New Mineral Names*†

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This New Mineral Names has entries for nine new minerals, including adachiite, dymkovite, ferroindialite, grandaitae, iwateite, kitagohaitae, rauchite, torrecillasite, and zvyaginitae.

ADACHIITE*


Adachiite (IMA 2012-101), ideally CaFe3Al6(Si5AlO18) (BO3)3(OH)3(OH), is a Si-poor member of the tourmaline supergroup. The mineral was named in honor of Tomio Adachi, an amateur mineralogist. Adachiite was found in a hydrothermal vein cutting the emery (an ultra-hard rock consisting mainly of corundum and hercynite) at the Kiura mine, Oita Prefecture, Japan. Adachiite occurs in association with margarite, chlorite, diaspore, and other tourmalines. The new mineral forms hexagonal crystals up to 2 cm in length and 5 mm in width. Massive adachiite is black in color while smaller crystals (<1 mm) are transparent and are brownish to bluish-purple. The Mohs hardness is 7; the calculated density is 3.228 g/cm3. Adachiite is uniaxial (−) with α = 1.674(2) and ε = 1.644(2) (589 nm) with strong pleochroism: α = dark green to dark blue, ε = brownish-yellow. The averaged electron probe analyses (WDS, 13 point analyses) gave: Na2O 0.84, CaO 3.34, MgO 2.32, FeO 11.90, B2O3 10.09, Al2O3 36.70, TiO2 0.46, SiO2 29.79, F 9.81, H2O 0.00. Total 98.54 wt% (H2O is calculated from stoichiometry). The empirical formula of adachiite calculated on the basis of 15 cations is (Ca0.62Na0.28)6.00 (Fe1.58Al0.81Mg0.55Ti0.06)2.00 (Al8.18Fe0.45Mg0.52)2.00 (Si5.15Al0.85)2.00 O18.00 B3.01 O9.36 (OH)0.56. FTIR spectroscopy identified a few absorption bands in the region from 400 to 4000 cm−1: 400–840 (lattice vibrations); 840–1200 [Si,Al]O18 stretching vibrations); 1200–2000 (BO3 stretching vibrations); 3200–3600 [O-H stretching vibrations]; and 3600–3700 cm−1 [O-H stretching vibrations]. No absorption band at 1600 cm−1 was observed indicating the absence of H2O. The strong lines of the X-ray powder diffraction pattern are [dcalc, Å (Icalc,%; hkl)]: 4.225 (40; 211), 4.002 (65; 220), 2.584 (100; 051), 2.043 (52; 223, 152), 1.9204 (22; 342). The crystal structure of adachiite was refined to R1 = 3.8%. The mineral is trigonal, R3m, a = 15.9290(2), c = 7.1830(1) Å, V = 1578.39 Å3, and Z = 3. Adachiite is a new end-member of the tourmaline group with the lowest Si content. It is characterized by the presence of Al at the tetrahedral site, and is compositionally formed by Tschermak-like substitution M2+ ↔ Si4+ ↔ Al3+. Adachiite formation indicates aberrantly high-Al and low-Si environment in the emery rock in which it occurs. The type specimen is deposited in the collections of the National Museum of Nature and Science, Tsukuba, Japan. Yu.U.

FERROINDIALITE*


Ferroindialite (IMA 2013-016), ideally (Fe2+,Mg)2Al4Si5O18, is a new mineral of the beryl group and is the Fe2+-dominant analog of indialite. It was discovered at Bellerberg Mountain, Eifel region, Germany, in a xenolith rock amongst alkaline basalts. Ferroindialite occurs in association with sillimanite, sanidine, phlogopite, enstatite-ferrosilite, wagnerite, fluorapatite, tridymite, zircon, and high-Mg almandine. The mineral forms short prismatic or tabular crystals up to 1.5 mm. Ferroindialite is brownish-violet to gray with violet-blue hint, and has a white streak. It is brittle, with no cleavage, glassy luster, and Mohs hardness of 7. Dcalc = 2.667 g/cm3. Infrared spectroscopy identified the following bands: 1711 and 1143 cm−1 (Si–O vibrations); 1578.39 Å (AlO4 tetrahedra ↔ AlO3 octahedra). The mineral is triagonal, α = 1.539(2), β = 1.552(2), γ = 1.554(2), a = 15.9290(2), c = 7.1830(1) Å, V = 1578.39 Å3, and Z = 3. Ferroindialite displays weak pleochroism, from colorless on X to pale violet on Z, and weak dispersion, r
NEW MINERAL NAMES

