

New Mineral Names*

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IN THIS ISSUE

In this issue, there are barioferrite, depmeierite, and oxyphlogopite, three new minerals from *Zapiski Rossiiskogo Mineralogicheskogo Obshchestva*, and klajite from the *European Journal of Mineralogy*. In addition, we list all of the new minerals from *American Mineralogist* in 2011 as a deposit¹ item.

BARIOFERRITE*

M.N. Murashko, N.V. Chukanov, A.A. Mukhanova, E. Vapnik, S.N. Britvin, S.V. Krivovichev, Yu.S. Polekhovsky, and Yu.D. Ivakin (2010) Barioferrite BaFe₁₂O₁₉, a new magnetoplumbite-group mineral from Hatrurim Formation, Israel. *Zap. Ross. Mineral. Obshch.*, 139(3), 22–30 (in Russian, English abstract). *Geol. Ore Deposits*, 53(7), 558 (2011; in English).

Barioferrite BaFe₁₂O₁₉ is a new practically pure BaFe end-member of magnetoplumbite group and is a natural analogue of synthetic barium ferrite. It has been discovered in a single specimen in only one of the numerous metamorphosed barite nodules found on the southern slope of Har Ye'elim Mountain, Israel (31°14'49" N 33°16'59" E) in a metamorphic rocks of the Hatrurim formation ("Mottled Zone"). By mineral composition the rocks of this formation belong to spurrite-merwinite and pyroxene-hornfels facies, while the origin of metamorphism remains discussable. Barioferrite-bearing barite concretion differs from other nodules by presence in its center calcite segregation surrounded by dark barite zone enriched with magnetite, maggemitte, and barioferrite. Barioferrite forms random and parallel aggregates of tiny platy (pinakoidal) black submetallic crystals up to 3 × 15 × 15 μm. The streak is brown. No data for hardness is given. Barioferrite is strongly ferrimagnetic, brittle with no cleavage observed. D_{calc} 5.31 g/cm³. Infrared absorption bands (cm⁻¹) are observed at 635 (shoulder), 582, 544, 433, 405 (shoulder). In reflected light barioferrite is grayish-white with brownish-red internal reflections; pleochroism is weak (from gray-white on R_{O} to gray-white with brown tint on R_{E}), bireflectance is weak, with distinct anisotropism. Reflectance data were obtained using MSF-10 micro-spectrophotometer in air [R_{O} /

R_{E} % (nm)]: 25.08/23.31 (400), 24.77/23.00 (420), 24.59/22.95 (440), 24.54/22.82 (460), **24.51/22.80 (470)**, 24.48/22.77 (480), 24.54/22.77 (500), 24.46/22.68 (520), 24.26/22.38 (540), **24.17/22.25 (546)**, 23.97/22.03 (560), 23.79/21.79 (580), **23.65/21.68 (589)**, 23.49/21.55 (600), 23.19/21.29 (620), 22.84/21.00 (640), **22.67/20.85 (650)**, 22.49/20.70 (660), 22.20/20.33 (680), 21.87/19.90 (700). The chemical composition of barioferrite was determined by EDS on a Tescan Vega IIXMU scanning electron microscope. The average (range) of 4 analyses gave BaO 13.13 (12.5–13.8), Fe₂O₃ 86.47 (85.5–87.5), sum 99.60 wt%. Other elements (F or heavier) were not detected by EMPA. The valence of iron was determined based on charge balance and by the X-ray emission spectroscopy data. Empirical formula based on 19 O: Ba_{0.95}Fe_{12.05}O₁₉. Powder X-ray diffraction data were obtained using a Stoe IPDS II powder diffractometer (filtered MoK α radiation). The strongest diffraction lines [d_{obs} in Å (I_{obs} , hkl)] include 3.85 (23, 006), 2.938 (46, 110), 2.770 (100, 107), 2.624 (94, 114, 200), 2.420 (44, 203), 2.225 (40, 205), 2.120 (25, 206), 1.665 (25, 217), 1.627 (56, 304, 2.0.11), with refined unit-cell parameters of $a = 5.875(3)$, $c = 23.137(19)$ Å, $V = 691.6(5)$ Å³, $Z = 2$. Barioferrite is hexagonal, space group $P6_3/mmc$ (by analogy with synthetic barium ferrite). The name is for composition and relationship to its synthetic analogue. Both the mineral and name have been approved by the IMA CNMNC (IMA 2009-030). The holotype specimen of barioferrite is deposited at the Mineralogical Museum of Saint Petersburg State University, catalogue number 1/19436. **D.B.**

