analyses) gave SiO<sub>2</sub> 29.85, TiO<sub>2</sub> 4.51, CaO 1.84, MnO 8.25, FeO 2.01, Na<sub>2</sub>O 15.43, Y<sub>2</sub>O<sub>3</sub> 0.22, La<sub>2</sub>O<sub>3</sub> 0.00, Ce<sub>2</sub>O<sub>3</sub> 0.01, ZrO<sub>2</sub> 31.63, Nb<sub>2</sub>O<sub>5</sub> 0.06, F 5.24, sum 99.05 wt%, corresponding to (Zr<sub>1.52</sub>Mn<sub>0.46</sub>Y<sub>0.02</sub>)<sub>Σ2.00</sub>(Zr<sub>0.55</sub>Ti<sub>0.45</sub>)<sub>Σ1.00</sub>(Mn<sub>0.48</sub>Na<sub>0.29</sub>Fe<sub>0.23</sub>)<sub>Σ1.00</sub>(Na<sub>3.72</sub>Ca<sub>0.26</sub>)<sub>Σ3.98</sub>Si<sub>4</sub>O<sub>15.40</sub>F<sub>2.22</sub>, based on 4 Si atoms. The ideal formula is (Zr,Mn)<sub>2</sub>(Zr,Ti)(Mn,Na)(Na,Ca)<sub>4</sub>(Si<sub>2</sub>O<sub>7</sub>)<sub>2</sub>(O,F)<sub>4</sub>. Grenmarite is biaxial positive,  $\alpha = 1.694$ ,  $\gamma = 1.735$ ,  $X = b$ ,  $Z \wedge a = 42^\circ$ , pleochroic with  $X$  colorless and  $Z$  light brown. The IR spectrum of grenmarite shows absorption bands at 3460 (O-H stretching), 1621 (H-O-H bending), 1082, 987, 938, 855, 730, 605, 535, 493, 440 cm<sup>-1</sup> (Si-O bending and stretching).

The structure of grenmarite was refined by single-crystal X-ray diffraction methods (0.28 × 0.14 × 0.08 mm<sup>3</sup> crystal) to  $R_1 = 0.043$  for 1427 reflections with  $I > 2\sigma(I)$  using starting parameters for seidozerite [Pushcharovskii et al. (2002), *Crystallogr. Rep.* 47, 196–200]. The mineral is monoclinic,  $P2/c$ ,  $a = 5.608(1)$ ,  $b = 7.139(1)$ ,  $c = 18.575(5)$  Å,  $\beta = 102.60(2)^\circ$ ,  $V = 725.72(3)$  Å<sup>3</sup>,  $Z = 2$ ,  $D_{\text{obs}} = 3.49$  g/cm<sup>3</sup>,  $D_{\text{calc}} = 3.568$  g/cm<sup>3</sup>. The strongest lines on the X-ray powder diffraction pattern (diffractometer, CuK $\alpha$  radiation, 67 lines) include 7.142(12,010), 6.645(12,011), 3.949(15, $\bar{1}04$ ), 3.027(68,006), 2.898(100,121), 2.613(26, $\bar{2}04$ ), 2.459(24, $\bar{1}25$ ), 1.853(24,127), 1.786(14,040) and 1.650(14, $\bar{3}23$ ). Grenmarite is a member of the götzenite-seidozerite-rosenbuschite group, is isostructural with seidozerite with Zr dominating both the M1 and M2 sites.

Grenmarite was discovered in an alkaline pegmatite dike on the eastern side of the island of Vesle Arøya in the Langesundsfjord district, Vestfold, Norway. The pegmatite was heavily blasted in the 1880s and only remnants are still present. The mineral was found embedded in microcline and fine-grained albite. Associated minerals include albite, astrophyllite, biotite, catapleiite, fluorite, galena, lävenite, leucosphenite, löllingite, pyrochlore, and sphalerite. It was among the first minerals to crystallize in the alkaline pegmatite. The name is after Grenmar, the Norse name of the Langesundsfjord. Type material has been deposited at the Museo di Storia Naturale, Università di Pisa, Italy (catalogue no. 2003-024) and at the Geological Museum, University of Oslo, Norway (catalogue no. 33974). **P.C.P.**

**KFe<sub>3</sub><sup>+</sup>H<sub>8</sub>(PO<sub>4</sub>)<sub>6</sub>·6H<sub>2</sub>O**

K. Walenta, T. Theye (2004) KFe<sub>3</sub><sup>+</sup>(H<sub>2</sub>PO<sub>4</sub>)<sub>2</sub>(HPO<sub>4</sub>)<sub>4</sub>·6H<sub>2</sub>O, a second new phosphate mineral from the Silberbrünnle mine in the central Black Forest. *Der Erzgräber*, 18, 17–23 (in German with English abstract).

The mineral forms columnar hexagonal prisms up to 0.06 mm long and 0.03 mm thick showing basal {0001} and prism {10 $\bar{1}0$ }

