

Cleavable, massive to granular massive and compact. Also globular and botryoidal, with columnar structure, sometimes indistinct; incrusting.

Cleavage: *r* perfect. Fracture uneven. Brittle. *H.* = 3.5–4.5. *G.* = 3.45–3.60 and higher. Luster vitreous, inclining to pearly. Color shades of rose-red; yellowish gray, fawn-colored, dark red, brown. Streak white. Translucent to subtranslucent. Optically —.

**Comp.**—Manganese protocarbonate,  $MnCO_3$  = Carbon dioxide 38.3, manganese protoxide 61.7 = 100. Iron carbonate is usually present even up to 40 p. c., as in *manganosiderite*; sometimes the carbonate of calcium, as in *manganocalcite*, also magnesium, zinc, and rarely cobalt.

**Pyr., etc.**—B.B. changes to gray, brown, and black, and decrepitates strongly, but is infusible. With salt of phosphorus and borax in O.F. gives an amethystine-colored bead, in R.F. becomes colorless. With soda on platinum foil a bluish-green manganate. Dissolves with effervescence in warm hydrochloric acid. On exposure to the air changes to brown, and some bright rose-red varieties become paler.

**Diff.**—Characterized by its pink color, rhombohedral form and cleavage, effervescence in acids.

**Obs.**—Occurs commonly in veins along with ores of silver, lead and copper, and with other ores of manganese. Found at Schemnitz and Kapnik in Hungary; Nagyág in Transylvania; at Freiberg in Saxony; at Diez near Oberneisen in Nassau; at Daaden, Rheinprovinz; at Moët-Fontaine in the Ardennes, Belgium. In the U. S., at Branchville, Conn.; in New Jersey, with franklinite at Mine Hill, Franklin Furnace. In Colorado, at the John Reed mine, Alamosa, Lake Co., in beautiful clear rhombohedrons; also at the Oulay mine, near Lake City. In Montana, at Butte City. Abundant at the silver mines of Austin, Nevada. At Placentia Bay, Newfoundland.

Named *rhodochrosite* from *ῥόδον*, a *rose*, and *χρῶσις*, *color*; and *dialogite*, from *διαλογή*, *doubt*.

**SMITHSONITE.** Calamine pt. Zinkspath. Dry-bone *Miners*.

Rhombohedral. Axis *c* = 0.8063. *rr'* = 72° 20'. Rarely well crystallized; faces *r* generally curved and rough. Usually reniform, botryoidal, or stalactitic, and in crystalline incrustations; also granular, and sometimes impalpable, occasionally earthy and friable.

Cleavage: *r* perfect. Fracture uneven to imperfectly conchoidal. Brittle. *H.* = 5. *G.* = 4.30–4.45. Luster vitreous, inclining to pearly. Streak white. Color white, often grayish, greenish, brownish white, sometimes green, blue and brown. Subtransparent to translucent. Optically —.

**Comp.**—Zinc carbonate,  $ZnCO_3$  = Carbon dioxide 35.2, zinc protoxide 64.8 = 100. Iron carbonate is often present (as in *monheimite*); also manganese and cobalt carbonates; further calcium and magnesium carbonates in traces; rarely cadmium and indium.

**Pyr., etc.**—In the closed tube loses carbon dioxide, and, if pure, is yellow while hot and white on cooling. B.B. infusible; moistened with cobalt solution and heated in O.F. gives a green color on cooling. With soda on charcoal coats the coal with the oxide, which is yellow while hot and white on cooling; this coating, moistened with cobalt solution, gives a green color after heating in O.F. Soluble in hydrochloric acid with effervescence.

**Diff.**—Distinguished from calamine, which it often closely resembles by its effervescence in acids.

**Obs.**—Found both in veins and beds, especially in company with galena and sphalerite; also with copper and iron ores. It usually occurs in calcareous rocks, and is generally associated with calamine, and sometimes with limonite. It is often produced by the action upon zinc sulphide of carbonated waters.

Found at Nerchinsk in Siberia; at Dognaczka in Hungary; Bleiberg and Raibel in Carinthia; Wiesloch in Baden; Moresnet in Belgium; Altenberg. In the province of Santander, Spain, at Puente Viesgo. In England, at Roughten Gill, Alston Moor, near Matlock, in the Mendip Hills, and elsewhere; in Ireland, at Donegal. At Laurion, Greece, varieties of many colors.

In the U. States, in *Penn.*, at Lancaster abundant, the var. called "dry-bone"; at the Ueberroth mine, near Bethlehem, in scalenohedrons. In *Wisconsin*, at Mineral Point, Shullsburg, etc., pseudomorphs after sphalerite and calcite. In *Minnesota*, at Ewing's diggings, N. W. of Dubuque, etc. In south-western *Missouri* associated with sphalerite and calamine. In *Arkansas*, at Calamine, Lawrence Co.; in Marion Co. A pink cobaltiferous variety occurs at Boleo, Lower California.