DEPMEIERITE*

I.V. Pekov, L.V. Olysysh, N.V. Chukanov, K.V. Van, and D.Yu. Pushcharovsky (2010) Depmeierite Na₈[Al₆Si₆O₂₄](PO₄,CO₃)_{1-x}·3H₂O ($x < 0.5$)—a new cancrinite group mineral from the Lovozero alkaline massif (Kola Peninsula, Russia). *Zap. Ross. Mineral. Obshch.*, 139(4), 63–74 (in Russian, English abstract). *Geol. Ore Deposits*, 53(7), 604 (2011; in English).

Depmeierite a new member of cancrinite group from underground mine at Karnasurt Mt., Lovozero alkaline massif, Kola Peninsula, Russia. It has been discovered as a main mineral along with natrolite in peralkaline hydrothermal veinlet up to 1.5 cm thick cross-cutting alternating foyaite, urtite, and lujavrite rocks. Others associated minerals [steenstrupine-(Ce), partial

*All minerals marked with an asterisk have been approved by the IMA CNMNC.

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¹ Deposit item AM-12-089, Appendix List of American Mineralogist 2011 New Mineral Names. Deposit items are available two ways: For a paper copy contact the Business Office of the Mineralogical Society of America (see inside front cover of recent issue) for price information. For an electronic copy visit the MSA web site at <http://www.minsocam.org>, go to the *American Mineralogist* Contents, find the table of contents for the specific volume/issue wanted, and then click on the deposit link there.

pseudomorphs of epistolite after vuonnemite, sodalite, and minor aegirine, serandite, natasite, and vitusite-(Ce)] are mostly concentrated near the veinlet contacts. Depmeierite forms aggregates of anhedral isometric colorless vitreous grains up to 1 cm. The bigger grains have a light bluish tint. It is hardly recognizable from surrounding natrolite by the angle of the cleavage plains. Cleavage is perfect on {100}. Mohs hardness 5, brittle. The mineral has a white streak and is not fluorescent under UV-light nor under electron beam. In transmitted light it is colorless, non-pleochroic, uniaxial positive (+), $\epsilon = 1.493(2)$, $\omega = 1.497(2)$. $D_{\text{meas}} = 2.32(1)$, $D_{\text{calc}} = 2.313$ g/cm. Infrared absorption bands (cm^{-1} , strongest lines italic) are: 3595, 3525, 3350 (shoulder), 1637, 1478, 1392, 1104, 1030 (shoulder), 990, 758, 683, 624, 567, 501, 458, 428. The chemical composition of depmeierite was determined by EDS on a CamScan MV2300 electron microprobe. The average (range) of 10 analyses gave Na_2O 23.04 (22.1–23.8), K_2O 0.54 (0.3–0.7), Fe_2O_3 0.03 (0.00–0.1), Al_2O_3 29.07 (27.9–30.1), SiO_2 36.48 (35.1–37.5), P_2O_5 3.30 (2.9–4.0), SO_3 0.08 (0.00–0.2). The volatiles determination by gas selective sorption methods gave CO_2 0.97, H_2O 5.93; sum 99.44 wt%. The empirical formula based on $(\text{Si,Al})_{12}\text{O}_{24}$: $(\text{Na}_{7.58}\text{K}_{0.12})_{\Sigma 7.70}(\text{Si}_{6.19}\text{Al}_{5.81}\text{O}_{24})[(\text{PO}_4)_{0.47}(\text{CO}_3)_{0.22}(\text{OH})_{0.02}(\text{SO}_4)_{0.01}]_{\Sigma 0.72} \cdot 3.35\text{H}_2\text{O}$. The ratio $\text{OH}/\text{H}_2\text{O}$ calculated by charge balance. The simplified chemical formula $\text{Na}_8[\text{Al}_6\text{Si}_6\text{O}_{24}](\text{PO}_4, \text{CO}_3)_{1-x} \cdot 3\text{H}_2\text{O}$ ($x < 0.5$). The hypothetical end member chemical formula can be represented as: $\text{Na}_8[\text{Al}_6\text{Si}_6\text{O}_{24}](\text{PO}_4)_{2/3} \cdot 3\text{H}_2\text{O}$. Powder X-ray diffraction data were obtained using a STOE STADI MP powder diffractometer (filtered $\text{CuK}\alpha_1$ radiation). The strongest lines on the diffraction pattern [d_{obs} in Å (I_{obs} , hkl)] include 6.380 (30, 110); 4.695 (91, 101); 4.167 (19, 210); 3.681 (37, 300); 3.250 (100, 211); 2.758 (33, 400), 2.596 (31, 002), 2.436 (21, 401); 2.121 (24, 330, 302), with refined unit-cell parameters of $a = 12.744(3)$, $c = 5.187(1)$ Å, $V = 729.4(6)$ Å³, $Z = 1$. Single-crystal X-ray structure data were collected using Xcalibur S diffractometer with a CCD detector (MoK α radiation). A total of 26 028 reflections were observed, with 2059 unique reflections. The structure was refined in space group $P6_3$ to $R_1 = 0.0362$, $wR_2 = 0.0953$ for 1683 observed reflections with $F_o > 4\sigma(F_o)$, GoF = 1.007. Depmeierite differs from cancrinite by the content of wide channels containing Na, H₂O, and anion groups $(\text{PO}_4)^{3-}$, $(\text{CO}_3)^{2-}$. It is the first mineral of cancrinite group with a prevalence of extra framework anion $(\text{PO}_4)^{3-}$. The simplified structural formula of depmeierite: $[\text{Al}_6\text{Si}_6\text{O}_{24}][\text{Na}_2(\text{H}_2\text{O})_2][\text{Na}_6(\text{PO}_4)_{2/3}(\text{H}_2\text{O})]$. The contents of the framework, which are narrow, and wide channels, are given in square brackets consequently.