faces. Electron microprobe analysis (H<sub>2</sub>O by difference) gave: P<sub>2</sub>O<sub>5</sub> 48.70, Al<sub>2</sub>O<sub>3</sub> 3.73, Fe<sub>2</sub>O<sub>3</sub> 23.27, Na<sub>2</sub>O 0.56, K<sub>2</sub>O 4.54, H<sub>2</sub>O 19.20, sum 100.00 wt%, corresponding to K<sub>0.85</sub>Na<sub>0.16</sub>Fe<sub>2.58</sub>Al<sub>0.65</sub>P<sub>6.08</sub>H<sub>18.89</sub>O<sub>30</sub>, ideally KFe<sub>3</sub><sup>+</sup>H<sub>8</sub>(PO<sub>4</sub>)<sub>6</sub>·6H<sub>2</sub>O for 30 O atoms by analogy with the synthetic compound. Analysis of a second sample gave K + Na = 0.40, suggesting H<sup>+</sup> or H<sub>3</sub>O<sup>+</sup> substitution for K. Soluble in dilute HCl. Transparent to translucent, color pale brown, streak white, vitreous luster, no cleavage, irregular fracture.  $H \sim 2$ ,  $D_{\text{meas}} = 2.40(5)$  g/cm<sup>3</sup>,  $D_{\text{calc}} = 2.43(2)$  g/cm<sup>3</sup> for  $Z = 2$ . Optically uniaxial positive,  $\epsilon = 1.596(2)$ ,  $\omega = 1.592(2)$ , anomalous pale brown interference colors. Assuming hexagonal symmetry, probable space group  $P6_3mc$ , the powder X-ray study gave  $a = 9.12(1)$ ,  $c = 16.84(2)$  Å,  $V = 1213.0(5)$  Å<sup>3</sup>, which are slightly less than those for the synthetic compound. Strongest lines of the powder pattern (57.3 mm camera, FeK $\alpha$  radiation, 42 lines given): 7.89 (40,10 $\bar{1}0$ ), 7.16 (100,10 $\bar{1}1$ ), 5.78 (80,10 $\bar{1}2$ ), 4.57 (70,10 $\bar{1}3$ ,11 $\bar{2}0$ ), 3.57 (50,20 $\bar{2}2$ ), 3.23 (60,20 $\bar{2}3$ ), 3.09 (80,10 $\bar{1}5$ ,11 $\bar{2}4$ ), 2.87 (40,20 $\bar{2}4$ ), 2.81 (50,21 $\bar{3}2$ , 0006), and 1.715 (40,41 $\bar{5}1$ ) in good agreement with data on the synthetic compound.

The mineral forms crusts with haigerachite on quartz in the dump of the Silberbrünnle mine, upper Haigerachtal near Gengenbach, central Black Forest, Baden-Württemberg, Germany; associated minerals are pyrite, gypsum, jarosite, and diadochite.

**Discussion.** Synthetic analogues of this mineral and of haigerachite, as well as of their H<sup>+</sup> analogues, have been studied in detail as components of fertilizer (e.g., Frazier et al., 1989; *Industrial & Engineering Chemistry Research*, 28, 225–230; Prochnow et al., 2003; *Soil Sci. Soc. Am. J.*, 67, 1551–1563). These are distinct compounds readily distinguished on the basis of optical properties, infra-red spectra and powder X-ray diffraction patterns. Single-crystal data have been reported for synthetic haigerachite (Waerstad and Frazier, 1987, *Powder Diffraction*, 2, 187–190), but not for synthetic KFe<sub>3</sub><sup>+</sup>H<sub>8</sub>(PO<sub>4</sub>)<sub>6</sub>·6H<sub>2</sub>O or Fe<sub>3</sub><sup>+</sup>H<sub>8</sub>(PO<sub>4</sub>)<sub>6</sub>·6H<sub>2</sub>O, and it appears that hexagonal symmetry has been assumed on the basis of morphology and uniaxial optics. By the present authors' own admission, their proposal for KFe<sub>3</sub><sup>+</sup>H<sub>8</sub>(PO<sub>4</sub>)<sub>6</sub>·6H<sub>2</sub>O was voted on by the CNMMN IMA, but failed to get the necessary two-thirds majority for approval. **E.S.G.**

**KOKCHETAVITE\***

S.-L. Hwang, P. Shen, H.-T. Chu, T.-F. Yui, J.G. Liou, N.V. Sobolev, R.-U. Zhang, V.S. Shatsky, A.A. Zayachkovsky (2004) Kokchetavite: a new potassium-feldspar polymorph from the Kokchetav ultrahigh-pressure terrain. *Contrib. Mineral. Petrol.*, 148, 380–389.

Kokchetavite occurs as plates and prisms (3–7  $\mu\text{m}$ ) with well-developed (0001) steps and {10 $\bar{1}0$ } planes within clinopyroxene and garnet in ultrahigh pressure rocks. Chemical analyses by EDX on a transmission electron microscope gave 64.6–66.4 SiO<sub>2</sub>, 18.0–18.9 Al<sub>2</sub>O<sub>3</sub>, and 15.5–16.8 K<sub>2</sub>O, Na<sub>2</sub>O < 0.3, sum 100.1 (ave) wt%, very close to the stoichiometric formula of pure sanidine, KAlSi<sub>3</sub>O<sub>8</sub>. Raman spectroscopy indicates absorption bands at 108 and 391 cm<sup>-1</sup>, and the absence of peaks at 514 cm<sup>-1</sup>, characteristic of potassium feldspar, and the O-H stretching peak at 3400–3700 cm<sup>-1</sup>, indicating that kokchetavite is anhydrous.

The crystal structure of kokchetavite could not be determined fully. Selective area diffraction patterns were taken to determine the crystal system and the  $d$ -spacings. Kokchetavite is hexagonal,  $a = 5.27(1)$ ,  $c = 7.82(1)$  Å,  $V = 188.09$  Å<sup>3</sup>,  $Z = 1$ ,  $D_{\text{calc}} = 2.45$  g/cm<sup>3</sup>. The

lines on the SAED pattern include 7.82(001), 4.56(100), 3.93(101), 2.98(102), 2.63(110), 2.51(111), 2.26(103), 1.80(104), 1.72(210) and 1.68(211). No intensities were given. Kokchetavite is a new metastable polymorph of potassium feldspar.

The mineral was found as inclusions in clinopyroxene and garnet from a garnet-pyroxene rock that occurs as layers up to 10 m thick within ultrahigh-grade granitic and biotite gneiss of the Kokchetav Massif metamorphic complex, northern Kazakhstan. The peak metamorphic conditions for this Proterozoic complex (530–540 Ma) are estimated to be 5.8–6.5 GPa and 900–1100 °C. Microdiamonds have been found as inclusions in garnet, zircon and clinopyroxene in many of the rocks of this complex. The sample containing kokchetavite was collected from an underground microdiamond mine in Kundry-Kol. Kokchetavite is associated with diopside, grossular-rich garnet, phengite mica, potassium feldspar, pyrrhotite quartz, titanite, and talc. It is thought to form metastably from infiltrated melts during retrograde exhumation, or from the dehydration of K-cymrite, which was a high-pressure precipitate from infiltrated melts. The name is for the locality. Type material has been deposited at the National Museum of Natural Science, Taichung, Taiwan (catalogue no. NMNS004438-P010220).

