NEW MINERAL NAMES

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Natrophosphate

Yu. L. Kapustin, A. V. Bykova, and V. I. Bukin (1972)

Analyses by Bykova gave Na₂O 28.40, 28.35, 29.15; K₂O 0.32, 0.32; P₂O₅ 22.10, 21.86, 21.42; F 0.42, 2.79, 2.60; H₂O 49.20, 48.45, 48.10, -(O = F₂) 0.17, 1.18, 1.07, sum 100.27, 100.27, 100.20%, corresponding to: Na₆H(PO₄)(F, OH)·17H₂O. Spectrographic analysis showed traces of Mn, Ba, Fe, Ca, and Sr. The mineral is readily synthesized by crystallization from solutions containing sodium metaphosphate, NaF, and Sr. The mineral is readily synthesized by crystallization from solutions containing sodium metaphosphate, NaF, and Sr. The mineral is readily synthesized by crystallization from solutions containing sodium metaphosphate, NaF, and Sr. The mineral is readily synthesized by crystallization from solutions containing sodium metaphosphate, NaF, and Sr.

Oscillation and Laue photographs show the mineral to be cubic, space group *Fd*₃c, a 27.79 ± 0.05 Å. The strongest lines (52 given, Cr radiation) are 8.12 (8) [222], 4.94 (6) [440], 4.03 (6) [444], 3.07 (6) [290] (6) [031], 2.68 (10) [951], 666, 10.2, 2.43 (9) [971], 3.30, calc 1.27. The strongest lines (74 given) are 8.09 (8) [1010], 5.76 (11) [1011], 3.65 (7) [1012], 2.01 (2021), 3.08 (8) [1122], 2.86 (7) [2022], 2.131, 2.68 (7) [3030], 2.03 (6) [2113], 2.24, 1.03 (6), 0.985 (8).

Color yellow, streak pale yellow, does not fluoresce in U.V. light. No distinct cleavage, fracture conchoidal, brittle, H. 2-2½. Optically uniaxial to slightly biaxial, negative, n₁ 1.601, e 1.480 (both ±0.002), pleochroic O yellow, E nearly colorless.

The mineral occurs as crusts of fine-grained aggregates, mostly of anhedral grains, in the cable tunnel between Gerstenegg and Sommerloch, Grimsel area, Aar massif, Oberhasli, Canton, Bern, Switzerland, associated with Schroengingerite, monohydrocalcite, and two new unnamed carbonates, where granodiorite, and aplite granite are cut by fissure veins and mineralized zones.

The name is for the locality. The mineral and name were approved before publication by the Commission on New Minerals and Mineral Names, IMA. Type material is preserved at the University of Stuttgart, Germany.

One unnamed new carbonate contains K, Ca and Mg. Decomposed by H₂O, dissolved by HCl. Color pale rose. It occurs in aggregates of acicular crystals, apparently orthorhombic. Optically biaxial, neg., 2V about 25°, α 1.426, γ 1.508 (both ±0.002), X parallel to elongation. The strongest X-ray lines (18 given) are 6.11 (9), 3.20 (10), 2.90 (8), 2.37 (5), 2.31 (5), 1.917 (5).

The second new carbonate contains K and Mg and less Ca. It occurs in small colorless grains. Decomposed by water, dissolved by HCl. Optically biaxial, pos., 2V about 64°, n₁ 1.462, γ 1.531 (both ±0.002). Probably orthorhombic. The strongest X-ray lines (26 given) are 6.33 (6), 3.12 (8), 2.98 (10), 2.56 (7), 2.47 (8), 2.06 (7).

Discussion. The last compound is very similar in its optics to K₂Mg(CO₃)₂·4H₂O, orth., α 1.465, β 1.485, γ 1.535, 2V + 65° (quoted by Winchell and Winchell, 1964).

Ilmajokite


Analysis by LFG on 1.6 g gave SiO₂ 35.55, TiO₂ 16.95, ZrO₂ 0.03, Nb₂O₅ 0.02, Ta₂O₅ 0.01, Al₂O₃ 0.28, Fe₂O₃ 0.07,
CaO 0.04, SrO 0.02, BaO 2.65, RE (= REO2?) 4.93, Na2O 12.40, K2O 0.40, H2O 7.76, H2O* 16.78, CO2 1.46, SiO2, P, F absent, sum 99.36%. The rare earths were determined (2TR2O3 = 100%) as La2O3 26.8, Ce2O3 51.2, Pr2O3 3.6, Nd2O3 17.8, Sm2O3 0.6%. The formula is given as:

\[(\text{Na}_8,\text{RE}_6,\text{Ba}_4,\text{O}_7)\text{Ti}_{15} \text{(Si}_{12} \text{Al}_{10})_2 \text{O}_{45} \text{(OH)}_{14} \cdot n\text{H}_2\text{O}.\]

or considering the C to be present as naoncolite, as

\[(\text{Na}_8,\text{Ba}_4,\text{RE}_6,\text{O}_7)\text{Ti}_{15} \text{(Si}_{12} \text{Al}_{10})_2 \text{O}_{45} \text{(OH)}_{14} \cdot n\text{H}_2\text{O}.\]

Infra-red study showed the presence of both OH groups and molecular water.

