

## New Mineral Names

CHRISTOPHER EMPROTO AND TRAVIS A. OLDS\*

<sup>1</sup>Section of Minerals and Earth Sciences, Carnegie Museum of Natural History, 4400 Forbes Avenue, Pittsburgh, Pennsylvania 15213, U.S.A.

### ABSTRACT

This edition of New Mineral Names provides selected information for the newly approved minerals, nomenclature, and classification changes from February to May 2025. All minerals presented have been approved by the International Mineralogical Association Commission on New Minerals, Nomenclature, and Classification (IMA-CNMNC).

### RECENTLY APPROVED

This section features just a few of the 37 minerals approved by the IMA-CNMNC between February and May 2025; see Table 1 for the list and cursory details of all 37 minerals (Bosi et al. 2025a, 2025b).

#### Akasakaite-(Ce), Akasakaite-(La), and Vanadoakasakaite-(La)

Three more allanite group minerals with the akasakaite root name were approved in May 2025: akasakaite-(Ce) (IMA2025-001; Ak-Ce), akasakaite-(La) (IMA2025-002; Ak-La), and vanadoakasakaite-(La) (IMA2025-003; Vak-La). Vanadoakasakaite-(Ce) (IMA2024-044; Vak-Ce) was approved in October 2024. All four minerals were described from the Mogurazawa Mine in Gunma Prefecture, Japan. This mine was earlier notable as the type locality for the rare vanadium minerals nagashimalite and suzukiite. The akasakaite root name applies to minerals that are Mn<sup>2+</sup> analogs of their counterparts with the allanite root name. For example, akasakaite-(Ce), (CaCe)(AlAlMn<sup>2+</sup>)O[Si<sub>2</sub>O<sub>7</sub>][SiO<sub>4</sub>](OH), is the Mn<sup>2+</sup> analog of allanite-(Ce), (CaCe)(AlAlFe<sup>2+</sup>)O[Si<sub>2</sub>O<sub>7</sub>][SiO<sub>4</sub>](OH), whereas vanadoakasakaite-(La), (CaLa)(V<sup>3+</sup>AlMn<sup>2+</sup>)O[Si<sub>2</sub>O<sub>7</sub>][SiO<sub>4</sub>](OH), is the Mn<sup>2+</sup> analog of vanadoallanite-(La), (CaLa)(V<sup>3+</sup>AlFe<sup>2+</sup>)O[Si<sub>2</sub>O<sub>7</sub>][SiO<sub>4</sub>](OH). The akasakaite root name was first applied to ferriakasakaite-(La) by Nagashima et al. (2015); however, a mineral consistent with ferriakasakaite-(Ce) was encountered earlier in samples from Kesebol, Sweden, by Bonazzi et al. (2009). The root name is in honor of Masahide Akasaka, professor at Shimane University, Japan. Akasaka is an expert on epidote supergroup minerals and contributed to a nomenclature revision for this family of minerals (Armbruster et al. 2006).

#### Sugarwhiteite, Pb<sub>2</sub>Te<sub>2</sub>O<sub>12</sub>

Sugarwhiteite (IMA2024-079; Sgw), Pb<sub>2</sub>Te<sub>2</sub>O<sub>12</sub>, is a new secondary tellurium species from the Moctezuma Mine, Sonora, Mexico. It is a relatively inconspicuous species, occurring as irregular pale-colored masses. The new mineral is named for Margaret “Sugar” White, mineral collector and inductee to the Micromounters Hall of Fame. She was an early pioneer of mineral photomicrography and had numerous photos published in mineralogical magazines. The system Pb-Te-O has expanded significantly in recent years with the descriptions of matthiasweillite (PbTe<sup>4+</sup>O<sub>3</sub>, IMA2021-069), murphyite [Pb(Te<sup>6+</sup>O<sub>4</sub>), IMA2021-107], and ottoite (Pb<sub>2</sub>TeO<sub>5</sub>, IMA2009-063). Prior to the discovery of ottoite, the only known mineral in the Pb-Te-O system was plumbotellurite, described in 1982. In addition to sugarwhiteite, a new denningite group

mineral from the Moctezuma Mine, chenzhangruite, MnFe<sup>2+</sup>Te<sub>4</sub><sup>4+</sup>O<sub>10</sub> (IMA2024-094), was also recently approved.

#### Lechnerite, Ag<sub>10</sub>Cu<sub>4</sub>HgPb<sub>33</sub>Sb<sub>58</sub>S<sub>128</sub>

Lechnerite (IMA2024-075; Lhn) is a new sulfosalt mineral found in the Sant’Olga tunnel workings of the Monte Arsiccio mine, Tuscany, Italy. The Monte Arsiccio mine accesses hydrothermal veins within marbles of the Apuan alps and is the type locality for twelve mineral species, including eight very rare sulfosalts: andreadiniite, arsiccioite, boscardinite, lechnerite, protochabournéite, proto-owyheite, and pyradoketosite. The discovery of lechnerite brings the number of known Pb-Sb-sulfides containing Hg up to five species (the others being andreadiniite, marrucciite, rouxelite, and tsyngankoite). Apart from its contributions of new minerals, the Monte Arsiccio mine has produced some of the world’s best examples of ferdowsiite, goldichite, graeserite, robinsonite, and rouxelite. Lechnerite is named for the German mineral collector Alois Lechner, who has made several discoveries of minerals new to the locality.

#### Morningstarite, Na(W<sub>2.67</sub>Fe<sub>0.33</sub><sup>3+</sup>)O<sub>9</sub>·H<sub>2</sub>O

Morningstarite (IMA2024-081; Mnsr) was named for its place of discovery: the dumps of the Morning Star Extended Workings within the Bamford Hill mines, Queensland, Australia. It is the third new mineral from the Bamford Hill mines, after bamfordite and ootannite. Morningstarite is isostructural with wumuite, K(W<sub>2.67</sub>Al<sub>0.33</sub>)O<sub>9</sub>, although wumuite lacks H<sub>2</sub>O groups. These minerals have a hexagonal tungsten bronze-type structure, characterized by sheets of corner-sharing MO<sub>6</sub> octahedra linked in rings around hexagonal channels that run along *c*, which is the stacking direction and the orientation of the sixfold axis of the *P6/mmm* structure (Xue et al. 2020).