Named after James Smithson (1754–1829), who founded the Smithsonian Institution in Washington. The name calamine is frequently used in England, cf. calamine, p. 446.

**Sphærocobaltite.** Cobalt protocarbonate,  $CoCO_3$ . Kobaltspath *Germ.* Rhombohedral. In small spherical masses, with crystalline surface, rarely in crystals. *G.* = 4.02–4.13. Color rose-red. From Schneeberg, Saxony.

## 2. Aragonite Group. $RCO_3$ . Orthorhombic.

For list of species, see p. 353.

### ARAGONITE.

Orthorhombic. Axes  $a : b : c = 0.62244 : 1 : 0.72056$ .

*mm''*,  $110 \wedge \bar{1}10 = 63^\circ 48'$ .

*kk'*,  $011 \wedge 0\bar{1}1 = 71^\circ 33'$ .

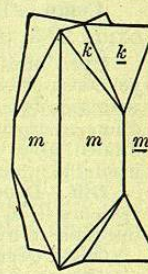
*pp'*,  $111 \wedge \bar{1}\bar{1}1 = 86^\circ 24\frac{1}{2}'$ .

*pp''*,  $111 \wedge \bar{1}\bar{1}1 = 50^\circ 27'$ .

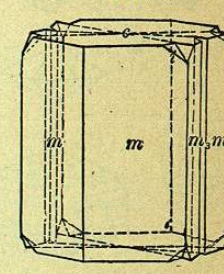
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709.



710.



Crystals often acicular, and characterized by the presence of acute domes or pyramids. Twins: tw. pl. *m* commonly repeated, producing pseudo-hexagonal forms (see p. 127, Figs. 398, 399 and 710). Also globular, reniform, and coralloidal shapes; sometimes columnar, straight or divergent; also stalactitic; incrusting.

Cleavage: *b* distinct; also *m*; *k* (011) imperfect. Fracture subconchoidal. Brittle. *H.* = 3.5–4. *G.* = 2.93–2.95. Luster vitreous, inclining to resinous on surfaces of fracture. Color white; also gray, yellow, green and violet; streak uncolored. Transparent to translucent. Optically —. Ax. pl.  $\parallel a$ .  $Bx \perp c$ . Dispersion  $\rho > v$  small.  $2E_y = 30^\circ 54'$ .  $\beta_y = 1.6816$ .

**Comp.**—Calcium carbonate,  $CaCO_3$  = Carbon dioxide 44.0, lime 56.0 = 100. Some varieties contain a little strontium, others lead, and rarely zinc.

**Var.**—*Ordinary.* (a) Crystallized in simple or compound crystals, the latter much the most common; often in radiating groups of acicular crystals. Columnar; also fine fibrous with silky luster. (c) Massive.

*Stalactitic* or *stalagmitic*: Either compact or fibrous in structure, as with calcite; *Sprudelstein* is stalactitic from Carlsbad. *Coralloidal*: In groupings of delicate interlacing and coalescing stems, of a snow-white color, and looking a little like coral; often called *Flosterferri* (Eisenblüthe *Germ.*). *Tarnowitzite* is a kind containing lead carbonate (4 to 8 p. c.), from Tarnowitz in Silesia; with *G.* = 2.99.

**Pyr., etc.**—B.B. whitens and falls to pieces, and sometimes, when containing strontia, imparts a more intensely red color to the flame than lime; otherwise reacts like calcite.

**Diff.**—Distinguished from calcite by higher specific gravity and absence of rhombohedral cleavage; from the zeolites (e.g., natrolite), etc., by effervescence in acid. Strontianite and witherite are fusible, higher in specific gravity and yield distinctive flames B.B. The resinous luster on fracture surfaces is to be noted.

**Obs.**—The most common repositories of aragonite are beds of gypsum; also beds of iron ore, as the Styrian mines, where it occurs in coralloidal forms, and is denominated *flosterferri*, "flower of iron"; in basalt; occasionally it occurs in lavas; often associated with copper and iron pyrites, galena, and malachite. It constitutes the pearly layer of shells.

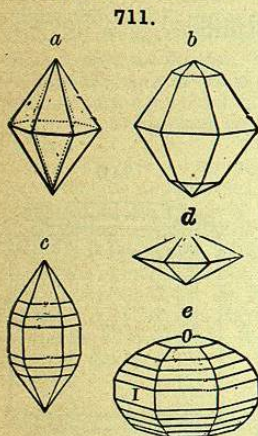


First discovered in Aragon, Spain (whence its name), at Molina and Valencia, in six-sided prisms, with gypsum. Prominent localities are Bilin, Bohemia; Leogang in Salzburg, Austria; Herregrund, Hungary; with sulphur in Sicily in fine prisms; also at Alston Moor, fine tapering crystals.