**Discussion.** Detailed chemical analyses are not given for this mineral. Kokchetavite decomposes readily under the electron beam. **P.C.P.**

#### MAZZETTIITE\*

B. Luca, C. Cipriani, (2004) Mazzettiite,  $\text{Ag}_3\text{HgPbSbTe}_5$ , a new mineral species from Findley Gulch, Saguache county, Colorado, USA. *Can. Mineral.*, 42(6), 1739–1743.

Mazzettiite occurs as anhedral to subhedral grains (200  $\mu\text{m}$  in length). The mineral is opaque, has a metallic luster and a black streak. It is brittle and does not have a cleavage. Microindentation measurements with (VHN load 25 g) gave a mean value of 101  $\text{kg}/\text{mm}^2$ , corresponding to a Mohs hardness of 3 to 3.5. Electron microprobe analyses gave Pb 14.12, Ag 21.60, Hg 13.58, Sb 8.07, Te 42.68, sum 100.05 wt%, corresponding to  $\text{Ag}_{2.99}\text{Hg}_{1.01}\text{Pb}_{1.02}\text{Sb}_{0.99}\text{Te}_{4.99}$  and a simplified formula of  $\text{Ag}_3\text{HgPbSbTe}_5$ , based on 11 atoms. Mazzettiite is light grey in reflected light, weakly to moderately birefractant, and weakly pleochroic from greenish grey to darker bluish grey. In crossed-polars, mazzettiite is moderately anisotropic and does not show internal reflections. Reflectance percentages for  $R_{\min}$  and  $R_{\max}$  are 45.6, 46.1 (470 nm), 46.1, 46.6 (546 nm), 46.3, 47.0 (589 nm), and 46.4, 47.1 (650 nm), respectively.

Mazzettiite is orthorhombic, space groups  $Pna2_1$  or  $Pnam$ , with unit-cell parameters refined from powder X-ray diffraction data  $a = 16.495(6)$ ,  $b = 14.762(7)$ ,  $c = 4.506(2)$  Å,  $V = 1097.2(8)$  Å<sup>3</sup>,  $Z = 4$ ,  $D_{\text{calc}} = 9.04$   $\text{g}/\text{cm}^3$ . The strongest lines on the X-ray diffraction pattern (114.6 mm Gandolfi camera,  $\text{CuK}\alpha$  radiation, 36 lines) include 4.41(30,320), 3.65(60,330), 3.60(40,420), 3.38(20,240), 3.26(50,131), 3.17(60,430), 3.01(100,520), 2.754(60,440), 2.577(20,620), 2.367(25,251), 2.316(45,611), 2.254(30,002), 2.137(50,122), 2.060(35,800), 2.012(20,650), 1.984(25,232), 1.975(30,551), 1.846(30,080), 1.834(20,660), 1.806(55,561), 1.754(20,831), 1.651(20,10.0.0). Mazzettiite shows strong similarities with the mineral petrovicite,  $\text{Cu}_3\text{HgPbBiSe}_5$ .

The mineral is from Findley Gulch, Saguache county, Colorado, which is part of the Bonanza mining district at the eastern end of

the San Juan Mountains. It is located south of Poncha Pass, 20 km from the Empress Josephine Mine. Mazzettiite is associated with altaite, galena and quartz. The mineral name is for Giuseppe Mazzetti (1942–2003), curator in chief of the Mineralogy Section of the Museo di Storia Naturale, Università di Firenze. Type material has been deposited at the Museo di Storia Naturale, Università di Firenze (catalogue no. 2951/I). Co-type material is deposited at the Mineralogical Collection, Institut royal des sciences naturelles de Belgique (catalogue no. V/876). **P.C.P.**

#### MUSEUMITE\*

L. Bindi, C. Cipriani (2004) Museumite,  $\text{Pb}_5\text{AuSbTe}_2\text{S}_{12}$ , a new mineral from the gold-telluride deposit of Sacarimb, Metaliferi Mountains, western Romania. *Eur. J. Mineral.*, 16, 835–838.

Museumite occurs as anhedral to subhedral, platy to flaky grains up to 300  $\mu\text{m}$ . Crystals are dark silver-grey, with a grey-black streak. It is opaque, with a metallic luster. The dominant form is  $\{001\}$  and twinning was not observed. Micro-indentation measurements with a VHN load of 15 g gave a mean value of 42  $\text{kg}/\text{mm}^2$ , corresponding to a Mohs hardness of 1 to 1.5. Electron microprobe analyses of a fragment of museumite (average of 25 analyses) gave Pb 52.00, Au 10.68, Sb 6.16, Te 11.71, S 19.43, sum 99.98 wt%, corresponding to  $\text{Pb}_{5.00}\text{Au}_{1.08}\text{Sb}_{1.01}\text{Te}_{1.83}\text{S}_{12.08}$ , based on 21 atoms. Also analyzed for but not detected were Ag, As, Cu and Fe. The simplified formula is  $\text{Pb}_5\text{AuSbTe}_2\text{S}_{12}$ , based on 21 atoms. Museumite is grayish white in reflected light, with a very low birefringence and pleochroism. It shows distinct anisotropism under crossed polars. Reflectance percentages for  $R_{\min}$  and  $R_{\max}$  are 38.4, 40.3 (471.1 nm), 38.1, 40.1 (548.3 nm), 37.5, 39.4 (586.6 nm), and 35.9, 38.0 (652.3 nm), respectively.

The crystal structure of museumite was performed by the precession method using a  $110 \times 130 \times 180$   $\mu\text{m}$  single crystal. Museumite is monoclinic,  $P2_1$  or  $P2_1/m$ , with refined unit-cell parameters from the powder diffraction pattern  $a = 4.361(2)$ ,  $b = 6.618(3)$  and  $c = 20.858(9)$  Å,  $\beta = 92.56^\circ$ ,  $V = 601.3(5)$ ,  $a:b:c = 0.6590:1:3.1517$ . The strongest lines on the X-ray powder diffraction pattern ( $\text{CuK}\alpha$ , Gandolfi camera, 60 lines) include 20.85(20,001), 6.93(38,003), 6.31(11,011), 5.21(13,004), 4.80(52,013), 4.10(40,014), 3.76(20,103), 3.65(15,110), 3.56(100,111), 3.47(58,112), 3.31(40,020), 3.27(20,104), 2.99(50,023), 2.98(30,007), 2.80(18,024), 2.69(22,115), 2.56(41,116), 2.21(28,027), 2.08(22,118), 1.982(15,119), 1.961(18,131), 1.728(11,136), 1.449(11,047).