#### Wolfsriedite, Pb[(UO<sub>2</sub>)<sub>2</sub>(W<sup>6+</sup>Fe<sup>3+</sup>)O<sub>7</sub>(OH)](H<sub>2</sub>O)<sub>3</sub>

Wolfsriedite (IMA2022-048a; Wfr) is a new species from the Clara Mine in Germany that is chemically and structurally related to uranotungstite, Ba(UO<sub>2</sub>)<sub>2</sub>W<sub>2</sub>O<sub>8</sub>(OH)<sub>2</sub>·H<sub>2</sub>O. Wolfsriedite is named for German mineral collector and retired automotive industry executive Stephan Wolfsried (b. 1958), who discovered the mineral. Stephan is widely renowned for his high-quality mineral photomicrographs. Between 2004 and 2022, he uploaded more than 11,500 high-quality photomicrographs to the open-source mineral database www.mindat.org, at an average rate of nearly two photos per day (~1.8).

#### Åsgruvanite-(Ce), Ce<sub>16</sub>Ca<sub>5</sub>Al(SiO<sub>4</sub>)<sub>6</sub>(AsO<sub>3</sub>)<sub>8</sub>(CO<sub>3</sub>)<sub>2</sub>Cl<sub>4</sub>F<sub>3</sub>(OH)<sub>2</sub>

Åsgruvanite-(Ce) (IMA2025-004; Åsg-Ce) is a chemically complex new mineral from the Åsgruvan mine, Västmanland, Sweden, for

\* All minerals have been approved by the IMA CNMNC. For a complete listing of all IMA-validated unnamed minerals and their codes, see <http://cnmnc.units.it/>.

**TABLE 1.** New minerals approved by the IMA-CNMNC from February–May 2025\*

Mineral	Formula	IMA #	Space Group	Type Locality Area	Country	New RN
Morningstarite	Na(W <sub>2.67</sub> Fe <sub>3.33</sub> O <sub>7</sub> ) <sub>2</sub> ·H <sub>2</sub> O	2024-081	<i>P6/mmm</i>	Bamford Hill mines	Australia	yes
Macivorite	(NH <sub>4</sub> ) <sub>3</sub> Al <sub>5</sub> (PO <sub>3</sub> OH) <sub>6</sub> (PO <sub>4</sub> ) <sub>2</sub> ·18H <sub>2</sub> O	2024-083	<i>R3c</i>	Skipton Caves	Australia	yes
Kenomicrolite	□ <sub>2</sub> Ta <sub>2</sub> O <sub>4</sub> (OH) <sub>2</sub> □	2024-097	<i>Fd3m</i>	Volta Grande pegmatite	Brazil	no
Johnjamborite	Pb <sub>14</sub> Sb <sub>8.5</sub> As <sub>7.5</sub> S <sub>38</sub>	2024-077	<i>P1</i>	Madoc	Canada	yes
Morleyite	Ag <sub>2</sub> CuPb <sub>2</sub> Sb <sub>2</sub> As <sub>4</sub> S <sub>68.5</sub>	2024-076	<i>P1</i>	Madoc	Canada	yes
Xianhuaite-(Ce)	K <sub>2</sub> CeNb <sub>5</sub> O <sub>15</sub>	2024-091	<i>P4/mbm</i>	Bayan Obo deposit	China	yes
Huanghoite-(Nd)	BaNd(CO <sub>3</sub> ) <sub>2</sub> F	2025-014	<i>R3m</i>	Bayan Obo deposit	China	no
Stillwellite-(La)	LaBSiO <sub>5</sub>	2024-074	<i>P3<sub>2</sub>21</i>	Gejiu intrusion	China	no
Fengruite	[Ag <sub>6</sub> Sb <sub>2</sub> S <sub>7</sub> ][Ag <sub>3</sub> CuS <sub>2</sub> Te <sub>2</sub> ]	2024-045	<i>P3m1</i>	Haopinggou deposit	China	yes
Wenqingite	Pb <sub>2</sub> (AsS <sub>3</sub> ) <sub>2</sub> (Ge <sub>2</sub> S <sub>6</sub> )	2024-098	<i>P2<sub>1</sub>/c</i>	Wusihe deposit	China	yes
Wolfsriedite	Pb[(UO <sub>2</sub> ) <sub>2</sub> (W <sup>6+</sup> Fe <sup>3+</sup> )O <sub>7</sub> (OH)](H <sub>2</sub> O) <sub>3</sub>	2022-048a	<i>P2<sub>1</sub>/m</i>	Clara Mine	Germany	yes
Ferroákermanite	Ca <sub>2</sub> FeSi <sub>2</sub> O <sub>7</sub>	2024-080	<i>P4<sub>2</sub>/m</i>	Hatrum complex	Israel	no
Bariolakargite	BaZrO <sub>3</sub>	2025-009	<i>Pm3m</i>	Hatrum complex	Israel	no
Lechnerite	Ag <sub>10</sub> Cu <sub>4</sub> HgPb <sub>3</sub> Sb <sub>35</sub> S <sub>128</sub>	2024-075	<i>P1</i>	Monte Arsiccio mine	Italy	yes
Marioantofillite	[Cu <sub>4</sub> Al <sub>2</sub> (OH) <sub>12</sub> (CO <sub>3</sub> ) <sub>2</sub> ·3H <sub>2</sub> O	2025-012	<i>C2/m</i>	Reppia mine	Italy	yes
Akasakaite-(Ce)	CaCe(Al <sub>2</sub> Mn <sup>2+</sup> )(Si <sub>2</sub> O <sub>7</sub> )(SiO <sub>4</sub> )O(OH)	2025-001	<i>P2<sub>1</sub>/m</i>	Mogurazawa mine	Japan	no
Akasakaite-(La)	CaLa(Al <sub>2</sub> Mn <sup>2+</sup> )(Si <sub>2</sub> O <sub>7</sub> )(SiO <sub>4</sub> )O(OH)	2025-002	<i>P2<sub>1</sub>/m</i>	Mogurazawa mine	Japan	no
Vanadoakasakaite-(La)	CaLa(V <sup>2+</sup> AlMn <sup>2+</sup> )(Si <sub>2</sub> O <sub>7</sub> )(SiO <sub>4</sub> )O(OH)	2025-003	<i>P2<sub>1</sub>/m</i>	Mogurazawa mine	Japan	no
Sugarwhiteite	Pb <sub>2</sub> Te <sub>2</sub> O <sub>12</sub>	2024-079	<i>P2<sub>1</sub>/c</i>	Moctezuma mine	Mexico	yes
Chenzhangruite	MnFe <sup>2+</sup> Te <sup>4+</sup> O <sub>10</sub>	2024-094	<i>P4<sub>2</sub>/nbc</i>	Moctezuma mine	Mexico	yes
Cad sulfohite	Cd <sub>2</sub> (SO <sub>4</sub> )(OH) <sub>2</sub>	2024-088	<i>P2<sub>1</sub>/n</i>	Tsumeb mine	Namibia	yes
Zavyalovite	Ag <sub>2</sub> TeS <sub>3</sub>	2024-096	<i>Cc</i>	Boevskoe deposit	Russia	yes
Anatolygurbanovite	SrCa <sub>2</sub> Si <sub>2</sub> O <sub>7</sub>	2024-086	<i>P1</i>	Chegem caldera	Russia	yes
Lucasite-(La)	LaTi <sub>2</sub> O <sub>5</sub> (OH)	2024-073	<i>I2/a</i>	Ermakovskaya-7 kimberlite	Russia	no
Barkovite	Ni <sub>1.5</sub> Sn	2024-095	<i>P6<sub>3</sub>/mmm</i>	Mt. Partomchorr	Russia	yes
Brunovskiyite	NaZrSi <sub>2</sub> O <sub>6</sub> (OH)	2024-089	<i>P1</i>	Mt. Takhtarvumchorr	Russia	yes
Arzamastsevite	K <sub>2</sub> Al <sub>2</sub> Si <sub>6</sub> O <sub>20</sub> (OH) <sub>4</sub> Cl	2024-085	<i>P42m</i>	Parguav Mountain	Russia	yes
Brunnitsynite	Mn <sub>3</sub> CuPbAs <sub>5</sub> Sb <sub>2</sub> S <sub>12</sub>	2025-010	<i>P2<sub>1</sub>/n</i>	Vorontsovskoe deposit	Russia	yes
Åsgruvanite-(Ce)	Ce <sub>16</sub> Ca <sub>5</sub> Al(SiO <sub>4</sub> ) <sub>6</sub> (AsO <sub>3</sub> ) <sub>6</sub> (CO <sub>3</sub> ) <sub>2</sub> Cl <sub>4</sub> F <sub>2</sub> (OH) <sub>2</sub>	2025-004	<i>P3m1</i>	Åsgruvan mine	Sweden	yes
Xiexiandeite	SiO <sub>2</sub>	2025-006	<i>P2<sub>1</sub>/c</i>	Muonionalusta meteorite	Sweden	yes
Guastoniite-(Y)	Pb <sub>4</sub> (YCa)(Si <sub>8</sub> B <sub>4</sub> O <sub>28</sub> )F	2024-082	<i>I1</i>	Dara-i-Pioz	Tajikistan	yes
Cadvanite	Cd(VO <sub>3</sub> ) <sub>2</sub>	2025-005	<i>C2/m</i>	Burro mine	U.S.A.	yes
Tomcampbellite	[KCl][Fe <sup>2+</sup> <sub>4</sub> (OH) <sub>6</sub> (PO <sub>4</sub> ) <sub>6</sub> (PO <sub>3</sub> OH) <sub>2</sub> ]	2024-072	<i>C2/m</i>	Dan Patch mine	U.S.A.	yes
Magselite	[Mg(H <sub>2</sub> O) <sub>4</sub> ](Se <sup>4+</sup> O <sub>3</sub> )	2024-084	<i>R3</i>	Pickett Corral mine	U.S.A.	yes
Fuchunite	Ba(C <sub>2</sub> H <sub>3</sub> O <sub>3</sub> ) <sub>2</sub> (C <sub>2</sub> H <sub>4</sub> O <sub>3</sub> ) <sub>2</sub>	2025-011	<i>P2<sub>1</sub>/n</i>	Pusch Ridge	U.S.A.	yes
Sigogglinitite	[Pb <sub>6</sub> Zn(OH) <sub>8</sub> ](SO <sub>4</sub> ) <sub>3</sub> ·3H <sub>2</sub> O	2024-069	<i>P2/n</i>	Redmond mine	U.S.A.	yes
Blueridgeite	[Pb <sub>8</sub> Zn <sub>2</sub> Cu <sup>2+</sup> (OH) <sub>10</sub> ](SO <sub>4</sub> ) <sub>2</sub> (S <sub>2</sub> O <sub>3</sub> ) <sub>2</sub> ·2H <sub>2</sub> O	2024-071	<i>P2<sub>1</sub>/c</i>	Redmond mine	U.S.A.	yes