The cancrinite sensu stricto subgroup is defined within the cancrinite group. It includes six minerals with the simple two layered AB framework, the smallest unit cell ($a \sim 12.55$ – 12.75 , $c \sim 5.1$ – 5.4 Å) and the chains $[\cdot\text{Na}\cdot\text{H}_2\text{O}\cdot]^n$ in narrow channels: cancrinite, vishnevite, cancrisilite, hydroxycancrinite, kyanoxalite, and depmeierite. The conditions of formation phosphorus-bearing varieties of cancrinite group minerals and non-carbonate members of the group in the derivatives of the alkaline intrusions are discussed.

Both the mineral and its name have been approved by the IMA CNMNC (IMA 2009-075). The mineral is named in honor of the professor mineralogy and crystallography at Christian Albrecht University of Kiel, Wulf Helmut Heinz Depmeier (b.

1944). The holotype specimen has been deposited at the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow (registration no. 3882/1). **D.B.**

KLAJITE*

Szakáll, S., Fehér, B., Bigi, S., and Máday, F. (2011) Klajite from Recsk (Hungary), the first Mn-Cu arsenate mineral. *Eur. J. Mineral.*, 23, 829–835.

Klajite (IMA no. 2010-004) was found in ore samples from the Lahóca Hill, Recsk, Mátra Mountains (northern Hungary). It belongs to the Lahóca epithermal high-sulphidation Cu-Au-As ore deposit, a classical occurrence of enargite.

Single-crystal X-ray analysis was not possible by lack of klajite crystals with appropriate quality, because of multiple intergrowths. A powder X-ray diffraction pattern was obtained using Ni-filtered $\text{CuK}\alpha$ radiation and a 114.6 mm Gandolfi camera. The strongest seven lines in the X-ray powder diffraction pattern are [d_{obs} in Å (I_{obs} , hkl)] 10.39 (100, 001), 2.916 (64, 202), 2.708 (29, $\bar{1}13$), 3.616 (28, $0\bar{2}1$), 3.050 (28, 022 and 211), 3.956 (27, 020) and 3.110 (24, 122). According to X-ray powder diffraction, klajite is structurally analogous to lindackerite-group minerals; it is triclinic, space group $P\bar{1}$, $a = 6.441(3)$, $b = 7.983(4)$, $c = 10.562(3)$ Å, $\alpha = 85.28(4)^\circ$, $\beta = 80.63(5)^\circ$, $\gamma = 84.80(4)^\circ$, $V = 532.4(3)$ Å³, and $Z = 1$.