In fibrous crusts at Hoboken, N. J.; at Edenville and Rossie, N. Y.; Wood's Mine, Lancaster Co., Penn.; Warsaw, Ill., lining geodes; Mine-la-Motte, Mo., in crystals. *Floesferri* in the Organ Mts., New Mexico.

**WITHERITE.**

Orthorhombic. Axes  $\tilde{a} : \tilde{b} : \tilde{c} = 0.6032 : 1 : 0.7302$ . Crystals always repeated twins, simulating hexagonal pyramids, Fig. 711 (cf. Fig. 557, p. 227). Also massive, columnar or granular.



Cleavage:  $\tilde{b}$  distinct;  $\tilde{m}$  imperfect. Fracture uneven. Brittle. H. = 3-75. G. = 4.27-4.35. Luster vitreous, inclining to resinous on surfaces of fracture. Color white, yellowish, grayish. Streak white. Sub-transparent to translucent.

**Comp.**—Barium carbonate,  $\text{BaCO}_3 = \text{Carbon dioxide } 22.3, \text{ baryta } 77.7 = 100$ .

**Pyr., etc.**—B.B. fuses at 2 to a bead, coloring the flame yellowish green; after fusion reacts alkaline. B.B. on charcoal with soda fuses easily, and is absorbed by the coal. Soluble in dilute hydrochloric acid; this solution, even when very much diluted, gives with sulphuric acid a white precipitate which is insoluble in acids.

**Diff**—Distinguished by its high specific gravity; effervescence in acid; green coloration of the flame B.B. Barite is insoluble in hydrochloric acid.

**Obs.**—Occurs at Alston Moor in Cumberland, with galena; at Fallowfield near Hexham in Northumberland; Tarnowitz in Silesia; Leogang in Salzburg; near Lexington, Kentucky, with barite. In a silver-bearing vein near Rabbit Mt., Thunder Bay, L. Superior.

**Bromlite.**  $(\text{Ba,Ca})\text{CO}_3$ . In pseudohexagonal pyramids (Figs. 558, 559, p. 227). Bromley Hill, near Alston, Cumberland.

**STRONTIANITE.**

Orthorhombic. Axes  $\tilde{a} : \tilde{b} : \tilde{c} = 0.6090 : 1 : 0.7239$ .

Crystals often acicular or acute spear-shaped, like aragonite. Twins: tw. pl.  $\tilde{m}$  common. Also columnar, fibrous and granular.

Cleavage:  $\tilde{m}$  nearly perfect;  $\tilde{b}$  in traces. Fracture uneven. Brittle. H. = 3.5-4. G. = 3.680-3.714. Luster vitreous; inclining to resinous on faces of fracture. Color pale asparagus-green, apple-green; also white, gray, yellow, and yellowish brown. Streak white. Transparent to translucent. Optically —. Ax. pl.  $\parallel \tilde{b}$ . Bx  $\perp \tilde{c}$ . Dispersion  $\rho < \nu$  small.  $2E_r = 12^\circ 17'$ .

**Comp.**—Strontium carbonate,  $\text{SrCO}_3 = \text{Carbon dioxide } 29.9, \text{ strontia } 70.1 = 100$ . A little calcium is sometimes present.

**Pyr., etc.**—B.B. swells up, throws out minute sprouts, fuses only on the thin edges, and colors the flame strontia-red; the assay reacts alkaline after ignition. Moistened with hydrochloric acid and treated either B.B. or in the naked lamp gives an intense red color. Soluble in hydrochloric acid; the dilute solution when treated with sulphuric acid gives a white precipitate.

**Diff.**—Differs from related minerals, not carbonates, in effervescing with acids; has a higher specific gravity than aragonite and lower than witherite; colors the flame red B.B.

**Obs.**—Occurs at Strontian in Argyllshire; in Yorkshire, England; Clausthal in the Harz; Bräunsdorf, near Freiberg, Saxony; Leogang in Salzburg; near Brixlegg, Tyrol

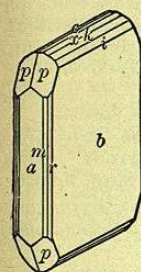
(*calciostrontianite*); in fine crystals near Hamm, Westphalia; at the Wilhelmine mine near Altahlen, Westphalia.

In the U. States, occurs at Schoharie, N. Y.; at Muscalonge Lake; Chaumont Bay and Theresa, in Jefferson Co., N. Y., Mifflin Co., Penn.

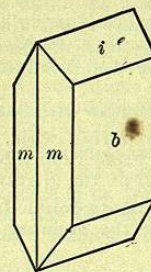
**CERUSSITE.** White Lead Ore. Weissbleierz *Germ.*

Orthorhombic. Axes  $\tilde{a} : \tilde{b} : \tilde{c} = 0.60997 : 1 : 0.72300$ .

