Bornite Cu_5FeS_4

Crystal Data: Orthorhombic, pseudocubic. *Point Group:* $2/m\ 2/m\ 2/m$. Crystals pseudocubic, dodecahedral, octahedral, to 6 cm; commonly granular, compact, or massive, disseminated. *Twinning:* On {111}; commonly shows penetration twins.

Physical Properties: *Cleavage:* {111} in traces. *Fracture:* Uneven to subconchoidal. *Tenacity:* Brittle. Hardness = 3–3.25 VHN = n.d. D(meas.) = 5.06–5.08 D(calc.) = 5.074

Optical Properties: Opaque. *Color:* Copper-red to pinchbeck-brown on fresh surfaces, rapidly tarnishes iridescent purplish; in polished section, pinkish brown when fresh. *Streak:* Pale grayish black. *Luster:* Metallic. *Pleochroism:* Weak but noticeable. *Anisotropism:* Weak.
R: (400) 19.9, (420) 18.8, (440) 17.9, (460) 17.6, (480) 18.0, (500) 18.8, (520) 20.0, (540) 21.3, (560) 22.9, (580) 24.4, (600) 26.0, (620) 27.5, (640) 28.8, (660) 30.2, (680) 31.6, (700) 32.7

Cell Data: *Space Group: Pbca.* $a = 10.950$ $b = 21.862$ $c = 10.950$ Z = 16

X-ray Powder Pattern: Messina, South Africa.
1.937 (100), 3.18 (60), 2.74 (50), 1.258 (50), 1.119 (50), 3.31 (40), 2.50 (40)

Chemistry:

	(1)	(2)	(3)
Cu	62.99	62.8	63.33
Pb	0.10		
Fe	11.23	11.4	11.12
S	25.58	25.7	25.55
Total	99.90	99.9	100.00

(1) Superior, Arizona, USA. (2) Monte Catini, Tuscany, Italy; by electron microprobe.
(3) Cu_5FeS_4.

Occurrence: Associated with and disseminated in mafic igneous rocks, in contact metamorphic skarn deposits, in pegmatites, in medium- to high-temperature hydrothermal deposits, and in sedimentary cupriferous shales; stable below ∼200 °C.

Association: Chalcopyrite, pyrite, other copper and iron sulfides, garnet, calcite, wollastonite, quartz.

Distribution: Important localities for fine crystals include: in the USA, from Butte, Silver Bow Co., Montana, and at Bristol, Hartford Co., Connecticut. In England, from the Carn Brea mine, Illogan, and elsewhere in Cornwall. Large crystals from the Mangula mine, Lomagundi district, Zimbabwe. From the Frossnitz Alpe, eastern Tirol, Austria. At Dzhezkazgan, Kazakhstan. In the N'ouva mine, Talate, Morocco. Widespread as an important ore mineral of copper, for example at the Magma mine, Superior, Pinal Co., and Bisbee, Cochise Co., Arizona; and Kennicott, Alaska, USA. At Ookiep, Namaqualand, Cape Province; and the Messina mine, Transvaal, South Africa. In Australia, from Mt. Lyell, Tasmania, and Olympic Dam, Roxby Downs, South Australia.

Name: Honoring Ignaz Edler von Born (1742–1791), distinguished Austrian mineralogist.

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