The chemical composition obtained after correction of electron-microprobe analysis is: MnO 5.67, CuO 32.03, CaO 0.41, As₂O₅ 44.40, H₂O (calc) 17.49, total 100.00 wt%. The empirical formula is $(\text{Mn}_{0.82}\text{Cu}_{0.10}\text{Ca}_{0.08})_{\Sigma=1.00}\text{Cu}_{4.05}\text{As}_{3.98}\text{O}_{14}(\text{OH})_2 \cdot 9\text{H}_2\text{O}$, and the simplified formula is $\text{MnCu}_4(\text{AsO}_4)_2(\text{AsO}_3\text{OH})_2 \cdot 9\text{H}_2\text{O}$. The members of the lindackerite group are hydrous arsenate minerals with the general formula $M\text{Cu}_4(\text{AsO}_4)_2(\text{AsO}_3\text{OH})_2 \cdot 9$ – $10\text{H}_2\text{O}$, where $M = \text{Cu, Co, Zn, and now Mn}$.

Klajite forms irregular or sheaf-like aggregates up to 0.5 mm in diameter, which is made up of lath-like to thin tabular crystals, typically 0.05–0.2 mm in length. Twinning was not observed. The mineral is greenish yellow to yellowish green, translucent, with white streak and vitreous luster. Its Mohs hardness is about 2–3. Density could not be measured directly due to the very limited amount of material available as well as the fact that the mineral decomposes in heavy liquids. The calculated density is 3.213 g/cm³ for the empirical formula. Klajite has a perfect cleavage parallel to {010}, and is very brittle. Its fracture is uneven. The mineral is not fluorescent under either long- or short-wave ultraviolet light and it is insoluble in water. Optically klajite is biaxial with $\alpha = 1.595(30)$, $\beta = \text{n.d.}$, and $\gamma = 1.665(20)$. It is weakly pleochroic, from colorless to pale green. Optical sign, optical orientation, and pleochroic scheme are not given.

Type materials are deposited in the collections of the Herman Ottó Museum, Miskolc (holotype, catalogue number 2010.1) and of the Hungarian Natural History Museum, Budapest (cotype, specimen number Gyn./1842). **K.T.T.**

OXYPHLOGOPITE*

N.V. Chukanov, A.A. Mukhanova, R.K. Rastsvetaeva, D.I. Belakovskiy, S. Möckel, O.V. Karimova, S.N. Britvin, and S.V. Krivovichev (2010) Oxyphlogopite $\text{K}(\text{Mg, Ti, Fe})_3[(\text{Si, Al})_4\text{O}_{10}](\text{O, F})_2$, a new mica group mineral. *Zap. Ross. Mineral. Ob-*

shch., 139(3), 31–40 (in Russian, English abstract). Geol. Ore Deposits, 53(7), 583 (2011; in English).

Oxyphlogopite is a new mica-group mineral found at Rothenberg basalt quarry in Eifel extrusive complex, Rothenberg Mountain near Mendig, Rhineland-Palatinate, Germany. It forms coarse dark brown to black vitreous prismatic (up to 1.5 mm) or platy (up to $4 \times 4 \times 0.2$ mm) crystals in cavities (gas bubbles) of alkaline basalt. Associated minerals in cavities are nepheline, plagioclase, sanidine, augite, diopside, and magnetite. Oxyphlogopite has brown streak, perfect cleavage on {001}, Mohs hardness 3. Thin laminae flexible but more brittle than those of phlogopite or annite. $D_{\text{meas}} = 3.06(1)$ g/cm³, $D_{\text{calc}} = 3.086$ g/cm³. The mineral is biaxial negative (–), $\alpha = 1.625(3)$, $\beta = 1.668(1)$, $\gamma = 1.669(1)^\circ$; $2V_{\text{meas}} = 16(2)^\circ$, $2V_{\text{calc}} = 17^\circ$. $X \perp (001)$. Dispersion is strong, $r < v$. Pleochroism is medium, $X > Y > Z$ (brown to dark brown). IR spectrum does not contain bands of OH groups. The chemical composition of oxyphlogopite was determined by EDS on a Tescan Vega IIXMU scanning electron microscope. H₂O was determined by the Alimarin method, Fe²⁺/Fe³⁺ ratio by the X-ray emission spectroscopy data. The average (range) of five analyses gave Na₂O 0.99 (0.89–1.12), K₂O 7.52 (7.44–7.58), MgO 14.65 (14.48–14.80), CaO 0.27 (0.17–0.51); FeO 4.73, Fe₂O₃ 7.25 (for total iron measured as FeO the range is 11.09–11.38), Al₂O₃ 14.32 (14.06–14.64), Cr₂O₃ 0.60 (0.45–0.69); SiO₂ 34.41 (34.03–34.66), TiO₂ 12.93 (12.69–13.13), F 3.06 (2.59–3.44). H₂O 0.14, –O=F₂ 1.29, sum 99.58 wt%. The empirical formula based on (O+F) = 12: $(\text{K}_{0.72}\text{Na}_{0.14}\text{Ca}_{0.02})_{\Sigma 0.88}(\text{Mg}_{1.64}\text{Ti}_{0.73}\text{Fe}_{0.30}^{2+}\text{Fe}_{0.27}^{3+}\text{Cr}_{0.04})_{\Sigma 2.98}$