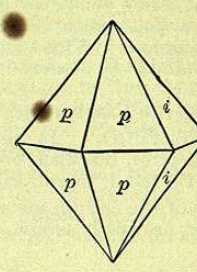
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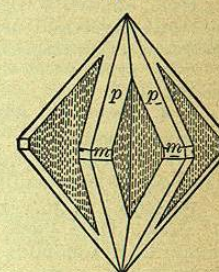
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$$mm''', 110 \wedge \bar{1}\bar{1}0 = 62^\circ 46'$$

$$kk', 011 \wedge 0\bar{1}\bar{1} = 71^\circ 44'$$

$$\tilde{w}\tilde{w}', 021 \wedge 0\bar{2}\bar{1} = 110^\circ 40'$$

$$cp, 000 \wedge 111 = 54^\circ 14'$$

$$pp', 111 \wedge \bar{1}\bar{1}\bar{1} = 87^\circ 42'$$

$$pp''', 111 \wedge \bar{1}\bar{1}\bar{1} = 49^\circ 59\frac{1}{2}'$$

Simple crystals often tabular  $\parallel \tilde{b}$ , prismatic  $\parallel \tilde{a}$ ; also pyramidal. Twins: tw. pl.  $\tilde{m}$ , very common, contact- and penetration-twins, often repeated yielding six-rayed stellate groups. Crystals grouped in clusters, and aggregates. Rarely fibrous, often granular massive and compact; earthy. Sometimes stalactitic.

Cleavage:  $\tilde{m}$  and  $\tilde{i}$  (021) distinct;  $\tilde{b}$  and  $\tilde{x}$  (012) in traces. Fracture conchoidal. Very brittle. H. = 3-3.5. G. = 6.46-6.574. Luster adamantine, inclining to vitreous, resinous, or pearly; sometimes submetallic. Color white, gray, grayish black, sometimes tinged blue or green (copper); streak uncolored. Transparent to subtranslucent. Optically —. Ax. pl.  $\parallel \tilde{b}$ . Bx  $\perp \tilde{c}$ . Dispersion  $\rho > \nu$  large. Indices and axial angles, Schrauf:

Line D	$\alpha$	$\beta$	$\gamma$	$2V$	$2E$
	1.80368	2.07628	2.07803	$\therefore 8^\circ 14'$	$17^\circ 8'$

**Comp.**—Lead carbonate,  $\text{PbCO}_3 = \text{Carbon dioxide } 16.5, \text{ lead oxide } 83.5 = 100$ .

**Pyr., etc.**—In the closed tube decrepitates, loses carbon dioxide, turns first yellow, and at a higher temperature dark red, but becomes again yellow on cooling. B.B. on charcoal fuses very easily, and in R.F. yields metallic lead. Soluble in dilute nitric acid with effervescence.

**Diff**—Characterized by high specific gravity and adamantine luster; also by yielding lead B.B. Unlike anglesite, it effervesces with nitric acid.

**Obs.**—Occurs in connection with other lead minerals, and is formed from galena, which, as it passes to a sulphate, may be changed to carbonate by means of solutions of calcium bicarbonate. It is found at Johannegeorgenstadt in beautiful crystals; Monte Ponì, Sardinia; Friedrichsseen, Nassau; Badenweiler, Baden; at Clausthal in the Harz; at Bleiberg in Carinthia; in England, in Cornwall; at E. Tamar mine, Devonshire; near Matlock and Wirksworth, Derbyshire; at Leadhills and Wanlockhead, Scotland.

Found in Penn., at Phenixville. In Virginia, at Austin's mines, Wythe Co. In N. Carolina, in King's mine. In Wisconsin and other lead mines of the northwestern States, rarely in crystals; at Hazelgreen, crystals coating galena. In Colorado, at Leadville, and elsewhere. In Arizona, at the Flux mine, Pima Co., in large crystalline masses; in crystals at the Red Cloud mine, Yuma Co.



**BARYTOCALCITE.**

Monoclinic. Axes  $a : b : c = 0.7717 : 1 : 0.6254$ ;  $\beta = 73^\circ 52'$ . In crystals; also massive.

Cleavage:  $m$  perfect;  $c$  less so. Fracture uneven to subconchoidal. Brittle.  $H. = 4$ .  $G. = 3.64-3.66$ . Luster vitreous, inclining to resinous. Color white, grayish, greenish or yellowish. Streak white. Transparent to translucent.

**Comp.**—Carbonate of barium and calcium,  $BaCO_3 \cdot CaCO_3 =$  Carbon dioxide 29.6, baryta 51.5, lime 18.9 = 100.

**Pyr., etc.**—B.B. colors the flame yellowish green, and at a high temperature fuses on the thin edges and assumes a pale green color; the assay reacts alkaline after ignition. With the fluxes reacts for manganese. With soda on charcoal the lime is separated as an infusible mass, while the remainder is absorbed by the coal. Soluble in dilute hydrochloric acid.