Notes: The type locality names have been simplified for readability and are organized by type locality country of origin. The “New RN” column conveys which mineral names introduce a new root name.

\*All minerals have been approved by the IMA-CNMNC. For a complete listing of all IMA-validated unnamed minerals and their codes, see <http://cnmnc.units.it/> (click on “IMA list of minerals”). The data contained within this chart were derived from Newsletters 84–85 (Bosi et al. 2025a, 2025b), individual references for each mineral can be found within.

which it is named. Åsgruvan translates to “Ridge Mine” in Swedish. The Åsgruvan mine is considered one of the Bastnäs-type rare earth element mineral occurrences, consisting of thin skarn zones within a stratified metavolcanic sequence that also hosts quartz-rich iron ores (Andersson et al. 2024). Currently, this mineral features a unique combination of elements among approved species and also exhibits a novel structure type.

### Minerals belonging to established nomenclature systems

Akasakaite-(Ce), akasakaite-(La), and vanadoakasakaite-(La) are named in accordance to nomenclature of the epidote supergroup and the Levinson rule, whereas stillwellite-(La), huanghoite-(Nd), and lucasite-(La) are not part of larger nomenclature systems (but still fall under the Levinson rule). Kenomicrolite belongs to the pyrochlore supergroup.

## RECENTLY PUBLISHED

This section includes some of the recently approved minerals that have been published (or entered press) since January 2025.