Museumite was discovered in the Neogene Sacarimb (Metaliferi Mountains, western Romania) gold-telluride epithermal deposits. The gold-telluride veins are located in a volcanic hornblende- and pyroxene-bearing andesite, which display pervasive propylitic and argillic alteration. Museumite was found in veins of the Magdalena group, in the southeastern part of the mine. It occurs in vugs in nagyágite and is associated with calcite, coloradoite, hessite, nagyágite, petzite, quartz, rhodochrosite, sylvanite, and base-metal sulfides. The mineral is named in recognition of all museums in the world that preserve their old samples with care and accuracy. The type material has been deposited at the Natural History Museum of the University of Florence (catalogue no. 899/G).

**Discussion.** The authors do not explain why a thorough single-crystal X-ray structure refinement was not performed on museumite even though a Nonius CAD4 four-circle diffractometer was employed to determine the crystal quality. **P.C.P.**

**NABALAMPROPHYLLITE\***

N.V. Chukanov, M.M. Moiseev, I.V. Pekov, K.A. Lazebnik, R.K. Rastsvetaeva, N.V. Zayakina, G. Ferraris, G. Ivaldi (2004) Nabalamprophyllite  $\text{Ba}(\text{Na},\text{Ba})\{\text{Na}_3\text{Ti}[\text{Ti}_2\text{O}_2\text{Si}_4\text{O}_{14}](\text{OH},\text{F})_2\}$ , a new layer titanosilicate of the lamprophyllite group from the Inagli and Kovdor alkaline-ultrabasic massifs, Russia. *Zapiski Vseross. Mineral. Obshch.*, 133(1), 59–72 (in Russian, English abstract).

Nabalamprophyllite occurs as flat prismatic brown to bright yellow crystals up to 1 cm (Kovdor) and 10 cm (Inagli) in length which form sheaf-like and random aggregates. Thin, platy crystals are often formed into fan-like aggregates. Crystals from Inagli show {100} as the dominant form, with minor {010} and {130}. Nabalamprophyllite is transparent to translucent, has a glassy luster, is brittle, has perfect (100) cleavage, and a Mohs hardness of 3. Electron microprobe analyses of the holotype (Inagli, average of 20 analyses) and cotype (Kovdor) specimens gave  $\text{Na}_2\text{O}$  11.14/11.99,  $\text{K}_2\text{O}$  0.94/1.03,  $\text{CaO}$  0.36/0.10,  $\text{SrO}$  0.65/ND,  $\text{BaO}$  24.12/25.32,  $\text{MgO}$  0.34/0.83,  $\text{MnO}$  1.10/1.09,  $\text{Fe}_2\text{O}_3$  0.78/1.81,  $\text{Al}_2\text{O}_3$  0.44/0.16,  $\text{TiO}_2$  27.80/27.31,  $\text{Nb}_2\text{O}_5$  ND/0.64,  $\text{SiO}_2$  28.75/29.08,  $\text{F}$  1.18/ND,  $\text{H}_2\text{O}$  1.83/ND (determined by TGA), sum 98.93/99.36 wt%, corresponding to an empirical formula for the holotype specimen of  $\text{Na}_{2.95}\text{K}_{0.17}\text{Ca}_{0.05}\text{Sr}_{0.05}\text{Ba}_{1.29}\text{Mn}_{0.13}(\text{Ti}_{2.86}\text{Fe}_{0.08}\text{Mg}_{0.07})_{\Sigma 3.01}(\text{Si}_{3.93}\text{Al}_{0.07})_{\Sigma 4.00}\text{O}_{14.00}[\text{O}_{1.94}(\text{OH})_{1.67}\text{F}_{0.51}]$ , based on  $4(\text{Si} + \text{Al})$  for  $Z = 2$ . The ideal formula is  $\text{Ba}(\text{Na},\text{Ba})\{\text{Na}_3\text{Ti}[\text{Ti}_2\text{O}_2\text{Si}_4\text{O}_{14}](\text{OH},\text{F})_2\}$ . Nabalamprophyllite is biaxial positive,  $\alpha = 1.750(12)$ ,  $\gamma = 1.799(15)$ ,  $2V_{\text{obs}} = 40.5^\circ$ ,  $a \wedge \gamma = 10^\circ$ ,  $b = \alpha$ , strong dispersion,  $r > v$ , and weak green-brown pleochroism. The IR spectrum of nabalamprophyllite is different from all other samples of lamprophyllite and barytolamprophyllite, with absorption bands at 3610, 1033, 954, 921, 854, 692, 575, 549, 459, 420, and 402  $\text{cm}^{-1}$ . The main difference is the presence of a distinct doublet at 954–921  $\text{cm}^{-1}$  (Si-O stretching) in nabalamprophyllite where other lamprophyllite-group minerals contain only a single band.

