

**Crystal Data:** Hexagonal. *Point Group:*  $6/m\ 2/m\ 2/m$  (2H);  $\bar{3}\ 2/m$  (3R). As hexagonal platy {0001} crystals having triangular striations on the base, to 20 cm. Massive, foliated; also scaly, columnar, granular, compact, earthy; in globular aggregates having radial structure. *Twinning:* Twin plane probably  $\{11\bar{2}1\}$ ; twinning due to pressure gliding, produces trigonal or hexagonal striae on {0001}; also by  $30^\circ$  ( $90^\circ$ ) rotation about [0001].

**Physical Properties:** *Cleavage:* Perfect on {0001}. *Tenacity:* Flexible but not elastic; sectile. Hardness = 1–2 VHN = 7–11 (10 g load).  $D(\text{meas.}) = 2.09\text{--}2.23$   $D(\text{calc.}) = 2.26$  Greasy feel.

**Optical Properties:** Opaque, transparent only in extremely thin flakes. *Color:* Iron-black to steel-gray; deep blue in transmitted light. *Streak:* Black to steel-gray, shining. *Luster:* Metallic; may be dull, earthy.

*Optical Class:* Uniaxial (–). *Pleochroism:* Strong.  $\omega = 1.93\text{--}2.07$  (red).  $\epsilon = \text{n.d.}$  (extreme birefringence). *Anisotropism:* Extreme.

$R_1\text{--}R_2$ : (400) 6.4–23.6, (420) 6.3–24.2, (440) 6.3–24.5, (460) 6.2–24.7, (480) 6.2–25.1, (500) 6.2–25.4, (520) 6.2–25.9, (540) 6.2–26.3, (560) 6.2–26.7, (580) 6.2–27.1, (600) 6.3–27.5, (620) 6.3–27.9, (640) 6.4–28.2, (660) 6.4–28.7, (680) 6.5–29.0, (700) 6.5–29.5

**Cell Data:** *Space Group:*  $P6_3/mmc$  (2H), with  $a = 2.464(2)$   $c = 6.711(4)$   $Z = 4$ , or *Space Group:*  $R\bar{3}m$  (synthetic 3R), with  $a = 2.456$   $c = 10.044$   $Z = 6$

**X-ray Powder Pattern:** Sri Lanka.

3.36 (10), 1.678 (8), 2.03 (5), 1.158 (5), 0.994 (4), 0.829 (4), 1.232 (3)

**Chemistry:** Carbon.

**Polymorphism & Series:** Polymorphous with chaoite, diamond, and lonsdaleite.

**Occurrence:** Formed by metamorphism of sedimentary carbonaceous material, by the reduction of carbon compounds; a primary constituent in igneous rocks.

**Association:** A wide variety of minerals stable in the metamorphic conditions under which graphite forms. In meteorites, in nodules with troilite, silicates.

**Distribution:** Numerous localities, but only a few afford well-crystallized examples. In the USA, at Monroe and Ticonderoga, Essex Co., New York; at Franklin and Sterling Hill, Ogdensburg, Sussex Co., New Jersey. In Canada, commercially significant occurrences in Quebec, at Buckingham and Grenville, and in adjacent parts of Ontario. In Russia, from Nizhni Tunguski, east of Turukhansk, near the Yenisei River, Siberia; at Shunga, Karelia. Around Ratnapura, Matara, and Kurunegale, Sri Lanka, large deposits of pure material. At Passau, Bavaria, Germany. From Pargas, Finland. In England, at Barrowdale, near Keswick, Cumbria. In Mexico, at Santa Maria, Sonora, formed by metamorphism of coal beds.

**Name:** From the Greek *to write*, in allusion to its use as a crayon.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 152–154. (2) Trucano, P. and R. Chen (1975) Structure of graphite by neutron diffraction. *Nature*, 258, 136–137. (3) Berry, L.G. and R.M. Thompson (1962) X-ray powder data for the ore minerals. *Geol. Soc. Amer. Mem.* 85, 23. (4) Criddle, A.J. and C.J. Stanley, Eds. (1993) Quantitative data file for ore minerals, 3rd ed. Chapman & Hall, London, 211.