Grandaite*  

Grandaite (IMA 2013-059), ideally Sr2Al(AsO4)2(OH), is a new mineral found on the dumps of the Valletta mine, Maira Valley, Canosio, province of the type locality ("la Granda"). A fragment of holotype material is deposited in the mineralogical collection of the Museo Regionale di Scienze Naturali di Torino, Sezione di Petrologica e di Scienze Naturali "Federico Eusebio", Alba, Cuneo, Italy. O.C.G.

Iwateite*  

Iwateite (IMA 2013-034), ideally Na3BaMn(PO4)2, is a new mineral from Ba- and Sr-bearing manganese ore at No. 3 (Matsumaezawa) deposit in the Tanohata mine, Iwate Prefecture, Japan, and is named after the locality where it occurred. The manganese ore body developed in the upper Jurassic accretionary complex chert and underwent contact metamorphism by the intrusion of a granodiorite. The ore has a zoned structure and consists mainly of braunite-, quartz-, rhodonte-, natronambulite-, and serandite-rich zones with a thin amphibole-rich zone wedged between the dominant ones. The mineral forms granular to anhedral inclusions of 10–100 μm in the main constituent minerals and is often found in serandite crystal. Iwateite is colorless with white streak. It is non-fluorescent and has weak pleochroism (colors not given). Other physical properties were not determined referring to the small grain size. Raman spectroscopy identified
a few peaks at 990, 973, 584, 577, and 428 cm$^{-1}$, corresponding to a symmetric stretching vibration, symmetric bending vibration, asymmetric stretching vibration, and asymmetric bending vibration of the PO$_4$ tetrahedra, respectively. The average of 10 electron microprobe EDS analyses gave: Na$_2$O 14.66, BaO 35.52, SrO 2.43, MnO 13.26, MgO 1.55, P$_2$O$_5$ 32.65, total 100.07 wt\%. The empirical formula calculated on the basis of 8 O atoms is Na$_{2.026}$(Ba$_{0.993}$Sr$_{0.101}$)$_{3}$O$_{8}$Mn$_{1.094}$(Mg$_{0.801}$Fe$_{0.164}$)$_{1.971}$O$_{8}$. The strongest lines of the powder diffraction pattern [d$_{hv}$ Å (I$_{obs}$; % hkl)] are: 4.646 (67; 100), 3.877 (48; 101, 011), 2.806 (100; 012, 102), 2.683 (74; 110), 2.506 (46; 111, 111), 1.938 (91; 022, 022). The powder XRD data were collected using a synchrotron source (λ = 0.5109 Å, Ångström) and calcite-baryte veins were later prospected for baryte and arsenic species, ideally Ni(UO$_2$)$_2$(As$_3$O$_4$)$_2$·7H$_2$O, were discovered. Two new supergene minerals rauchite (IMA 2010-037), an arsenate species of the autunite group, ideally Ni(UO$_2$)$_2$(AsO$_4$)$_2$·7H$_2$O, and dymkovite (IMA 2010-087), an arsenite species, ideally Ni(UO$_2$)$_2$(As$^{+}$O$_3$)$_2$·7H$_2$O, were discovered at the adit #1 of the Belorechenskoye deposit, in the Belaya River basin, 60 km south of the Maikop city, Adygea Republic, Northern Caucasus, Russia. This deposit includes two systems of hydrothermal veins cross-cutting Paleozoic gneisses, granites, amphibolites, and serpentinitized ultrabasites. The earlier dolomite veins containing U and Ni mineralization were known as Dakhovskoe U deposit. The younger calcite-baryte veins were later prospected for baryte and deposit was named Belorechenskoye. The oxidation processes