The crystal structure of nabalamprophyllite was solved in a previous study [Rastsvetayeva and Chukanov (1999), *Dokl. RAN*, 4, 492–495]. Nabalamprophyllite is monoclinic,  $P2/m$ ,  $a = 19.741(5)$ ,  $b = 7.105(4)$ ,  $c = 5.408(2)$  Å,  $\beta = 96.67(1)^\circ$ ,  $V = 753.4(5)$  Å<sup>3</sup>,  $Z = 2$ ,  $D_{\text{obs}} = 3.62(2)$  g/cm<sup>3</sup>,  $D_{\text{calc}} = 3.58$  and  $3.68$  g/cm<sup>3</sup> from the empirical formula and the structural data, respectively. The strongest lines in the X-ray powder diffraction pattern (diffractometer,  $\text{CuK}\alpha$  radiation) include 9.87(96,200), 4.12(29,111), 3.75(65,31 $\bar{1}$ ), 3.45(90,311,510), 3.36(18,220), 3.275(78,600), 3.040(41,51 $\bar{1}$ ), 2.953(16,12 $\bar{1}$ ,60 $\bar{1}$ ), 2.894(33,22 $\bar{1}$ , 420), 2.797(100,221), 2.775(34,511), 2.673(33,20 $\bar{2}$ ,601), 2.610(43,42 $\bar{1}$ ,710), 2.210(15,60 $\bar{2}$ ), 2.143(40,022,22 $\bar{2}$ ,621), 2.084(15,33 $\bar{1}$ ,910), 2.027(17,530,512), and 1.604(12,023,11.1.1). Refined cell parameters from the powder data are  $a = 19.805(5)$ ,  $b = 7.123(3)$ ,  $c = 5.426(3)$  Å,  $\beta = 96.45(2)^\circ$ ,  $V = 753.4(5)$  Å<sup>3</sup>. Nabalamprophyllite is a heterophyllosilicate with a HOH structure. The O layer consists of  $\text{Na}_3\text{Ti}(\text{OH})_2$  whereas the H layer contains both  $\text{TiO}_5$  polyhedra and two distinct  $\text{Si}_2\text{O}_7$  diorthosilicate groups (lamprophyllite and barytolamprophyllite contain only one type of  $\text{Si}_2\text{O}_7$  group). The interlayer contains 11-coordinated Ba and Na. Nabalamprophyllite is the Sr-free member of the lamprophyllite group.

Nabalamprophyllite has been found at two localities—a peralkaline pegmatite in the Inagli alkaline-ultrabasic massif, south Yukutsk (Russia) and in Ca-enriched, zeolitized peralkaline pegmatites of the Kovdor alkaline-ultrabasic massif, Kola Peninsula (Russia). At

Inagli (holotype location), the mineral is found in leached cavities and confined to fractures that circle the massif. It is associated with aegirine, albite, ancylite, batisite, diopside, eckermannite, innelite, leucosphenite, lorenzenite, natrolite, neptunite, and strontium apatite. At Kovdor, nabalamprophyllite was found in two pegmatites that differ in their feldspathoid content—cancrinite and nepheline. It is associated with apatite, cancrinite, eudialyte-group minerals, lorenzenite, lueshite, nepheline, pectolite, pyrrhotite, thomsonite-Ca, titanite, and pyroxenes (diopside, hedenbergite, aegirine). In the cancrinite-bearing pegmatite, nabalamprophyllite forms aggregates with pectolite and cancrinite, often intergrown with lorenzenite. In the nepheline-bearing pegmatite, nabalamprophyllite forms radial aggregates of lamellar crystals with lorenzenite, titanite and eudialyte-group minerals. The name is given for its composition and relation to other lamprophyllite-group minerals. The holotype specimen has been deposited in the Geological Museum of the Institute of Geology and Geophysics, Russian Academy of Science, Novosibirsk, Russia (catalogue no. XIII-274/1) and the cotype material has been deposited at the A.E. Fersman Mineralogical Museum, Russian Academy of Science, Moscow, Russia (catalogue nos. 90837 and 90843). **P.C.P./T.S.E.**

**PELLOUXITE\***

P. Orlandi, Y. Moëlo, A. Meerschaut, P. Palvadeau, P. Leone (2004) Lead-antimony sulfosalts from Tuscany (Italy). VI. Pellouxite,  $\sim(\text{Cu},\text{Ag})_2\text{Pb}_{21}\text{Sb}_{23}\text{S}_{55}\text{ClO}$ , a new oxy-chloro-sulfosalts from Buca della Vena mine, Apuan Alps. *Eur. J. Mineral.*, 16, 839–844.

P. Palvadeau, A. Meerschaut, P. Orlandi, Y. Moëlo (2004) Lead-antimony sulfosalts from Tuscany (Italy). VII. Crystal structure of pellouxite,  $\sim(\text{Cu},\text{Ag})_2\text{Pb}_{21}\text{Sb}_{23}\text{S}_{55}\text{ClO}$ , an expanded monoclinic derivative of  $\text{Ba}_{12}\text{Bi}_{24}\text{S}_{48}$  hexagonal sub-type (zinkenite group). *Eur. J. Mineral.*, 16, 845–855.

Pellouxite occurs as black, acicular crystals elongated along [010] and flattened on (001). The crystals are up to 1 mm long and less than 0.05 mm wide with lozenge-shaped sections. Pellouxite is brittle with flexible fibers, has a good cleavage parallel to the elongation corresponding to {20 $\bar{1}$ }. It is opaque, with a black metallic luster and a brown streak; the hardness could not be determined owing to the small size of the crystals. Electron microprobe analyses of pellouxite (15 analyses) gave Pb 47.17, Sb 31.16, Cu 0.89, Ag 0.59, S 19.08, Cl 0.33, O 0.39, sum 99.60 wt%, corresponding to  $(\text{Cu}_{0.64}\text{Ag}_{0.25})_{20.89}\text{Pb}_{10.36}\text{Sb}_{11.64}\text{S}_{27.07}\text{Cl}_{0.42}\text{O}_{1.11}$  based on 22 Pb + Sb atoms. The ideal crystal chemical formula, taking into account a 2b superstructure, is  $(\text{Cu},\text{Ag})_{2-x}\text{Pb}_{21-x}\text{Sb}_{23+x}\text{S}_{55}\text{ClO}$  where  $x = 0.12$ . The idealized, stoichiometric general formula can be written as  $(\text{Cu},\text{Ag})_2\text{Pb}_{21}\text{Sb}_{23}\text{S}_{55}\text{ClO}$ . Pellouxite is weakly birefringent in reflected light, weakly birefringent (white to white-grey) and is distinctly anisotropic with crossed polars. The  $R_{\text{air}}$  and  $R_{\text{sil}}$  percentage values for the four standard COM wavelengths are 38.3, 23.8 (470 nm), 37.3, 22.4 (589 nm), and 35.2, 19.6 (650 nm).

