

# Sphalerite

(Zn, Fe)S

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**Crystal Data:** Cubic. *Point Group:*  $\bar{4}3m$ . Crystals tetrahedral, dodecahedral, typically complex and distorted, curved and conical faces common, to 30 cm. Also fibrous, botryoidal, stalactitic, cleavable, coarse to fine granular, massive. *Twining:* Twin axis [111], twin plane {111}, simple contact twins or complex lamellar forms.

**Physical Properties:** *Cleavage:* Perfect on {011}. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 3.5–4 VHN = 208–224 (100 g load). D(meas.) = 3.9–4.1 D(calc.) = 4.096 Pyroelectric, may be triboluminescent, fluorescent.

**Optical Properties:** Transparent to translucent, opaque when iron-rich. *Color:* Highly variable, ranging from colorless to dark brown, gray, black, commonly brown, yellow, red, green. *Streak:* Pale brown to pale yellow and white. *Luster:* Resinous to adamantine. *Optical Class:* Isotropic.  $n = 2.369$  (Na) (ZnS). *Anisotropism:* May show strain-induced birefringence.

R: (400) 19.6, (420) 19.0, (440) 18.3, (460) 17.9, (480) 17.5, (500) 17.2, (520) 16.9, (540) 16.7, (560) 16.5, (580) 16.4, (600) 16.3, (620) 16.2, (640) 16.1, (660) 16.0, (680) 15.9, (700) 15.8

**Cell Data:** *Space Group:*  $F\bar{4}3m$ .  $a = 5.4060$   $Z = 4$

**X-ray Powder Pattern:** Synthetic ZnS.

3.123 (100), 1.912 (51), 1.561 (30), 2.705 (10), 1.240 (9), 1.1034 (9), 1.351 (6)

| Chemistry: | (1)   | (2)   | (3)   | (1)   | (2)   | (3)    |
|------------|-------|-------|-------|-------|-------|--------|
| Zn         | 66.98 | 44.67 | 67.10 | Mn    | 2.66  |        |
| Fe         | 0.15  | 18.25 |       | S     | 32.78 | 32.90  |
| Cd         |       | 0.28  |       | Total | 99.91 | 100.00 |

(1) Sonora, Mexico; corresponds to  $Zn_{1.00}S_{1.00}$ . (2) St. Christoph mine, Isère, France; corresponds to  $(Zn_{0.65}Fe_{0.31}Mn_{0.05})_{\Sigma=1.01}S_{1.00}$ . (3) ZnS.

**Polymorphism & Series:** Trimorphous with matraite and wurtzite.

**Mineral Group:** Sphalerite group.

**Occurrence:** Formed under a wide range of low- to high-temperature hydrothermal conditions; in coal, limestone, and other sedimentary deposits.

**Association:** Galena, chalcopyrite, marcasite, pyrite, fluorite, barite, quartz, many other hydrothermal minerals.

**Distribution:** The most important ore of zinc. Only a few localities for the finest crystallized examples can be given. In Germany, from Freiberg, Saxony, and Neudorf, Harz Mountains. Colorless crystals in the Lengenbach quarry, Binntal, Valais, Switzerland. At Horní Slavkov (Schlaggenwald) and Příbram, Czech Republic. From Rodna, Romania. Transparent crystals in the Aliva mine, Picos de Europa Mountains, Cantabria [Santander] Province, Spain. In England, from Alston Moor, Cumbria. At Dal'negorsk, Primorskiy Kray, Russia. From Watson Lake, Yukon Territory, Canada. In the USA, in the Tri-State district of the Mississippi Valley; near Baxter Springs, Cherokee Co., Kansas; Joplin, Jasper Co., Missouri and Picher, Ottawa Co., Oklahoma. From the Elmwood mine, near Carthage, Smith Co., Tennessee; in the Eagle mine, Gilman district, Eagle Co., Colorado. In Mexico, from Santa Eulalia and Naica, Chihuahua, and Cananea, Sonora. At Huaron, Casapalca, and Huancavelica, Peru.

**Name:** From the Greek for *treacherous*, the mineral sometimes being mistaken for galena, but yielding no lead.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 210–215. (??) Ewald, ?? (1916) ??title?? Ann. Phys.,??, 257–?? str?? or (1980) Acta Cryst., A36, 482 ?? (2) (1953) NBS Circ. 539, 2, 16. (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 523.

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