

**Crystal Data:** Hexagonal. *Point Group:*  $6/m\ 2/m\ 2/m$ . As microscopic crystals, flaky to platy on {001}, in parallel aggregates, sometimes in rows at 120°, probably due to replacement of an earlier hexagonal mineral; as flaky polycrystalline aggregates.

**Physical Properties:** *Cleavage:* {001}. *Hardness* = n.d. *D(meas.)* = n.d. *D(calc.)* = [4.78]

**Optical Properties:** [Opaque.] *Color:* Pale gray to black.

*Optical Class:* Uniaxial.

*R<sub>1</sub>–R<sub>2</sub>:* n.d.

**Cell Data:** *Space Group:*  $P6_3/mmc$ . *a* = 2.83–2.85 *c* = 4.47–4.88 *Z* = [1]

**X-ray Powder Pattern:** Mt. Zarod, Russia; calculated from an electron diffraction pattern. 2.45, 2.15, 1.65, 1.42

**Chemistry:** Sufficient material for direct chemical analysis cannot be separated; energy-dispersive analysis shows Mn as the only cationic species; Mn<sup>4+</sup> and O were established by X-ray photoelectronic spectroscopy, as was the absence of OH and H<sub>2</sub>O.

**Polymorphism & Series:** Trimorphous with pyrolusite and ramsdellite.

**Occurrence:** In mixtures in “psilomelane” with other manganese oxides in an iron oxide deposit, probably bacterially altered from a previous mineral (Akhtensk deposit, Russia); in incrustations of ferromanganese minerals on oceanic basalt on a guyot (Mt. Zarod, Russia).

**Association:** Cryptomelane, nsutite, pyrolusite, todorokite, goethite (Akhtensk deposit, Russia); vernadite, manganite, Fe–Mn oxides (Mt. Zarod, Russia).

**Distribution:** In the Akhtensk brown ironstone deposit, north of Magnitka, Southern Ural Mountains; on Mt. Zarod, Sikhote-Alin Mountains, Primorskiy Kray, Russia.

**Name:** For the Akhtensk deposit, Russia, where it was first noted.

**Type Material:** Mining Institute, St. Petersburg, Russia, 307/5.

**References:** (1) Chukhrov, F.V., A.I. Gorshkov, and V.S. Drits (1987) Advances in the crystal chemistry of manganese oxides. *Zap. Vses. Mineral. Obshch.*, 16, 210–221 (in Russian). (2) Chukhrov, F.V., A.I. Gorshkov, A.V. Sivtsov, V.V. Berezovskaya, Y.P. Dikov, G.A. Dubinina, and N.N. Varinov (1989) Akhtenskite – the natural analog of  $\epsilon$ -MnO<sub>2</sub>. *Izv. Akad. Nauk SSSR, Ser. Geol.*, 9, 75–80 (in Russian). (3) (1990) *Amer. Mineral.*, 75, 931 (abs. refs. 1 and 2).