Before the blowpipe ilmajokite sinters to a white porcelain-like enamel, coloring the flame yellow, then melts to a white vesicular enamel. Loss of water begins at 60°. An endothermic peak on the DTA curve at 175° corresponds to a loss of weight of 12.7%. At 320°, 6.5% of H2O is retained; loss of H2O concludes at 760°. Melting occurs at 800°. An exothermic break occurs at 865°. The mineral is decomposed by water at 20°, giving amorphous silica, and by acids giving slight effervescence and amorphous silica gel.

The X-ray pattern was weak. The strongest lines (48 given) were: 11.5 (10), 10.9 (7), 10.2 (9), 4.3 (10), 3.7 (7), 3.1 (9), 2.48 (7), 2.44 (10). Monoclinic (?), a ~ 23, b ~ 24.4, c ~ 37Å.

Color bright yellow, luster vitreous. Perfect cleavages on the rhombic prism and pinacoid intersect at 72°. H. = 1, brittle. G. 2.20 ± 0.02. Optically biaxial, positive, \( n_r = 1.573, n_i = 1.576, \gamma = 1.579, 2V = 90° \).

The mineral forms granular deposits, crusts, and brushes of crystals up to 2 mm long on the walls of cavities in the central natrolic zone of pegmatites in the Lovozero Tundra, Kola Peninsula, near the valley of the Ilmajok River. Associated minerals are pale sphalerite, halite, and byrkit. The X-ray study shows it to be triclinic, with supercell \( P1 \) (subcell), structure along \( b \) and \( c \) axes, \( a = 11.6 ± 0.05 \), \( b = 6.65 \times 2 ± 0.05 \), \( c = 2 \times 13.1 ± 0.1Å, \alpha = 94.3°, \beta = 95.0°, \gamma = 93.6° \). The subcell contains \( Y_5\text{MgSi}_5\text{O}_{12}\)(OH)₆. The strongest X-ray lines (private communication from A. Kato) (indexed on subcell) are 3.11(40) (020), 3.02 (65)(312, 013), 2.96 (100)(220), 204, 122, 2.88 (45) (004), 2.78 (50)(220), 214, 2.715 (50)(204), 222, 122, 402.

Color light purplish gray, luster vitreous, streak white. H. 5½–6. G. 4.21 (meas), 4.22 (calc) Cleavage \( \{011\} \) distinct. In section colorless, optically biaxial, negative, \( n_r = 1.786, n_i = 1.827 \) (all ± 0.050), \( 2V° = 15° \).

The mineral occurs as masses up to 3 × 3 × 2 cm in size in quartz-microcline pegmatite at Fusamata, Kawama-machi, Fukushima Pref., Japan, associated with biotite, monazite, ferrousionite, uranite, and an undetermined mineral. Also known from the nearby Suishoyama (formerly Isaka) pegmatite as an alteration product of thalencite. The name is for Dr. Satoyasu Iimori and the late Dr. Takeo Iimori, who described many rare-earth minerals from the pegmatites in this area.

Type material is preserved at the National Science Museum, Tokyo, and the U.S. National Museum, Washington. The mineral and name were approved in advance of publication by the Commission on New Minerals and Mineral Names, IMA.

Ilmorite


Analysis by K. N. of about 1 g of hand-picked, purified material gave SiO2 19.09, P2O5 0.91, \( \Sigma \text{SiO}_2 \) 64.99, \( \Sigma \text{CaO} \) 0.83, CaO 0.09, ThO2 0.11, UO2 0.88, CoO 0.85, (Zr, Hf)O2 1.43, MgO 0.71, Fe2O3 1.33, Al2O3 1.31, H2O* 5.85, Na2O 0.87, sum 99.25%. This corresponds to

\[(\text{Si}_{8.13} \text{Al}_{0.87} \text{O}_{23.41} \text{O}_6)\text{O}_{12} \text{Si}_{13} \text{O}_{23} (\text{OH})_{6} \cdot 4\text{H}_2\text{O}, \]

or

\[(\text{Y}_{3.16} \text{Ca}_{0.84} \text{O}_{23} \text{O}_{23} (\text{OH})_{6} \cdot 4\text{H}_2\text{O}, \]

or

\[(\text{Fe}_{6} (\text{Zr}, \text{Y})_2 \text{Si}_2 \text{O}_7) \]

The X-ray pattern is indexed on a hexagonal cell with \( a = 11.69 ± 0.05 \), \( c = 22.25 ± 0.10Å, Z = 3, G. \) calc 4.7 ± 0.01. The strongest X-ray lines (27 given) are 4.04 (5) (114), 3.23 (10) (302), 2.155 (6) (412), 3.08, 1.781 (7) (328).