**Obs.**—Occurs at Alston Moor in Cumberland, in limestone with barite and fluorite.

**Bismutosphärite.**  $Bi_2(CO_3)_3 \cdot 2Bi_2O_3$ . In spherical forms with radiated structure.  $G. = 7.42$ . Color yellow to gray or blackish brown. From Schneeberg, Saxony. Also sparingly at Willimantic and Portland, Conn., as a result of the alteration of bismuthinite.

**Parisite.** A fluocarbonate of the cerium metals. In acute double hexagonal pyramids.  $H. = 4.5$ .  $G. = 4.358$ . Color brownish yellow. From the emerald mines of the Muso valley, U. S. Colombia.

**Bastnäsite.** Hamartite. A fluocarbonate of the cerium metals  $(RF)CO_3$ . Color wax-yellow to reddish brown. From the Bastnäs mine, Riddarhyttan, Sweden. Also as an alteration product of tysonite in the granite of the Pike's Peak region in Colorado.

**PHOSGENITE.**

Tetragonal. Axis  $c = 1.0876$ . Crystals prismatic; sometimes tabular  $\parallel c$ .

Cleavage:  $m, a$  distinct; also  $c$ . Rather sectile.  $H. = 2.75-3$ .  $G. = 6.0-6.3$ . Luster adamantine. Color white, gray, and yellow. Streak white. Transparent to translucent. Optically +.

**Comp.**—Chlorocarbonate of lead,  $(PbCl)_2CO_3$  or  $PbCO_3 \cdot PbCl_2 =$  Lead carbonate 49.0, lead chloride 51.0 = 100.

**Pyr., etc.**—B.B. melts readily to a yellow globule, which on cooling becomes white and crystalline. On charcoal in R.F. gives metallic lead, with a white coating of lead chloride. With a salt of phosphorus bead previously saturated with copper oxide gives the chlorine reaction. Dissolves with effervescence in dilute nitric acid.

**Obs.**—At Cromford near Matlock in Derbyshire; at Gibbas, Monte Poni and Montevocchio in Sardinia.

**Northupite.**  $MgCO_3 \cdot Na_2CO_3 \cdot NaCl$ . In isometric octahedrons. White to yellow or gray. From Borax Lake, San Bernardino Co., California.

**B. Acid, Basic, and Hydrated Carbonates.**

**Teschemacherite.** Acid ammonium carbonate,  $HNH_4CO_3$ . In yellowish to white crystals.  $G. = 1.45$ . From guano deposits of Africa, Patagonia, the Chincha Islands.

**MALACHITE.**

Monoclinic. Axes  $a : b : c = 0.8809 : 1 : 0.4012$ ;  $\beta = 61^\circ 50'$ .

Crystals rarely distinct, usually slender, acicular prisms ( $mm''' = 75^\circ 40'$ ), grouped in tufts and rosettes. Twins: tw. pl.  $a$  common. Commonly massive or incrusting, with surface botryoidal, or stalactitic, and structure divergent; often delicately compact fibrous, and banded in color; frequently granular or earthy.

Cleavage:  $c$  perfect;  $b$  less so. Fracture subconchoidal, uneven. Brittle.  $H. = 3.5-4$ .  $G. = 3.9-4.03$ . Luster of crystals adamantine, inclining to

vitreous; of fibrous varieties more or less silky; often dull and earthy. Color bright green. Streak paler green. Translucent to subtranslucent to opaque.

**Comp.**—Basic cupric carbonate,  $CuCO_3 \cdot Cu(OH)_2$  or  $2CuO \cdot CO_2 \cdot H_2O =$  Carbon dioxide 19.9, cupric oxide 71.9, water 8.2 = 100.

**Pyr., etc.**—In the closed tube blackens and yields water. B.B. fuses at 2, coloring the flame emerald-green; on charcoal is reduced to metallic copper; with the fluxes reacts like cuprite. Soluble in acids with effervescence.

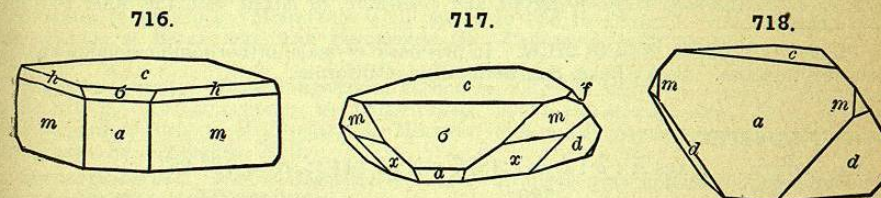
**Diff.**—Characterized by green color and copper reactions B.B.; differs from other copper ores of a green color in its effervescence with acids.