The crystal structure of pellouxite was solved and refined using a  $0.3 \times 0.04 \times 0.016$  mm needle-like crystal and a STOE IPDS single  $\phi$  axis diffractometer with a 2D area detector based on Imaging Plate technology,  $R_1 = 0.044$  for 3057 reflections with  $I > 2\sigma(I)$ . Pellouxite is monoclinic,  $C2/m$ , with  $a = 55.824(11)$ ,  $b = 4.0892(8)$ ,  $c = 24.128(5)$  Å,  $\beta = 113.14(3)^\circ$ ,  $V = 5065(2)$  Å<sup>3</sup>,  $Z = 4$ ,  $D_{\text{calc}} = 5.97$  g/cm<sup>3</sup>. The strongest lines on the powder X-ray diffraction pattern

(70 lines,  $\text{CuK}\alpha_1$  radiation) include 4.002(38,406), 3.878(24,206), 3.800(16,510), 3.648(15,313), 3.562(31,804), 3.423(100,16 04), 3.202(22,12 0 3), 3.009(25,808), 2.948(27,1313), 2.781(18,116), 2.265(19,409) and 2.048(20,020). Pellouxite is the second known naturally occurring oxy-chloro-sulfosalt. It is a monoclinic  $\text{SnS}$ -type derivative of hexagonal  $\text{Ba}_{12}\text{Bi}_{24}\text{S}_{48}$  and structurally related to scainite,  $\text{Pb}_{14}\text{Sb}_{30}\text{S}_{54}\text{O}_5$  (topological similarity for about 90% of the atom positions). It belongs to the zinkenite group of cyclically twinned sulfosalt structures.

Pellouxite was discovered in extensional calcite veins cross-cutting the Ba-Fe ore body, as well as within the phyllites and dolomitic limestones at the Buca della Vena mine, Apuan Alps, Tuscany, Italy. Pb-Sb sulfosalts are widely distributed in these associations. The main ore body is hosted within carbonate lenses and contains a fine-grained mixture of barite and Fe oxides (magnetite and hematite) with minor calcite. The formation of pellouxite, as for pillaitite, is the result of complex sulfide deposition by hydrothermal brines, at relatively high temperatures and  $f_{\text{O}_2}/f_{\text{S}_2}$  conditions controlled by the pyrite-hematite-magnetite buffer. The mineral is named for Professor Alberto Pelloux (1868–1947), curator of the mineralogical museum at the University of Genova. No reference is made to where the type material was deposited. **P.C.P.**

#### PEZZOTTAITE\*

B.M. Laurs, W.B. Simmons, G.R. Rossman, E.P. Quinn, S.F. McClure, A. Peretti, T. Armbruster, F.C. Hawthorne, A.U. Falster, D. Günther, M.A. Cooper, B. Grobéty (2003) Pezzottaite from Ambatovita, Madagascar: A new gem mineral. *Gems & Gemology*, 39, 284–301.

F.C. Hawthorne, M.A. Cooper, W.B. Simmons, A.U. Falster, B.M. Laurs, T. Armbruster, G.R. Rossman, A. Peretti, D. Günther, B. Grobéty (2004) Pezzottaite,  $\text{Cs}(\text{Be}_2\text{Li})\text{Al}_2\text{Si}_6\text{O}_{18}$ , a spectacular new beryl-group mineral from the Sakavalana pegmatite, Fianarantsoa Province, Madagascar. *Mineral. Record*, 35, 369–378.

The mineral forms flat masses and tabular, subhedral to euhedral crystals up to 10 cm in diameter or flat, equant, or elongated crystals a few millimeters across. The pinacoid {001} is generally dominant with prism {100} and pyramid {101} subordinate. It is transparent to translucent, raspberry-red to pink in color, streak colorless to white, vitreous luster, imperfect {001} cleavage, conchoidal to irregular fracture. The mineral has a Mohs hardness of 8, is brittle,  $D_{\text{meas}} = 3.10 \text{ g/cm}^3$  for the sample richest in Cs,  $D_{\text{calc}} = 3.06 \text{ g/cm}^3$  for  $Z = 18$ . Laser ablation ICP-MS analysis of the sample richest in Cs ( $\text{H}_2\text{O}$  by crystal structure refinement) gave:  $\text{SiO}_2$  54.58,  $\text{TiO}_2$  0.01,  $\text{Al}_2\text{O}_3$  16.88,  $\text{FeO}$  0.02,  $\text{MnO}$  0.02,  $\text{CaO}$  0.22,  $\text{Na}_2\text{O}$  0.46,  $\text{K}_2\text{O}$  0.14,  $\text{Rb}_2\text{O}$  0.44,  $\text{Cs}_2\text{O}$  18.23,  $\text{Li}_2\text{O}$  2.12,  $\text{BeO}$  8.14,  $\text{H}_2\text{O}$  0.28, sum 101.54 wt%, corresponding to  $\text{Cs}_{0.83}\text{Rb}_{0.03}\text{Na}_{0.10}\text{K}_{0.02}\text{Ca}_{0.02}(\text{Be}_{2.10}\text{Li}_{0.92})\text{Al}_{2.14}\text{Si}_{5.86}\text{O}_{18}$ , ideally  $\text{Cs}(\text{Be}_2\text{Li})\text{Al}_2\text{Si}_6\text{O}_{18}$  for 18 O atoms (anhydrous basis). Optically uniaxial negative,  $\epsilon = 1.611$ ,  $\omega = 1.620$  for the sample richest in Cs. Dichroism is strong:  $\epsilon$  = orange-red,  $\omega$  = purple-violet. The infrared spectrum includes a broad envelope at  $\sim 3600 \text{ cm}^{-1}$  and a weak band at  $1620 \text{ cm}^{-1}$  indicating water in fluid inclusions; sharp features between  $3500$  and  $3600 \text{ cm}^{-1}$ , indicating water in the channels; the spectrum overall resembles that of beryl although some features are shifted. An X-ray study gave trigonal symmetry,  $R\bar{3}m$ ; powder data gave  $a = 15.946(4)$ ,  $c = 27.803(8) \text{ \AA}$ ,  $V = 6122(2) \text{ \AA}^3$  for the sample richest in Cs. The strongest lines of the powder pattern

(diffractometer,  $\text{CuK}\alpha$  radiation, 37 lines) include 3.271 (100,036), 3.027 (41,246), 3.019 (29,150), 2.871 (52,153), 2.229 (12,12.12), 2.215 (14,270), 1.749 (12,3.6.12), 1.743 (12,390), and 1.636 (14,0.6.12).