### Andreybulakhite, Ni(C<sub>2</sub>O<sub>4</sub>)<sub>2</sub>·2H<sub>2</sub>O

Andreybulakhite (IMA2023-037; Adb), the first nickel oxalate, is a new mineral in the humboldtine group from the Nyud II mine, Murmansk Oblast, Russia (Vereshchagin et al. 2025a). Its occurrence is extremely unique, forming tiny prismatic crystals up to ~2 μm in oxalic acid-producing lichen (*Lecanora* cf. *polytropa*) growing over

oxidized pyrrhotite-pentlandite-chalcocopyrite ore. Oxalate minerals are extremely widespread in nature as byproducts of biological processes and decay, for example, in kidney stones or desiccated cacti (Garvie 2003). Oxalate mineralogy has expanded significantly in just the last few years from new minerals discovered in environments where organically produced oxalate interacts with weathered ore minerals, including at Pusch Ridge and the Rowley Mine in Arizona, as well as at Alum Cave Bluff in Tennessee. Vereshchagin et al. (2025a) named andreybulakhite for esteemed Russian mineralogist Andrey Glebovich Bulakh (1933–2020), former head of the Department of Mineralogy at Saint Petersburg State University in Russia.

### Cabrerite, NiMg<sub>2</sub>(AsO<sub>4</sub>)<sub>2</sub>·8H<sub>2</sub>O

Cabrerite (IMA2023-123; Cabr) is a newly approved vivianite group member and ordered intermediate in the annerbergite-hörnseite series from the Nickel mine, Nevada, U.S.A. (Kampf et al. 2025a). Its structure contains two metal sites, M1 and M2, with nearly identical M–O bond distances: 2.086 and 2.077 Å, respectively. The M1 site is preferentially occupied by Ni, whereas Mg is localized to M2, which forms a more idealized octahedron. It is hypothesized that Ni achieves greater crystal field stabilization energy (CFSE) at M1 and is the cause of its preference for this site in cabrerite, and that Ni-rich “hörnseite” is probably very rare. The name derives from Sierra Cabrera in Andalusia, Spain, where it was applied to a Ni-Co-Mg arsenate mineral that was later determined to be a Mg-bearing variety of annabergite, Ni<sub>3</sub>(AsO<sub>4</sub>)<sub>2</sub>·8H<sub>2</sub>O.

**Chinleite-(Ce), NaCe(SO<sub>4</sub>)<sub>2</sub>(H<sub>2</sub>O)**

The new mineral chinleite-(Ce) (IMA2024-009; Chi-Ce) is a post-mining secondary phase from the Blue Streak mine, Montrose County, Colorado, U.S.A. (Kampf et al. 2025b). It occurs as small colorless prisms to ~0.7 mm on montrosite-corvusite matrix with associated mathiesiusite, boltwoodite, gypsum, and hummerite. As in the closely related chinleite-(Nd) and -(Y) species, its structure is based on a 3D framework of NaO<sub>8</sub> polyhedra and REE<sup>3+</sup>O<sub>9</sub> tricapped trigonal prisms connected by sulfate. The chinleite root name is for the Upper Triassic-aged Chinle formation. The first chinleite group mineral, chinleite-(Y), was found as a post-mining product of ores hosted within the Chinle formation.

**Ertlite, NaAl<sub>3</sub>Al<sub>6</sub>(Si<sub>4</sub>B<sub>2</sub>O<sub>18</sub>)(BO<sub>3</sub>)<sub>3</sub>(OH)<sub>3</sub>O**

Ertlite (IMA2023-086; Etl) is a newly recognized member of the tourmaline family described by Cempírek et al. (2025). This mineral is an unusual addition to the tourmaline supergroup; it is a B-rich oxy-species belonging to the sodic group of the supergroup. The name honors mineralogist Andreas Ertl-Winand of the Natural History Museum of Vienna and the University of Vienna, Austria, who described many new tourmalines, including fluor-schorl, darrellhenryite, bosiite, and aluminooxy-rossmanite. Ertl predicted the occurrence of B-rich tourmaline, noting that it would likely occur as colorless or pale, tiny crystals from very low-temperature environments, and that a negative correlation between B content and unit cell volume would be observed. This was indeed the case—all natural tourmalines ertlite has the smallest unit-cell volume measured at 1475 Å<sup>3</sup>, and the shortest average T–O bond length at 1.577 Å.

**Ginelfite, Ag<sub>2</sub>(Ag<sub>0.5</sub>Fe)TlPb<sub>23.5</sub>(Sb,As)<sub>33.5</sub>S<sub>76</sub>**

Ginelfite (IMA2022-110; Glf) is a newly discovered Ag-Pb-Tl sulfosalt with a rod-based structure from Jas Roux, France (Biagioni et al. 2025). Alongside Allchar, Lengenbach, and Monte Arsiccio, Jas Roux is one of the most mineralogically diverse localities for sulfides in the world. It is the type locality for seven other Tl-bearing species: chabournéite, dewitite, écrinsite, markwelchite, pierrotite, routhierite, and vallouiseite. Ginelfite occurs as dark grey acicular crystals to 0.5 mm, associated with sphalerite and lopatkaitite. Its structure is a complex “box-work” of triangular Pb<sub>6</sub>S<sub>6</sub> rods and ribbon walls and is partially related to zinkenite. The name is a portmanteau for Carlo Gini (b. 1954) and Francesco Guelfi (b. 1947), in recognition of their over 40 years of work supporting mineralogical research as technicians at the X-ray laboratory of the Dipartimento di Scienze della Terra of the Università di Pisa.

**Hanswilkeite, KFeS<sub>2</sub>**

Hanswilkeite (IMA2022-041; Hsw) is a new K-Fe sulfide mineral from the Hatrurim complex in Israel (Britvin et al. 2025a). It is the fourth mineral in the K-Fe-S system after rasvumite, KFe<sub>2</sub>S<sub>3</sub>, bartonite, K<sub>6</sub>Fe<sub>20</sub>S<sub>26</sub>S, and the recently approved mineral gmalimite, K<sub>4</sub>□Fe<sub>24</sub>S<sub>27</sub> (also from the Hatrurim complex). Hanswilkeite is structurally related to rasvumite through a homologous relationship with its Fe sulfide chains. The structure of hanswilkeite comprises infinite chains of edge-sharing FeS<sub>4</sub> tetrahedra with inter-chain K<sup>+</sup> cations, whereas in rasvumite, there is a double-chain of FeS<sub>4</sub> tetrahedra. The new mineral is named for German mineral collector Hans-Jürgen Wilke (1925–2014).