**Obs.**—Common with other ores of copper and as a product of their alteration; thus as a pseudomorph after cuprite and azurite. Occurs abundantly in the Ural; at Chessy in France; in Cornwall and in Cumberland, England; Rheinbreitbach; Dillenburg, Nassau; Betzdorf near Siegen. At the copper mines of Nizhni Tagilsk; with the copper ores of Cuba; Chili; at the Cobar mines and elsewhere in New South Wales; South Australia.

Occurs in *N. Jersey*, at Schuylers mines, and at New Brunswick. In *Pennsylvania*, at Cornwall, Lebanon Co.; at the Perkiomen and Phenixville lead-mines. In *Wisconsin*, at the copper mines of Mineral Point, and elsewhere. Abundantly in fine masses and acicular crystals, with calcite at the Copper Queen mine, Bisbee, Cochise Co., *Arizona*; also in Graham Co., at Morenci (6 m. from Clifton), in stalactitic forms of malachite and azurite in concentric bands. At the Santa Rita mines, Grant Co., and elsewhere in *New Mexico*. Tintic district, *Utah*. Named from  $\mu\alpha\lambda\alpha\chi\eta$ , *mallows*, in allusion to the green color.

**AZURITE.** Kupferlasur *Germ.*

Monoclinic. Axes:  $a : b : c = 0.8501 : 1 : 0.8805$ ;  $\beta = 87^\circ 36'$ .



$mm''', 110 \wedge 1\bar{1}0 = 80^\circ 41'$	$pp', 021 \wedge 0\bar{2}1 = 120^\circ 47'$
$ac, 100 \wedge 001 = 87^\circ 36'$	$cm, 001 \wedge 110 = 88^\circ 10'$
$c\sigma, 001 \wedge 101 = 44^\circ 46'$	$cd, 001 \wedge \bar{2}43 = 54^\circ 29'$
$ll', 023 \wedge 0\bar{2}3 = 60^\circ 47'$	$hh', 221 \wedge \bar{2}\bar{2}1 = 73^\circ 56'$

Crystals varied in habit and highly modified. Also massive, and presenting imitative shapes, having a columnar composition; also dull and earthy.

Cleavage:  $p$  (021) perfect but interrupted;  $a$  less perfect;  $m$  in traces. Fracture conchoidal. Brittle.  $H. = 3.5-4$ .  $G. = 3.77-3.83$ . Luster vitreous, almost adamantine. Color various shades of azure-blue, passing into Berlin-blue. Streak blue, lighter than the color. Transparent to subtranslucent.

**Comp.**—Basic cupric carbonate,  $2CuCO_3 \cdot Cu(OH)_2$  or  $3CuO \cdot 2CO_2 \cdot H_2O =$  Carbon dioxide 25.6, cupric oxide 69.2, water 5.2 = 100.

**Pyr., etc.**—Same as in malachite.

**Diff.**—Characterized by its blue color; effervescence in nitric acid; copper reactions B.B.

**Obs.**—Occurs in splendid crystallizations at Chessy, near Lyons, whence it derived the name *Chessy Copper* or *chessylite*. Also in fine crystals in Siberia; Moldavia in the Banat; at Wheel Buller, near Redruth in Cornwall; in Devonshire and Derbyshire, England; Cobar mines and elsewhere in New South Wales; South Australia.

Occurs in *Penn.*, at Phenixville, in crystals. In *N. Jersey*, near New Brunswick. In *Wisconsin*, near Mineral Point. In *Arizona*, at the Longfellow and other mines in Graham



Co.; with malachite in beautiful crystals at the Copper Queen mine, Bisbee. In Grant Co., *New Mexico*. At the Mammoth mine in the Tintic district, *Utah*. In *California*, Calaveras Co., at Hughes's mine, in crystals.

**Aurichalcite.** A basic carbonate of zinc and copper,  $2(\text{Zn,Cu})\text{CO}_3 \cdot 3(\text{Zn,Cu})\text{(OH)}_2$ . In drusy incrustations.  $G. = 3.54-3.64$ . Luster pearly. Color pale green to sky-blue. From the Altai; Chessy, near Lyons; Rezbánya, Hungary; and elsewhere. In the U. S., at Lancaster, Pa.; the Santa Caterina Mts., Arizona; Beaver Co., Utah.

**Hydrozincite.** A basic zinc carbonate, perhaps  $\text{ZnCO}_3 \cdot 2\text{Zn(OH)}_2$ . Massive, fibrous, earthy or compact, as incrustations.  $G. = 3.58-3.8$ . Color white, grayish or yellowish. Occurs at mines of zinc, as a result of alteration. In great quantities at the Dolores mine, Santander, Spain. In the U. S., at Friedensville, Pa.; at Linden, in Wisconsin.