**References cited**


are poorly developed mostly in the upper part of the deposit. In the oxidized parts of the dolomite veins with primary uraninite, nickeline, krutovite, rammelsberge, gersdorffite, or native As, the secondary minerals include limonite, annabergite, pharma-
colite, picropharmacolite, hörnesite, rösslerite, parasymplesite, nováčekite, gypsum, aragonite, arsenolite, schröckingerite, and rabbittite. In the oxidation zone of the calcite-baryte veins with primary galena, sphalerite, chalcopyrite, pyrite, andMarcasite, the supergene minerals include limonite, jarosite, gypsum, malenanterite, brochantite, antlerite, devilline, serpierite, angle-
site, malachite, azurite, cerussite, coronadite, hematopilitic, and native sulfur. Both rauchite and dymkovite were found in small cavities and cracks of slightly oxidized dolomite veins in close association with uraninite, nickeline, gersdorffite, limo-
nite, and annabergite. Dymkovite is the earliest As phase in the supergene mineral association. Rauchite was named according to the autunite group naming rules as the hydrated analog of recently described metarauchite, Ni(UO2)2(AsO4)·8H2O (Plášil et al. 2010). The root name is in memory of the Czech mineral collector Luděk Rauch (1951–1983). Dymkovite was named in honor of the Russian mineralogist Yuriy Maksimovich Dymkov (b. 1926), a well-known specialist in mineralogy and geology of U deposits, who published the first fundamental paper on composition and formation of the U ores of the Belorechenskoye deposit. Type specimens of both new minerals were deposited in Fersman Mineralogical Museum, Moscow, Russia.

Rauchite has typical U micas appearance and forms pseudotetragonal lamellar crystals up to 0.5 mm with pinacoidal {010} habit. Crystals are usually splitted, like an open book, and their clusters or crusts are up to 2 mm. Rauchite is light yellowish-green (colorless under microscope), transparent to translucent, and vitreous. The mineral is brittle, Mohs hardness is ~2. The cleavage on {001} is perfect. The density measurements were unsatisfactory due to the open-work character of the mineral ag-
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$D_{\text{calc}} = 3.910 \, \text{g/cm}^3$. The difference could be caused by the partial dehydration of the sample during the single crystal experiment. The crystal structure was solved by direct methods and refined to $R_I = 0.063$ for 717 unique reflections with $F \geq 4\sigma(F)$. The structure is based on [[UO$_3$](As$^{3+}$O$_4$)$_2$] sheets formed by chains of edge-sharing [UO$_2$] pentagonal bipyramids and (As$^{3+}$O$_6$) triangular pyramids, which are linked through hydrogen bonds involving disordered [Ni(H$_2$O)$_4$]$^{2+}$ octahedra and additional H$_2$O molecules in the interlayer. Dymkovite is a Ni-dominant, almost arsenate free analog of seelite. The presence of continuous isomorphic series between seelite and dymkovite in nature is proposed. D.B.

References cited

TORRECILLASITE*


Torrecillasite (IMA 2013-112), ideally Na(As,Sb)$_4$O$_5$Cl, is a new mineral from the Torrecillas mine in the northern Atacama Desert of Chile. The deposit consists of two main veins that intersect metamorphosed marine shales and lavas and related sedimentary and porphyritic lavas of the La Negra Formation. These veins are rich in secondary As and Cu minerals. Torrecillasite occurs as a secondary alteration phase associated with anhydrite, cinnaabar, gypsum, halite, lavendulan, magnesio-koritnikite, marcasite, quartz, pyrite, scorodite, wendtsoilite, leuverettite, canutite, and several other potentially new arsenate and arsenide minerals. The mineral is assumed to have formed from the oxidation of native As and other As-bearing primary phases, followed by later alteration by saline fluids derived from evaporating meteoric water under hyperarid conditions. Torrecillasite occurs as thin prisms up to 0.4 mm long in jack-straw aggregates, as very thin fibers in pufballs, and as massive intergrowths of needles. Prisms are elongated on [100] with diamond-shaped cross section and have irregular terminations. Crystals are colorless with a white streak, adamantine, with no cleavage, have an irregular fracture, brittle tenacity and a Mohs hardness of 2½. The density could not be measured due to paucity of material; $D_{\text{calc}} = 4.056 \, \text{g/cm}^3$. The mineral is very lightly hydrated in H$_2$O, lightly soluble in dilute HCl and is soluble in concentrated HCl. Torrecillasite is biaxial (−) with $\alpha = 1.800(5)$, $\beta = 1.96(1)$, $\gamma = 2.03(3)$; $2\ell_v^{\text{meas}} = 62.1(5)$; $2\ell_v^{\text{obs}}$ could not be measured due to its high refraction index. The mineral shows no dispersion and is nonpleochroic. The optical orientation is $X = c$, $Y = b$, $Z = a$. The average of 6 electron probe analyses (WDS) on four crystals gave [wt% (range)]: Na$_2$O 6.56 (6.07–7.04), MgO 0.15 (0.12–0.18), As$_2$O$_3$ 68.64 (65.40–71.85), Sb$_2$O$_3$ 18.43 (15.66–20.72), C$\ell$ 6.75 (6.37–7.24), O$_{\text{Cl}}$ 1.52, total 99.01. This gives the empirical formula [Na$_{1.03}$Mg$_{0.02}$]$_{1.05}$[(As$_{3.39}$Sb$_{0.62}$)$_{1.05}$O$_{18.62}$]$_{5.26}(\text{OH,F})_3(H_2O)_{4+}$, which proposed to be homoaxial pseudomorphs after (001) that share O atoms to form six-membered rings. Successive layers are flipped relative to one another; successive interlayer regions contain alternately either Na or Cl atoms. Torrecillasite is named after its type locality. Four cotype specimens are deposited in the collections of the Natural History Museum of Los Angeles County, Los Angeles, CA 90007, U.S.A. O.C.G.