**Heimaeyite, Na<sub>3</sub>Al(SO<sub>4</sub>)<sub>3</sub>**

The fumarolic mineral heimaeyite (IMA2023-127; Hme) formed as a sublimated encrustation in vuggy red scoria from the Eldfell Volcano, Heimaey Island, Iceland (Balić-Žunić et al. 2025). It takes its name from the island where it was found. Heimaeyite’s structure is built from pinwheel arrangements of Al octahedra and sulfate connected by highly distorted NaO<sub>6</sub> polyhedra, and mimics the known synthetic analog. Up to 25% Fe substitutes for Al, but further work is needed to understand the

solid solution, including an associated but so far unidentified potentially new mineral labeled mineral “EN.” It forms as an admixture of several other sulfates and its cell bears some resemblance to both Na<sub>3</sub>Al(SO<sub>4</sub>)<sub>3</sub> and Na<sub>3</sub>Fe(SO<sub>4</sub>)<sub>3</sub>.

**Mariakrite, [Ca<sub>4</sub>Al<sub>2</sub>(OH)<sub>12</sub>(H<sub>2</sub>O)<sub>4</sub>][Fe<sub>2</sub>S<sub>4</sub>]**

Mariakrite (IMA2021-097; Mari) is a layered double hydroxide (LDH) mineral with a very unique chemical makeup, bearing intercalated dithioferate anionic chains, [Fe<sup>3+</sup>S<sub>2</sub>]<sup>-</sup>. The new mineral was discovered as a product of late hydrothermal alteration from an outcrop of “clinker-like” pyrometamorphic rocks near Hatrurim Junction (road #31), in the Hatrurim Basin, Negev Desert, Israel (Murashko et al. 2025). It occurs as millimeter-sized crystals in larnite-jasmundite-brownmillerite vugs. The name honors Maria Krzhizhanovskaya (b. 1973), Russian crystallographer and crystal chemist, for her contributions to the crystal chemistry of inorganic compounds and minerals, including LDH’s. Its structure is built from hydrocalumite-like LDH layers, intercalated with chains of iron disulfide formed from FeS<sub>4</sub> tetrahedra, and linked to the layers by H··S hydrogen bonds.

**Olgafrankite, Ni<sub>3</sub>Ge**

Olgafrankite (IMA2024-048; Ofk) is a new germanide mineral described from the Dzhaltul intrusion in Siberia, Russia (Vereshchagin et al. 2025b). A phase likely corresponding to Ni<sub>3</sub>Ge was earlier encountered by Berlin et al. (2001) in the Rumuruti meteorite but could not be adequately characterized for approval as a new mineral species. Olgafrankite was discovered in samples of a highly reduced basalt hosting an unusual mineral assemblage, consisting of native iron, ilmenite, Ge-rich taenite, graphite, cohenite, and native copper, among other minerals, with scarce Co and Ni minerals, including cobaltpentlandite, pentlandite, and heazlewoodite. The description of olgafrankite is also noteworthy in that the authors made use of synthetic material for property determinations that were not feasible with natural samples and deposited the studied samples as anthropotype material alongside the holotype specimen. Anthropotypes were officially recognized as type material by the IMA-CNMNC in 2019 (Miyawaki et al. 2019). The new mineral is named for Olga Victorovna Frank-Kamenetskaya (b. 1945) of Saint Petersburg State University, Russia, a respected crystallographer specializing in biomineralogy and organic mineralogy.

**Paulišite, Ca<sub>2</sub>Zn(CO<sub>3</sub>)<sub>3</sub>·2H<sub>2</sub>O**

Paulišite (IMA2023-031; Plš) is a new supergene Ca-Zn-carbonate hydrate with a novel structure. Chemically, it is closely related to minrecordite, CaZn(CO<sub>3</sub>)<sub>2</sub>, the Zn analog of dolomite (Sejkora et al. 2025). The structure is built from chains of Zn tetrahedra and carbonate, bound by columns of Ca forming {001} heteropolyhedral layers. The new mineral was discovered on the first level of the Staročeské Lode, near Kutná Hora, Central Bohemian Region, Czech Republic, occurring as nearly centimeter-thick crusts of radial and parallel aggregates of colorless to white acicular crystals. The name honors Czech mineralogist, engineer, and geologist Petr Pauliš (b. 1956) from Kutná Hora, central Bohemia, Czech Republic, for his mineralogical and economic geological work in the Kutná Hora ore district.

**Rubinite, Ca<sub>3</sub>Ti<sub>2</sub><sup>3+</sup>(SiO<sub>4</sub>)<sub>3</sub>**

Rubinite (IMA2016-110; Rbi) is a new calcium and trivalent titanium garnet group species described from the Allende, Efremovka, and Vigarano CV3 carbonaceous chondrite meteorites (Ma et al. 2025). Galuskin et al. (2025) recently documented terrestrial rubinite from the Hatrurim complex in Israel—each of these occurrences required a highly reducing environment for the production of Ti<sup>3+</sup>. Another garnet group mineral, morimotoite, Ca<sub>3</sub>(Ti<sup>4+</sup>Fe<sup>2+</sup>)(SiO<sub>4</sub>)<sub>3</sub>, also has essential Ti in the same structural environment as Ti in rubinite. However, Ti in

morimotoite is present as part of a coupled substitution with Fe<sup>2+</sup> to achieve a cumulative site charge of 6+. Rubinite is named for cosmochemist and meteoriticist Alan E. Rubin (b. 1953) of the University of California, Los Angeles.

### Svornostite-(NH<sub>4</sub>), (NH<sub>4</sub>)<sub>2</sub>Mg(UO<sub>2</sub>)<sub>2</sub>(SO<sub>4</sub>)<sub>4</sub>(H<sub>2</sub>O)<sub>8</sub>

The description of svornostite-(NH<sub>4</sub>) (IMA2024-068; Svo-NH4) established the svornostite group, thereby better delineating the close relationship of this mineral with others, including rietveldite (Kampf et al. 2025c). Two subgroups were introduced (the svornostite subgroup and rietveldite subgroup), and Levinson suffixes were added, leading to the renaming of svornostite, K<sub>2</sub>Mg[(UO<sub>2</sub>)(SO<sub>4</sub>)<sub>2</sub>]<sub>2</sub>(H<sub>2</sub>O)<sub>8</sub>, and oldsite, K<sub>2</sub>Fe<sup>2+</sup>[(UO<sub>2</sub>)(SO<sub>4</sub>)<sub>2</sub>]<sub>2</sub>(H<sub>2</sub>O)<sub>8</sub>, to svornostite-(K) and oldsite-(K), respectively. All members of the group are post-mining secondary phases formed from acidic solutions derived from decomposed sulfides, with (NH<sub>4</sub>)<sup>+</sup> derived from decaying organic matter or bacterial activity in the “asphaltum” ore-bearing layers.

