Pyrrhotite $\mathbf{Fe_{1-x}S}$ (x = 0 to 0.17)

Crystal Data: Monoclinic, pseudohexagonal. *Point Group:* $2/m$. Crystals typically tabular or platy on {0001}, to 40 cm; steep pyramidal faces or short pyramidal; as rosettes showing nearly parallel aggregation on {0001}; commonly massive, granular. *Twinning:* On $\{10\bar{1}2\}$.

Physical Properties: *Cleavage:* Parting on {0001}, distinct. *Fracture:* Uneven to subconchoidal. Hardness = 3.5–4.5 VHN = 373–409 (100 g load). D(meas.) = 4.58–4.65 D(calc.) = 4.69 Magnetic, varying in intensity inversely with iron content.

Optical Properties: Opaque. *Color:* Bronze-yellow to pinchbeck-brown; tarnishes quickly, rarely to iridescence. *Streak:* Dark grayish black. *Luster:* Metallic. *Pleochroism:* Weak. *Anisotropism:* Strong.
R_1–R_2: (400) 27.9–31.0, (420) 28.6–32.2, (440) 29.4–33.6, (460) 30.3–34.8, (480) 31.4–36.2, (500) 32.4–37.6, (520) 33.4–38.6, (540) 34.5–39.6, (560) 35.5–40.4, (580) 36.5–41.2, (600) 37.4–42.0, (620) 38.3–42.6, (640) 39.1–43.0, (660) 39.9–43.5, (680) 40.7–43.9, (700) 41.4–44.1

Cell Data: *Space Group:* Depends on polytype. $a = 6.865$ $b = 11.9$ $c = 22.72$ $\beta = 90°5'$ Z = 64

X-ray Powder Pattern: Santa Eulalia, Mexico.
2.08 (10), 2.65 (6), 1.728 (5), 3.00 (4), 1.328 (4), 1.105 (4), 1.052 (3)

Chemistry:

	(1)	(2)	(3)
Fe	60.18	59.83	61.57
S	39.82	39.55	38.53
rem.		0.55	
Total	100.00	99.93	100.10

(1) Homestake mine, Lead, Lawrence Co., South Dakota, USA; corresponds to $Fe_{0.87}S_{1.00}$. (2) Kongsberg, Norway; average of two analyses, corresponds to $Fe_{0.87}S_{1.00}$. (3) Setregruben, Østfold, Norway; corresponds to $Fe_{0.92}S_{1.00}$.

Polymorphism & Series: Numerous polytypes, with 4-M, 6-M, 5-H, 7-H, and 11-H known, and a high-temperature hexagonal polymorph which may remain stable at ordinary temperatures.

Occurrence: Mainly in mafic igneous rocks, typically as magmatic segregations; also in pegmatites, and in high-temperature hydrothermal and replacement veins, and in sedimentary and metamorphic rocks; in iron meteorites.

Association: Pyrite, marcasite, chalcopyrite, pentlandite, many other sulfides, magnetite, calcite, dolomite.

Distribution: Massive material occurs at many localities. Well-crystallized from Herja (Kisbánya), Baia Mare (Nagybánya) district, Romania. From the Stari Trg mine, Trepča, Serbia. In Val Passiria, Trentino-Alto Adige, and at Bottino, near Servezza, Tuscany, Italy. In Germany, in the Harz Mountains, at St. Andreasberg. From the Bristenstock tunnel, Uri, Switzerland. In Sweden, at Falun, Kopparberg. In Russia, very large crystals at Dal'negorsk, Primorskiy Kray. Large crystals from the Morro Velho gold mine, Nova Lima, Minas Gerais, Brazil. At the Potosí and San Antonio mines, Santa Eulalia, Chihuahua, Mexico. From the Bluebell mine, Riondel, British Columbia, Canada.

Name: From the Greek for *redness*, in allusion to its color.

References: (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 231–235. (2) Deer, W.A., R.A. Howie, and J. Zussman (1962) Rock-forming minerals, v. 5, non-silicates, 145–157. [change this to new vol V??must - and review - if H polymorphs should have hexagonal system added also??] (3) Francis, C.A. and J.R. Craig (1976) Pyrrhotite: the *nA* (or 2*A*, 3*C*) superstructure reviewed. Amer. Mineral., 61, 21–25. (3) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 466. (5) Berry, L.G. and R.M. Thompson (1962) X-ray powder data for the ore minerals. Geol. Soc. Amer. Mem. 85, 60.