Pezzottaite occurs in pockets and vugs in the Sakavalana granitic pegmatite a few kilometers northwest of Ambatovita village, Fianarantsoa province, central Madagascar. It is associated with smoky quartz, K-feldspar (amazonite), plagioclase (cleavelandite), tourmaline-group minerals, spodumene, lithian muscovite and danburite. The new mineral name is for Federico Pezzotta, mineralogist at the Natural History Museum, Milan, Italy, in recognition of his contributions to Madagascar mineralogy. Type material has been deposited in the Smithsonian Institution, Washington, D.C., Canadian Museum of Nature, Ottawa, Canada, and the Natural History Museum of Bern, Switzerland.

**Discussion.** Simmons et al. (2003, *Gems & Gemology*, 39, 50–54) first reported the mineral, but its full description is given only in the two papers used to prepare the abstract; Hawthorne et al. (2004) is considered to be the formal description. The two papers present the same information, but with different emphases. Electron microprobe analyses for samples ranging in  $\text{Cs}_2\text{O}$  from 11 to 16 wt% (0.50–0.74 Cs per 18 O), together with physical and optical properties, are also given, but the analyses differ from one paper to another. **E.S.G.**

#### PUTZITE\*

W.H. Paar, A.C. Roberts, P. Berlepsch, T. Armbruster, D. Topa, G. Zagler (2004) Putzite,  $(\text{Cu}_{4.7}\text{Ag}_{3.3})_{28}\text{GeS}_6$ , a new mineral species from Capillitas, Catamarca, Argentina: Description and crystal structure. *Can. Mineral.*, 42(6), 1757–1769.

Putzite occurs as aggregates of anhedral grains up to  $3 \times 1 \text{ mm}$  in a matrix of chalcocite and bornite. It is opaque, iron-black with a violet tint, has a metallic luster and a black streak. The mineral is brittle with an irregular to subconchoidal fracture with a distinct cleavage observed in thin section (direction unknown). Micro-indentation measurements with a VHN load of 50 g gave a mean value of  $188 \text{ kg/mm}^2$ , corresponding to a Mohs hardness of 3 to 3.5. The mineral is pale rose to pale violet in plane-polarized light, lacks internal reflections and is isotropic. The  $R_{\text{air}}$  and  $R_{\text{oil}}$  percentage values for four standard wavelengths are 28.9, 13.5 (470 nm), 25.8, 11.1 (589 nm), and 25.3, 10.9 (650 nm). Electron microprobe analyses (WDS, average of 6 analyses) gave Cu 32.71, Ag 39.83, Ge 7.62, S 20.59, sum 100.75 wt%, corresponding to  $(\text{Cu}_{4.73}\text{Ag}_{3.40})_{28.13}\text{Ge}_{0.97}\text{S}_{5.91}$  on the basis of a sum of 15 atoms. The ideal formula is  $(\text{Cu}_{4.7}\text{Ag}_{3.3})_8\text{GeS}_6$ .

The structure of putzite was solved and refined using a combination of the precession method and single-crystal X-ray studies with an ENRAF Nonius CAD4 X-ray diffractometer ( $\text{MoK}\alpha$  radiation),  $R_1 = 0.0562$  for 297 observed reflections with  $I > 2\sigma(I)$ . Putzite is cubic,  $F\bar{4}3m$ , with  $a = 10.1250(12)$ ,  $V = 1037.97 \text{ \AA}^3$ ,  $Z = 4$ . The strongest lines on the powder X-ray diffraction pattern (114.6 mm Debye-Scherrer camera,  $\text{CuK}\alpha$  radiation, 14 lines) include 5.896(30,111), 3.074(60,311), 2.943(100,222), 2.343(20,331), 2.083(30,422), 1.962(50,333,511), 1.805(70,440), 1.725(25,531), 1.701(15,600,442), 1.534(15,622). Putzite is a member of the argyroidite group and an Ag-rich variety of the synthetic inorganic compound  $\gamma\text{-Cu}_8\text{GeS}_6$ .

Putzite was discovered in old dumps near the Rosario shaft in the Capillitas mining district, Department of Andalgalá, Catamarca Province, Argentina. The Capillitas diatreme is part of the Farallón Negro Volcanic Complex, consisting of Miocene extrusive rocks of andesitic composition which host porphyry Cu-Au and epithermal vein-type deposits. Putzite occurs in vuggy bornite-chalcoite ore with catamarcaite, hübnite, "Ge-stannoidite," luzonite, sphalerite, tennantite, thalcosite, and wittichenite. Putzite, and other Ge-bearing sulfides, represent an early stage in the crystallization sequence. The source of the Ge is unknown, but is thought to have been derived from enrichment processes during fractional crystallization or due to incorporation of Ge from country rocks containing organic matter (shales and schists enriched in bituminous material). The mineral is named for Hubert Putz (1973-present) who discovered the species and who has made a significant contribution to the mineralogy of Ge in the Capillitas deposit. Type material has been deposited in the mineral collection at the Division of Mineralogy, University of Salzburg, Austria (catalogue no. 14835 and 14837), the Systematic References Series, National Mineral Collection of Canada, Geological Survey of Canada, Ottawa, Canada (catalogue no. NMCC 68096), and at the Laboratory for Chemical and Mineralogical Crystallography, University of Bern, Switzerland. **P.C.P.**

### $(\text{UO}_2)\text{H}(\text{AsO}_3)\cdot\text{H}_2\text{O}$

K. Walenta (2004) New data on uranium mineral D from two localities in the Black Forest. *Der Erzgräber*, 18, 24–29 (in German with English abstract).