### Zhonghongite, Cu<sub>29</sub>(As,Sb)<sub>12</sub>S<sub>33</sub>

Zhonghongite (IMA2023-046; Zhh), a new tetrahedrite derivative, was found in high-sulfidation skarn mineralization at the Jiama deposit, southern Tibet, China (Zheng et al. 2025). Zhonghongite is intimately associated with watanabeite and tetrahedrite as veined and massive aggregates up to several centimeters wide, forming as a paragenetic intermediate between these two phases. The three minerals are visually indistinguishable in white light. Like tetrahedrite, zhonghongite contains pyramidal AsS<sub>3</sub>, tetrahedral CuS<sub>4</sub>, and triangular CuS<sub>3</sub>, but each has higher dimensionality coordination to one another than in tetrahedrite. Zhonghongite additionally contains a unique As<sub>5</sub>S<sub>7</sub> cluster of pyramids not found in tetrahedrite. The mineral's name is in honor of Hong Zhong (1971–2023), former professor at the Institute of Geochemistry, Chinese Academy of Sciences.

### Zoharite, (Ba,K)<sub>6</sub>(Fe,Cu,Ni)<sub>25</sub>S<sub>27</sub> and Gmalimite, K<sub>6</sub>□Fe<sub>23</sub>S<sub>27</sub>

Zoharite (IMA2017-049; Zoh) and gmalimite (IMA2019-007; Gma) are alkaline and alkali iron sulfides in the djerfisherite group, named geographically after Mt. Zohar and Wadi Gmalim, a tributary of Wadi Hemar in the Hatrurim Basin, Israel (Galuskina et al. 2025). Both structures are cubic frameworks built from M<sub>2</sub>S<sub>14</sub> clusters (M = Fe, Cu, and Ni) connected by MS<sub>4</sub> tetrahedra. This connectivity forms channels filled by anion-centered polyhedra—SBa<sub>9</sub> in zoharite and SK<sub>9</sub> in gmalimite. Intermetallic bonds occur between nearby M<sub>2</sub>S<sub>14</sub> clusters due to their close overlap; this bonding configuration is also observed in pentlandite.

### Other recent minerals

Other recently published minerals include airdite (Elliott and Kampf 2025), allanite-(Sm) (Piecicka et al. 2025), amurselite (Kampf et al. 2025d), clino-ferro-suenoite (Holtstam et al. 2025), fluormacraeite (Grey et al. 2025), jianmuite (Borriello et al. 2025), moabite (Britvin et al. 2025b), nacareniobsite-(Nd) (Agakhanov et al. 2025), nioboixiolite-(□) (Li et al. 2025), skogbyite (Jonsson et al. 2025), and vargite (Langhof et al. 2025).

## RECENT NOMENCLATURE AND CLASSIFICATION CHANGES

Nomenclature schemes for the aeschynite and monazite groups were approved (see Bosi et al. 2025b), and the nolanite supergroup was approved and published (Chukanov et al. 2025).

## REFERENCES CITED

Agakhanov, A.A., Day, M.C., Sokolova, E., Karpenko, V.Y., Hawthorne, F.C., Pavlov, L.A., Kasatkin, A.V., Pekov, I.V., Belakovskiy, D.I., Agakhanova, V.A., and