The mineral is nearly opaque; thin crystals in strong transmitted light are deep fox-red with \( R = 12.9 ± 0.2% \) at 546 nm, so that \( n \) must be 2.11–2.13. Isotropic to
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weakly anisotropic, non-pleochroic; one observer stated it to be biaxial 2V. 40°.

The mineral occurs as thin laths from a few microns to approx. 65 x 15 microns in basaltic rocks as product of late stage crystallization, associated with interstitial phases such as troilite + metal, pyroxferroite, cristabolite, and alkali feldspar.

The name is for the Sea of Tranquillity from which the Apollo XI rocks were collected. Type material is deposited in the Lunar Science Institute, Houston, Texas. The mineral and name were approved before publication by the Commission on New Minerals and Mineral Names, IMA.

Unnamed Lunar Mineral (phase β)

E. L. HAINES, A. L. ALBEE, A. A. CHODOS, AND G. J.

Microprobe analyses gave TiO₂ 22.1, 22.1; ZrO₂ 17.1, 17.2; Nb₂O₅ 8.6, 7.9; FeO 9.4, 13.8; CaO 3.0, 2.9; Y₂O₃ 9.2, 8.9; La₂O₃ 0.1, 0.2; Ce₂O₃ 1.7, 1.6; Nd₂O₃ 0.9, 0.9; other rare earths (calc) 2.4, 2.2; PbO 4.0, 4.2; ThO₂ 4.7, 3.5; UO₂ 3.2, 3.6; SiO₂ 2.1, 2.0, sum 88.5 (given as 88.4), 91.0%. The cause of the low summations is not known.

The mineral occurs as irregular grains up to 5 x 10 microns in Apollo XII rocks.

Unnamed Lunar Minerals (Phase X, Phase Y)


Electron microprobe analyses of “phase X” and “phase Y” gave TiO₂ 68.8, 27.1; ZrO₂ 6.1, 30.8; Cr₂O₃ 4.3, 0.5; Al₂O₃ 0.9, 0.5; MgO 1.7, 0.1; FeO 13.4, 11.4; MnO 0.2, 0.3; CaO 3.1, 3.2; Y₂O₃ 10.4; RE₂O₃ 1.3, 12.1; SiO₂ 0.2. Nb, Pb, Th, U not found in either, sum 100.0, 96.4%. The rare earths (RE) in “phase Y” consist of La₂O₃ 0.6, Ce₂O₃ 1.9, Pr₂O₃ 0.7, Nd₂O₃ 3.3, Sm₂O₃ 1.7, Eu₂O₃ 0.4, Gd₂O₃ 2.1, Tb₂O₃ 0.3, Dy₂O₃ 0.9, Ho₂O₃ 0.2%. The cause of the deficiency in the analysis of “phase Y” is unknown; possibly the light elements Li, Be, B, C, N are present.

The authors state that “the new phase calculates to the zirkelite formula, A₄B₄⁴⁻O₈. The calculation actually gives on the basis of O₈,

“phase X”:

(Fe₆.8₂Mg₆.0₆Mn₆.0₆Ca₉.1₂RE₉.0₆)₈₋₄₋₉₋\.(Ti₉.1₂Zr₉.0₆Cr₉.1₃Al₉.0₆)O₄;

“phase Y”:

(Fe₆.8₄Mg₆.0₈Mn₆.0₆Ca₉.1₂Y₉.1₄RE₉.3₄)₈₋₄₋₉₋\.(Ti₉.1₂Zr₉.7₇Cr₉.0₆Al₉.0₆)O₄.

The two minerals are very similar in occurrence, crystal habit, and optical properties to tranquillityite. Both occur as rare, small crystals (12-40 microns) in the residual mesostasis of lunar basalts, with baddeleyite, whitlockite, K-Ba feldspar, and rhyolitic glass. “Phase X” is in Apollo XIV basalt (no. 14310/20), “phase Y” in Apollo XV basalt (no. 15555/39).

Both minerals are dark reddish-brown in transmitted light, with high n, and are nearly isotropic. In reflected light the grains are pale gray and rectangular or sheaf-like in habit.

NEW DATA

Freieslebenite


New microprobe analyses were made of museum samples from Feiberg and Braunsdorf, Germany, and 4 samples from Hiendelaencina, Spain, giving, resp., Ag 20.8, 20.8, 20.4, 20.3, 20.1, 20.0; Pb 41.1, 41.6, 40.5, 40.6, 40.2, 39.0; Sb 23.4, 23.3, 24.0, 23.4, 23.9, 22.4; S 17.1, 16.4, 16.9, 17.3, 17.0, 17.0; sum 102.4, 102.1, 101.8, 101.6, 101.2, 99.41%; averaging Ag₉.0₆Pb₉.0₆Sb₉.0₆S₉.0₆. The formula is therefore AgPbSb₈, in agreement with Hellner (Z. Kristallogr. 109, 284–295, 1957), not Ag₉.0₆Pb₉.0₆Sb₉.0₆.