ZVYAGINITE*


Zvyaginite (IMA 2013-071), ideally NaZnNb$_2$Ti[[Si$_2$O$_7$]$_2$O(OH,F)$_3$(H$_2$O)$_4$s, (x < 1), is a new mineral of the epistolite group from pegmatite #71 at Mt. Malyi Punkarau, Lovozero alkaline complex, Kola Peninsula, Russia, and was named after Russian crystallographer, crystal chemist and physicist Boris Borisovich Zvyagin, who was a pioneer and expert in electron diffraction studies of materials. The new mineral occurs in a hydrothermally altered peralkaline pegmatite in a peripheral part of pegmatite ussingite core near its contact with aegirine-eudialite zone. Other associated minerals are: microcline, sodalite, arfvedsonite, sphalerite, pectolite-sérandite, mangan-neptunite, murmanite, vizhiginosite, epistolite, belovite-(Ce), steenstrupine, chkalovite, vigrishinite, epistolite, belovite-(Ce), steenstrupine, chkalovite, vigrishinite, epistolite, belovite-(Ce), steenstrupine, chkalovite, vigrishinite, epistolite, belovite-(Ce), steenstrupine, chkalovite.
1.36, FeO 0.24, ZnO 9.61, Al₂O₃ 0.19, SiO₂ 29.42, TiO₂ 12.33, Nb₂O₅ 27.22, F 1.94, H₂O 12.65, –O=F 0.82, total 99.87 wt%. The empirical formula calculated on the basis of (Si+Al) = 4 apfu is Na₁.₂₄K₀.₀₄Ca₀.₁₁Mn₀.₁₆Fe₀.₀₃Zn₀.₉₆Nb₁.₆₆Ti₁.₂₅(Si₃.₉₇Al₀.₀₃)₂O₁₅.₀₇(OH)₂.₁₀F₀.₈₃(H₂O)₄.₆₄. The strongest lines of the powder diffraction pattern \[d_{obs} \text{ Å (I}_\text{obs; hkl)}\] are: 11.72 (100; 001), 5.83 (40; 002), 5.28 (53; TT1, 112), 4.289 (86; 200, 021), 3.896 (36; TT2, 001, 003, 022, 113), 2.916 (57; 310, 132, 004), 2.862 (72; 130, 312). The crystal structure of zvyaginite was solved and refined on the basis of 2947 reflections to \[R₁ = 15.9\%\]. The new mineral is triclinic, \[P₁, a = 8.975(3), b = 8.979(3), c = 12.135(4) \text{ Å, } \alpha = 74.328(9), \beta = 80.651(8), \gamma = 73.959(8)\]. The new mineral is isostructural with epistolite. Their structures are based on the HOH block consisting of one octahedral (O) and two heteropolyhedral (H) sheets. In between HOH blocks there are H₂O groups. In zvyaginite, the H sheets are composed of Nb octahedra, Si tetrahedra and Na polyhedra, while the O sheets is composed of Zn, Ti, and Na octahedra. The type specimen is deposited in the Fersman Mineralogical Museum of Russian Academy of Sciences, Moscow, Russia. Yu.U.

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