- Britvin, S.N. (2025) Nacareniobsite-(Nd), Ca<sub>2</sub>(CaNd)Na<sub>3</sub>Nb(Si<sub>2</sub>O<sub>7</sub>)(OF)F<sub>2</sub>, a new rinkite-group (seidozerite-supergroup) mineral from the Darai-Pioz Alkaline Massif, Tajikistan: Description and crystal structure. *The Canadian Journal of Mineralogy and Petrology*, 63(2), 179–190, <https://doi.org/10.3749/2400033>.
- Andersson, S.S., Jonsson, E., and Sadeghi, M. (2024) A synthesis of the REE-Fe-polymetallic mineral system of the REE-line, Bergslagen, Sweden: New mineralogical and textural-paragenetic constraints. *Ore Geology Reviews*, 106275, <https://doi.org/10.1016/j.oregeorev.2024.106275>.
- Armbruster, T., Bonazzi, P., Akasaka, M., Bermanec, V., Chopin, C., Gieré, R., Heuss-Assbichler, S., Liebscher, A., Menchetti, S., Pan, Y., and Pasero, M. (2006) Recommended nomenclature of epidote-group minerals. *European Journal of Mineralogy*, 18, 551–567, <https://doi.org/10.1127/0935-1221/2006/0018-0551>.
- Balić-Zunić, T., Garavelli, A., Mitolo, D., Nestola, F., Pamato, M.G., Rasmussen, M.B., and Jolnæs, M.B. (2025) Heimaeyite, Na<sub>3</sub>Al(SO<sub>4</sub>)<sub>3</sub>, a new mineral from the fumaroles on Eldfell volcano, Iceland. *European Journal of Mineralogy*, 37(1), 79–89, <https://doi.org/10.5194/ejm-37-79-2025>.
- Biagioli, C., Sejkora, J., Moëlo, Y., Favreau, G., Bourgoïn, V., Boulliard, J.-C., Bonaccorsi, E., Mauro, D., Musetti, S., Pasero, M., Perchiazzi, N., and Ulmanová, J. (2025) Ginelfite, Ag<sub>2</sub>(Ag<sub>0.3</sub>Fe<sub>0.3</sub>)TlPb<sub>24.3</sub>(Sb,As)<sub>32.3</sub>S<sub>75.3</sub>, a new boxwork sulfosal from Jas Roux, France: occurrence and crystal structure. *European Journal of Mineralogy*, 37, 319–335, <https://doi.org/10.5194/ejm-37-319-2025>.
- Bonazzi, P., Holtstam, D., Bindi, L., Nysten, P., and Capitani, G. (2009) Multi-analytical approach to solve the puzzle of an allanite-subgroup mineral from Kessebol, Västra Götaland, Sweden. *American Mineralogist*, 94, 121–134, <https://doi.org/10.2138/am.2009.2998>.
- Borriello, R., Xiong, F., Ma, C., Lorenzon, S., Mugnaioli, E., Yang, J., Xu, X., and Grew, E.S. (2025) Jianmuite, ZrTi<sup>4+</sup>Ti<sup>3+</sup>Al<sub>0.6</sub>, a new mineral from the Allende meteorite and from chromitite near Kangjinla, Tibet, China. *American Mineralogist*, 110(4), 630–642, <https://doi.org/10.2138/am-2024-9362>.
- Bosi, F., Hatert, F., Pasero, M., and Mills, S.J. (2025a) IMA Commission on New Minerals, Nomenclature and Classification (CNMNC)—Newsletter 84. *European Journal of Mineralogy*, 37, 249–255, <https://doi.org/10.5194/ejm-37-249-2025>.
- Bosi, F., Hatert, F., Pasero, M., and Mills, S.J. (2025b) IMA Commission on New Minerals, Nomenclature and Classification (CNMNC)—Newsletter 85. *European Journal of Mineralogy*, 37, 337–342, <https://doi.org/10.5194/ejm-37-337-2025>.
- Britvin, S.N., Murashko, M.N., Krzhizhanovskaya, M.G., Vereshchagin, O.S., Vapnik, Y., Vlasenko, N.S., Shelukhina, Y.S., and Bocharov, V.N. (2025a) Hanswilkeite, KFeS<sub>2</sub>, a new peralkaline sulfide mineral. *American Mineralogist*, 110, 956–965, <https://doi.org/10.2138/am-2024-9494>.
- Britvin, S.N., Murashko, M.N., Krzhizhanovskaya, M.G., Vapnik, Y., Vlasenko, N.S., Vereshchagin, O.S., Pankin, D.V., and Vasiliev, E.A. (2025b) Moabite, NiFe<sup>3+</sup>(PO<sub>4</sub>)O, a new natural oxyphosphate. *European Journal of Mineralogy*, 37, 353–363, <https://doi.org/10.5194/ejm-37-353-2025>.
- Cempirek, J., Jonsson, E., Skřápková, L., Škoda, R., Kolitsch, U., Čopjaková, R., Groat, L.A., Kampf, A.R., Lussier, A.J., Hawthorne, F.C., and Haifler, J. (2025) Ertlite, NaAl<sub>4</sub>Al<sub>6</sub>(Si<sub>4</sub>B<sub>2</sub>O<sub>18</sub>)(BO<sub>3</sub>)<sub>3</sub>(OH)<sub>2</sub>O, a new mineral species of the tourmaline supergroup. *American Mineralogist*, in press, <https://doi.org/10.2138/am-2025-9816>.
- Chukanov, N.V., Gridchina, V.M., Rastsvetaeva, R.K., Zubkova, N.V., and Pekov, I.V. (2025) Nolanite supergroup of minerals: nomenclature and classification. *European Journal of Mineralogy*, 37, 133–142, <https://doi.org/10.5194/ejm-37-133-2025>.
- Elliott, P., and Kampf, A.R. (2025) Airdite, Sr(V<sup>4+</sup>)<sub>2</sub>(PO<sub>4</sub>)<sub>2</sub>·4H<sub>2</sub>O, a New Mineral from the Spring Creek Copper Mine, South Australia, Australia. *The Canadian Journal of Mineralogy and Petrology*, 63(2), 191–192, <https://doi.org/10.3749/2400022>.
- Galuskin, E.V., Galuskina, I.O., Kusz, J., Vapnik, Y., and Zieliński, G. (2025) Discovery of terrestrial rubinite, Ca<sub>3</sub>Ti<sup>3+</sup>Si<sub>3</sub>O<sub>12</sub>, super-reduced garnet from the Hatrurim Complex, Israel. *Mineralogical Magazine*, 1–20, <https://doi.org/10.1180/mgm.2025.3>.
- Galuskina, I.O., Krüger, B., Galuskin, E.V., Krüger, H., Vapnik, Y., Murashko, M., Banasik, K., and Agakhanov, A.A. (2025) Zoharite, (Ba,K)<sub>6</sub>(Fe,Cu,Ni)<sub>25</sub>S<sub>27</sub>, and Gmalimite, K<sub>6</sub>□Fe<sub>23</sub>S<sub>27</sub>—New djerfisherite group minerals from gehlenite-wollastonite paralava, Hatrurim Complex, Israel. *Minerals*, 15(6), 564, <https://doi.org/10.3390/min15060564>.
- Garvie, L.A. (2003) Decay-induced biomineralization of the saguaro cactus (*Carnegiea gigantea*). *American Mineralogist*, 88, 1879–1888.
- Grey, I.E., Rewitzer, C., Hochleitner, R., Kampf, A.R., Boer, S., Mumme, W.G., Wilson, N.C., and Davidson, C.J. (2025) Fluormacraeite, [(H<sub>2</sub>O)K]Mn<sub>2</sub>(Fe<sub>2</sub>Ti)(PO<sub>4</sub>)<sub>4</sub>(OF)(H<sub>2</sub>O)10·4H<sub>2</sub>O, the first type mineral from the Plößberg pegmatite, Upper Palatinate, Bavaria, Germany. *European Journal of Mineralogy*, 37, 169–179, <https://doi.org/10.5194/ejm-37-169-2025>.
- Holtstam, D., Cámara, F., Skogby, H., Karlsson, A., and De Leo, A. (2025) The fate of an old Mn-Fe amphibole species: description of clino-ferro-suenoite, □Mn<sub>2</sub>Fe<sub>2</sub><sup>3+</sup>Si<sub>6</sub>O<sub>22</sub>(OH)<sub>2</sub>. *European Journal of Mineralogy*, 37, 221–231, <https://doi.org/10.5194/ejm-37-221-2025>.
- Jonsson, E., Hålenius, U., Majka, J., and Bosi, F. (2025) Skogbyite, Zr(Mg<sub>2</sub>Mn<sup>4+</sup>)