The mineral forms fine-grained to earthy crusts consisting of anhedral grains and radiating scaly crystals up to a few micrometers across at Wittichen and crusts of sphaeroliths 0.02 mm in diameter of scaly grains at Müllenbach. The plane of flattening is considered to be (010). Electron microprobe analysis ( $\text{H}_2\text{O}$  by difference) of the Wittichen material gave:  $\text{UO}_3$  69.3,  $\text{FeO}$  2.4,  $\text{As}_2\text{O}_3$  23.8,  $\text{H}_2\text{O}$  4.5, sum 100.00 wt%, corresponding to  $\text{U}_{1.06}\text{As}_{1.05}\text{Fe}_{0.15}\text{H}_{2.19}\text{O}_6$ , ideally  $(\text{UO}_2)\text{H}(\text{AsO}_3)\cdot\text{H}_2\text{O}$  for 6 O atoms. Other analyses gave FeO as low as 0.2 wt%. Rare earth elements and Y, with Y dominant, total scarcely as much as Fe in the formula; minor Na, Ca, Ba and Co are also present, but neither any of these elements nor Fe are considered essential constituents. Soluble in 1:1 HCl and 1:1  $\text{HNO}_3$ . Transparent, color yellow, streak yellow, dull luster, possible (010) cleavage, irregular fracture.  $H \sim 2$ ,  $D_{\text{meas}} > 4.03 \text{ g/cm}^3$ ,  $D_{\text{calc}} = 4.30 \text{ g/cm}^3$  for  $Z = 2$ . Optically biaxial negative,  $\alpha = 1.646(5)$ ,  $\beta = 1.750(1)$ ,  $\gamma = 1.766(5)$ ,  $2V_{\text{calc}} = 41^\circ$ . Pleochroism:  $X$  = nearly colorless,  $Z$  = yellow. An orthorhombic cell  $a = 7.04$ ,  $b = 8.03$ ,  $c = 5.98 \text{ \AA}$ ,  $V = 338.06 \text{ \AA}^3$  was calculated from powder X-ray data assuming the plane of flattening is (010). The strongest lines on the powder pattern (57.3 mm camera,  $\text{FeK}\alpha$  radiation) for the Wittichen material include 8.09 (100,010), 4.82 (50,011), 3.51 (70,200), 2.99 (60,002), 2.81 (5,012), 2.19 (10,212,301), 2.11 (10,311), 1.904 (20,041), 1.757(10,400); the corresponding lines in the Müllenbach material are 7.92, 4.79, 3.52, 2.97, 2.80, 2.20, 2.10 and 1.902 (400 was not reported).

The mineral is found on the dump of the Sophia mine near Wittichen in the central Black Forest, Baden-Württemberg Germany. It occurs with chadwickite, metakahlerite, arsenuranospathite, uranospathite, and erythrine either on altered uraninite or on barite near

uraninite. At the Müllenbach uranium deposit near Baden-Baden, Northern Black Forest, Baden-Württemberg, it occurs on Upper Carboniferous sandstone.

**Discussion.** By the authors' own admission, their proposal for  $(\text{UO}_2)\text{H}(\text{AsO}_3)\cdot\text{H}_2\text{O}$  was voted on by the CNMMN IMA, but failed to get the necessary two-thirds majority for approval. In contrast to chadwickite (Am. Mineral., 84, 1195), attempts to synthesize an analogue were not successful. **E.S.G.**

## NEW DATA

### FENAKSITE (SYNTHETIC)

I.V. Rozhdestvenskaya, I.I. Bannova, I.V. Nikishova, T.V. Sobolyeva (2004) Refinement of the crystal structure of fenaksite. *Dokl. Akad. Nauk*, 398, 524–528 (in Russian).

Deep blue fenaksite,  $\text{K}_2\text{Na}_2\text{Fe}_2\text{Si}_8\text{O}_{20}$ , was produced as a run by-product during the synthesis of colored quartz (260 to 350 °C); the blue color is due to minor Co. Single-crystal X-ray structure refinement ( $R = 0.0275$ ;  $wR = 0.0329$ ) gave triclinic symmetry,  $P\bar{1}$ ,  $a = 8.142(2)$ ,  $b = 9.954(3)$ ,  $c = 6.983(2) \text{ \AA}$ ,  $\alpha = 100.21(2)$ ,  $\beta = 114.13(2)$ ,  $\gamma = 105.87(2)^\circ$ ,  $D_{\text{meas}} = 2.786(4) \text{ g/cm}^3$ ,  $Z = 1$ . The structure is topologically similar to that of agrellite,  $\text{Na}_2\text{Ca}_4\text{Si}_8\text{O}_{20}\text{F}_2$ , with infinite  $[\text{Si}_8\text{O}_{20}]^{8-}$  silicate tubes of corner-linked tetrahedra parallel to  $c$  within (010) layers. These layers alternate with layers consisting of dual columns of edge-sharing  $\text{NaO}_7$  and  $\text{FeO}_3$  polyhedra. Unlike agrellite, the dual columns are not interconnected to form continuous layers. **T.S.E.**

### KOCHELITE

J. Janeczek, (2004) Re-examination of kochelite: A mixture of metamict fergusonite-(Y) and altered zircon. *N. Jahrb. Mineral. Monatsh.*, 5, 193–207.

Kochelite was originally described in 1868 as a crust or octahedral crystals on fergusonite and ilmenite from a pegmatite in the Karkonosze granite, Kochelwiesen, southwest Poland, and is generally thought to be altered metamict fergusonite. A sample labeled by the original author as kochelite from the type locality was re-investigated using optical microscopy, back-scattered electron imaging and electron microprobe analyses. A crystal marked by the original author as kochelite was shown to be altered zircon having a habit dominated by {110} prisms and {101} dipyrramids and overgrowing metamict fergusonite-(Y). Given the presence of albite and Fe hydroxides in the sample, the material handpicked for the original chemical analysis most likely was a mixture of zircon, fergusonite-(Y), albite and Fe hydroxide.

**Discussion.** Since kochelite has never been considered a valid species, formal discreditation was unnecessary. **E.S.G.**

## ERRATA

In the abstract for the Fe-dominant analog of konderite (Am. Mineral. 90, p. 274, 2005), in the term  $(\text{Rh}_6.08\text{Ir}_1.00\text{Pb}_0.55\text{Co}_0.13\text{Pt}_0.01)$ , the Pb should read Pd. On the same page, O11 needs to be added to the formula for the Cs-dominant analog of polyolithionite.

In Am. Mineral. (90, p. 768) the mineral name should be bario-oligite.