$(\text{Si}_{2.59}\text{Al}_{1.27}\text{Fe}_{0.14}^{3+}\text{O}_{10})\text{O}_{1.20}\text{F}_{0.73}(\text{OH})_{0.07}$. For cotype specimen Na₂O 1.42, K₂O 8.26, MgO 16.64, CaO 0.17, FeO 10.54, Al₂O₃ 13.66, SiO₂ 36.38, TiO₂ 11.14, F 2.86, –O=F₂ –1.20, total 99.87 wt%. Fe²⁺/Fe³⁺ = 1/4. The empirical formula: $(\text{K}_{0.78}\text{Na}_{0.20}\text{Ca}_{0.01})_{\Sigma 0.99}(\text{Mg}_{1.83}\text{Ti}_{0.62}\text{Fe}_{0.30}^{2+}\text{Fe}_{0.14}^{3+})_{\Sigma 3.00}(\text{Si}_{2.68}\text{Al}_{1.19}\text{Fe}_{0.13}^{3+}\text{O}_{10})\text{O}_{1.34}\text{F}_{0.66}$. The idealized chemical formula is $\text{K}(\text{Mg}_2\text{Ti})(\text{Si}_3\text{AlO}_{10})\text{O}_2$.

Powder X-ray diffraction data for oxyphlogopite were obtained using a Rigaku D/MAX-2200 diffractometer (filtered CuK α_1 radiation). The strongest lines of the X-ray powder diffraction pattern [d , Å (I , %, hkl)] for holotype specimen are: 9.91 (32, 001), 4.53 (11, 110), 3.300 (100, 003), 3.090 (12, 112), 1.895 (21, 005), 1.659 (12, $\bar{1}35$), 1.527 (16, $\bar{2}06$, 060) with refined unit-cell parameters of $a = 5.317(12)$, $b = 9.161(2)$, $c = 10.069(2)$ Å, $\beta = 100.53(6)^\circ$, $V = 484.1(2)$ Å³, $Z = 2$. Single-crystal X-ray structure data were collected using Xcalibur CCD diffractometer with a detector (MoK α radiation). A total of were obtained. The structure was refined to $R1 = 0.047$ based on 1642 unique reflections with $F > 5\sigma(F)$. Oxyphlogopite is monoclinic, space group $C2/m$. Crystal structure refinement resulting to crystallochemical formula: $(\text{K}_{0.7}\text{Na}_{0.3})_{\Sigma=1}(\text{Mg}_{0.6}\text{Fe}_{0.4})_{\Sigma=1}(\text{Mg}_{1.0}\text{Ti}_{0.74}\text{Fe}_{0.22}\text{Cr}_{0.04})_{\Sigma=2}[(\text{Si}_{2.6}\text{Al}_{1.3}\text{Fe}_{0.1})_{\Sigma=4}\text{O}_{10}](\text{O},\text{F})_2$. The presence of Ti in M2 octahedron leads to its strong distortion. Both the mineral and name have been approved by the IMA CNMNC (IMA 2009-069). The name is given for the mineral composition. Type specimens of oxyphlogopite are deposited at the Fersman Mineralogical Museum of the Russian Academy of Sciences, Moscow, Russia; registration numbers 3884/2 (holotype) and 3884/1 (cotype). **D.B.**

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