- SiO<sub>12</sub>, a new zirconium mineral in the braunite group from Långban, Bergslagen, Sweden, *European Journal of Mineralogy*, 37, 269–277, <https://doi.org/10.5194/ejm-37-269-2025>.
- Kampf, A.R., Adams, P.M., and Ma, C. (2025a) Cabrerite, NiMg<sub>2</sub>(AsO<sub>4</sub>)<sub>2</sub>·8H<sub>2</sub>O, a new old mineral: The ordered intermediate between annabergite and hörnesite. *American Mineralogist*, 110, 643–649, <https://doi.org/10.2138/am-2024-9498>.
- Kampf, A.R., Chi, M., and Marty, J. (2025b) Chinleite-(Ce), NaCe(SO<sub>4</sub>)(H<sub>2</sub>O), a new mineral from the Blue Streak Mine, Montrose County, Colorado, USA. *The Canadian Journal of Mineralogy and Petrology*, 63, 199–204, <https://doi.org/10.3749/2400030>.
- Kampf, A.R., Olds, T.A., Plášil, J., Ma, C., Celestian, A.J., and Marty, J. (2025c) Svornostite-(NH<sub>4</sub>), (NH<sub>4</sub>)<sub>2</sub>Mg(UO<sub>2</sub>)<sub>2</sub>(SO<sub>4</sub>)<sub>4</sub>(H<sub>2</sub>O)<sub>8</sub>, a new mineral from the Blue Lizard mine, San Juan County, Utah, USA, and the establishment of the svornostite mineral group. *Mineralogical Magazine*, 1–24, <https://doi.org/10.1180/mgm.2025.19>.
- Kampf, A.R., Olds, T.A., Emproto, C., Ma, C., and Marty, J. (2025d) Amurselite, a new uranyl selenite from the Burro Mine, San Miguel County, Colorado, USA. *The Canadian Journal of Mineralogy and Petrology*, 63(3), 305–315, <https://doi.org/10.3749/2500004>.
- Langhof, J., Holtstam, D., Bindi, L., Karlsson, A., and Jonsson, E. (2025) Introducing the akrochordite mineral group, with the new mineral vargite from the Långban Mn-Fe deposit, Filipstad, Värmland, Sweden. *Journal of the Geological Society of Sweden*, 1–8, <https://doi.org/10.1080/11035897.2024.2391277>.
- Li, Y., Ke, C., Wang, D., Peng, Z., Zhao, Y., Li, R., Chen, Z., Li, G., Yu, H., Zhang, L., Guo, B., and Gao, Y. (2025) Nioboixiolite-(□)(Nb<sub>0.8</sub>□<sub>2</sub>)<sup>4+</sup>O<sub>3</sub>, a new mineral species from the Bayan Obo World-Class REE-Fe-Nb deposit, Inner Mongolia, China. *Minerals*, 15(1), 88, <https://doi.org/10.3390/min15010088>.
- Ma, C., Yoshizaki, T., Krot, A.N., Beckett, J.R., Nakamura, T., Nagashima, K., Muto, J., Ivanova, M.A., and Ulyanov, A.A. (2025) Rubinite, Ca<sub>3</sub>Ti<sub>2</sub><sup>3+</sup>Si<sub>3</sub>O<sub>12</sub>, a new mineral in CV3 carbonaceous chondrites and a refractory garnet from the solar nebula. *American Mineralogist*, 110(3), 489–500, <https://doi.org/10.2138/am-2024-9435>.
- Miyawaki, R., Hatert, F., Pasero, M., and Mills, S.J. (2019) *New Minerals, Nomenclature and Classification (CNMNC)*, Newsletter 50. New minerals and nomenclature modifications approved in 2019. *Mineralogical Magazine*, 83, 615–620. <https://doi.org/10.1180/mgm.2019.46>.
- Murashko, M.N., Vapnik, Y., Vlasenko, N.S., Vereshchagin, O.S., Shelukhina, Y.S., Pekov, I.V., and Britvin, S.N. (2025) Mariakrite, [Ca<sub>4</sub>Al<sub>2</sub>(OH)<sub>12</sub>(H<sub>2</sub>O)<sub>4</sub>][Fe<sub>2</sub>S<sub>4</sub>], a new mineral, the first layered double hydroxide intercalated with dithioferrate (iron disulfide) chains. *American Mineralogist*, in press, <https://doi.org/10.2138/am-2024-9624>.
- Pieczka, A., Gołębiewska, B., Włodek, A., Stachowicz, M., Jokubauskas, P., Kotowski, J., Nejbart, K., Szuszkiewicz, A., and Woźniak, K. (2025) Allanite-(Sm), CaSm(Al<sub>2</sub>Fe<sup>3+</sup>)(Si<sub>2</sub>O<sub>7</sub>)(SiO<sub>3</sub>)O(OH), the third samarium mineral from Jordanów Śląski, Lower Silesia, Poland. *American Mineralogist*, 110(5), 808–819, <https://doi.org/10.2138/am-2024-9453>.
- Sejkora, J., Biagioni, C., Dolničec, Z., Škoda, R., and Ederová, J. (2025) Paulišite, Ca<sub>2</sub>Zn(CO<sub>3</sub>)<sub>2</sub>·2H<sub>2</sub>O, a new mineral with a novel crystal structure. *American Mineralogist*, 110(3), 480–488, <https://doi.org/10.2138/am-2024-9418>.
- Vereshchagin, O.S., Britvin, S.N., Pankin, D.V., Zelenskaya, M.S., Krzhizhanovskaya, M.G., Kuz'mina, M.A., Vlasenko, N.S., and Frank-Kamenetskaya, O.V. (2025a) Andreybulakhite, Ni(C<sub>2</sub>O<sub>4</sub>)<sub>2</sub>·2H<sub>2</sub>O, the first natural nickel oxalate. *European Journal of Mineralogy*, 37, 63–74, <https://doi.org/10.5194/ejm-37-63-2025>.
- Vereshchagin, O.S., Khmel'nitskaya, M.O., Kopylova, A.G., Solov'eva, Y.V., Krzhizhanovskaya, M.G., Kasatkin, A.V., Gorelova, L.A., Vlasenko, N.S., and Britvin, S.N. (2025b) Olgafrankite, Ni<sub>3</sub>Ge, a new mineral, the carrier of siderophile germanium in reduced systems. *American Mineralogist*, in press, <https://doi.org/10.2138/am-2024-9714>.
- Xue, Y., Li, G., and Xie, Y. (2020) Wumuite (KAl<sub>0.33</sub>W<sub>2.67</sub>O<sub>9</sub>)—a new mineral with an HTB-type structure from the Panzhihua–Xichang region in China. *European Journal of Mineralogy*, 32(5), 483–494, <https://doi.org/10.5194/ejm-32-483-2020>.
- Zheng, S.-J., Gu, X.-P., Bai, Z.-J., and Zhang, Z.-K. (2025) Zhonghongite, Cu<sub>29</sub>(As,Sb)<sub>12</sub>S<sub>33</sub>, a new mineral from the high-sulfidation vein of Jiama porphyry system, Tibet, China. *American Mineralogist*, 110, 312–318, <https://doi.org/10.2138/am-2024-9338>.