**Hydrocerussite.** A basic lead carbonate, probably  $2\text{PbCO}_3 \cdot \text{Pb(OH)}_2$ . In thin colorless hexagonal plates. Occurs as a coating on native lead, at Långban, Sweden; with galena at Wanlockhead, Scotland.

**Dawsonite.** A basic carbonate of aluminium and sodium,  $\text{Na}_2\text{Al}(\text{CO}_3)_3 \cdot 2\text{Al(OH)}_3$ . In thin incrustations of white radiating bladed crystals.  $G. = 2.40$ . Found on a feldspathic dike near McGill College, Montreal. From the province of Siena, Pian Castagnaio, Tuscany.

**Thermonatrite.** Hydrous sodium carbonate,  $\text{Na}_2\text{CO}_3 + \text{H}_2\text{O}$ .  $G. = 1.5-1.6$ . Occurs in various lakes, and as an efflorescence over the soil in many dry regions.

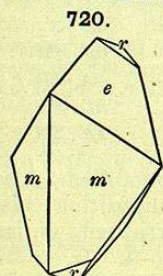
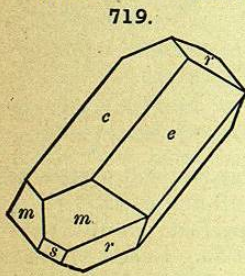
**Nesquehonite.** Hydrous magnesium carbonate,  $\text{MgCO}_3 + 3\text{H}_2\text{O}$ . In radiating groups of prismatic crystals.  $G. = 1.83-1.85$ . Colorless to white. From a coal mine at Nesquehoning, Schuylkill Co., Penn. See lansfordite, p. 367.

**Natron.** Hydrous sodium carbonate,  $\text{Na}_2\text{CO}_3 + 10\text{H}_2\text{O}$ . Occurring in nature only in solution, as in the soda lakes of Egypt, and elsewhere, or mixed with the other sodium carbonates.

**Pirssonite.**  $\text{CaCO}_3 \cdot \text{Na}_2\text{CO}_3 \cdot 2\text{H}_2\text{O}$ . In prismatic crystals, orthorhombic-hemimorphic. Colorless to white. Borax Lake, San Bernardino, California.

#### GAY-LUSSITE.

Monoclinic. Axes  $a : b : c = 1.4897 : 1 : 1.4442$ ;  $\beta = 78^\circ 27'$ .



$mm''$ ,  $110 \wedge \bar{1}\bar{1}0 = 111^\circ 10'$ .  
 $ee'$ ,  $011 \wedge 0\bar{1}1 = 109^\circ 30'$ .  
 $me$ ,  $110 \wedge 011 = 42^\circ 21'$ .  
 $rr'$ ,  $\bar{1}12 \wedge \bar{1}\bar{1}2 = 69^\circ 29'$ .

Crystals often elongated  $\parallel a$ ; also flattened wedge-shaped. Cleavage:  $m$  perfect;  $c$  rather difficult. Fracture conchoidal. Very brittle.  $H. = 2-3$ .  $G. = 1.93-1.95$ . Luster vitreous. Color white, yellowish white.

Streak uncolored to grayish. Translucent.

**Comp.**—Hydrous carbonate of calcium and sodium,  $\text{CaCO}_3 \cdot \text{Na}_2\text{CO}_3 + 5\text{H}_2\text{O}$  = Calcium carbonate 33.8, sodium carbonate 35.8, water 30.4 = 100.

**Pyr., etc.**—Heated in a closed tube decrepitates and becomes opaque. B.B. fuses easily to a white enamel, and colors the flame intensely yellow. Dissolves in acids with a brisk effervescence; partly soluble in water, and reddens turmeric paper.

**Obs.**—Abundant at Lagunilla, near Merida, in Venezuela, in crystals disseminated at the bottom of a small lake, in a bed of clay, covering *urao*. Also abundant in Little Salt Lake, or Soda Lake, in the Carson desert near Ragtown, Nevada, deposited upon the evaporation of the water. Named after Gay Lussac, the French chemist (1778-1850).

**Lanthanite.**  $\text{La}_2(\text{CO}_3)_3 + 9\text{H}_2\text{O}$ . In thin tabular crystals; also granular, earthy.  $G. = 2.605$ . Color grayish white, pink, yellowish. Found coating cerite at Bastnäs,

Sweden; with zinc ores of the Saucon valley, Lehigh Co., Pa.; at the Sandford iron-ore bed, Moriah, N. Y.

#### TRONA. Urao.

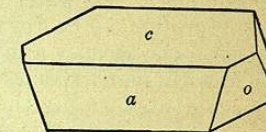
Monoclinic. Axes:  $a : b : c = 2.8460 : 1 : 2.9700$ ;  $\beta = 77^\circ 23'$ .

$ca$ ,  $001 \wedge 100 = 77^\circ 23'$ .

$co$ ,  $001 \wedge \bar{1}11 = 75^\circ 53\frac{1}{2}'$ .

$oo''$ ,  $\bar{1}11 \wedge 1\bar{1}\bar{1} = 47^\circ 35\frac{1}{2}'$ .

721.



Often fibrous or columnar massive.

Cleavage:  $a$  perfect;  $o$ ,  $c$  in traces. Fracture uneven to subconchoidal.  $H. = 2.5-3$ .  $G. = 2.11-2.14$ . Luster vitreous, glistening. Color gray or yellowish white. Translucent. Taste alkaline.

**Comp.**— $\text{Na}_2\text{CO}_3 \cdot \text{HNaCO}_3 + 2\text{H}_2\text{O}$  or  $3\text{Na}_2\text{O} \cdot 4\text{CO}_2 \cdot 5\text{H}_2\text{O}$  = Carbon dioxide 38.9, soda 41.2, water 19.9 = 100.

Chatard established the above composition for urao, and showed that trona, sometimes called "sesquicarbonate of soda," is an impure form of the same compound.

**Pyr., etc.**—In the closed tube yields water and carbon dioxide. B.B. imparts an intensely yellow color to the flame. Soluble in water, and effervesces with acids. Reacts alkaline with moistened test-paper.

**Obs.**—Found in the province of Fezzan, Africa, forming thin superficial crusts; at the bottom of a lake at Lagunilla, Venezuela, S. A. Efflorescences of trona occur near the Sweetwater river, Rocky Mountains. An extensive bed in Churchill Co., Nevada. In fine crystals at Borax lake, San Bernardino Co., California, with banksite, glauconite, thenardite, etc.

**Hydromagnesite.** Basic magnesium carbonate,  $3\text{MgCO}_3 \cdot \text{Mg(OH)}_2 + 3\text{H}_2\text{O}$ . Crystals small, tufted. Also amorphous; as chalky crusts. Color and streak white. Often occurs with serpentine; thus at Hrubschütz, in Moravia; at Kraubat, Styria, etc. Also similarly near Texas, Pa.; Hoboken, N. J.

**Hydrogiobertite.**  $\text{MgCO}_3 \cdot \text{Mg(OH)}_2 + 2\text{H}_2\text{O}$ . In light gray spherical forms. From the neighborhood of Pollena, Italy.

**Lansfordite.**  $3\text{MgCO}_3 \cdot \text{Mg(OH)}_2 + 21\text{H}_2\text{O}$ . Occurs as small stalactites in the anthracite mine at Nesquehoning near Lansford, Schuylkill Co., Penn.; changed on exposure to nesquehonite.

**Zaratite.** Emerald Nickel.  $\text{NiCO}_3 \cdot 2\text{Ni(OH)}_2 + 4\text{H}_2\text{O}$ . In mammillary incrustations; also massive, compact. Color emerald-green. Occurs on chromite at Texas, Lancaster Co., Pa.; at Swinansess, Unst, Shetland, and elsewhere.

**Remingtonite.** A hydrous cobalt carbonate. A rose-colored incrustation, soft and earthy. From a copper mine near Finksburg, Carroll Co., Maryland.

**Tengerite.** A supposed yttrium carbonate. In white pulverulent coatings. On gadolinite at Ytterby. A similar mineral is associated with the gadolinite of Llano Co., Texas.

**Bismutite.** Wismuthspath *Germ.* A basic bismuth carbonate, perhaps  $\text{Bi}_2\text{O}_3 \cdot \text{CO}_2 \cdot \text{H}_2\text{O}$ . Incrusting, or earthy and pulverulent; amorphous.  $G. = 6.86-6.9$  Breith.; 7.67 Rg. Color white, green, yellow and gray. Occurs at Schneeberg and Johannegeorgenstadt, with native bismuth, and at Joachimsthal, etc. In the U. S., in So. Carolina, at Brewer's mine; in Gaston Co., N. C., etc.

**Uranothallite.**  $2\text{CaCO}_3 \cdot \text{U}(\text{CO}_3)_2 \cdot 10\text{H}_2\text{O}$ . In scaly or granular crystalline aggregates. Color siskin-green. Occurs on uraninite at Joachimsthal, Bohemia.

**Liebigite.** A hydrous carbonate of uranium and calcium. In mammillary concretions, or thin coatings. Color apple-green. Occurs on uraninite near Adrianople, Turkey; also Johannegeorgenstadt and Joachimsthal.

**Voglite.** A hydrous carbonate of uranium, calcium and copper. In aggregations of crystalline scales. Color emerald-green to bright grass-green. From the Elias mine, near Joachimsthal, on uraninite.