Hambergite

\[ \text{Be}_2\text{BO}_3(\text{OH}, \text{F}) \]


Crystal Data: Orthorhombic. Point Group: 2/m 2/m 2/m. Typically well-crystallized, prismatic along [001] or dipyramidal, showing \{110\}, \{021\}, \{010\}, \{100\}, \{210\}, with another 20 forms known; \{100\} striated || [001]; to 30 cm. Twinning: On \{110\}, commonly reticulated; contact twins may be markedly hemimorphic.

Physical Properties: Cleavage: On \{010\}, perfect; on \{100\}, good. Tenacity: Brittle. Hardness = 7.5 \( D(\text{meas.}) = 2.347–2.372 \) \( D(\text{calc.}) = 2.365 \)

Optical Properties: Transparent to translucent. Color: Colorless, pale gray, pale yellow; colorless in transmitted light. Luster: Vitreous. Optical Class: Biaxial (+). Dispersion: \( r > v \), weak. \( \alpha = 1.554–1.560 \) \( \beta = 1.587–1.591 \) \( \gamma = 1.628–1.631 \) \( 2V(\text{meas.}) = 87^\circ \)

Cell Data: Space Group: P bca. \( a = 9.654(2)–9.776(3) \) \( b = 12.194(2)–12.364(4) \) \( c = 4.430(1)–4.440(2) \) \( Z = 8 \)

X-ray Powder Pattern: Anjanabanoana, Madagascar. 3.81 (10), 3.13 (9), 4.53 (8), 3.19 (8), 2.40 (7), 2.21 (7), 2.13 (7)

Chemistry:  

| \( \text{B}_2\text{O}_5 \) | 36.0 | 36.6 |
| \( \text{BeO} \) | 53.6 | 52.9 |
| \( \text{F} \) | 1.0 | 6.0 |
| \( \text{H}_2\text{O} \) | 8.8 | 6.7 |
| \(-\text{O=F} \) | 0.4 | 2.5 |
| **Total** | **99.0** | **99.7** |

(1) Anjanabanoana, Madagascar; corresponds to Be\(_{2.04}\)B\(_{0.98}\)O\(_3\)[(OH)\(_{0.93}\)F\(_{0.05}\)]\(_\Sigma=0.98\). (2) Little Three mine, California, USA; corresponds to Be\(_{2.06}\)B\(_{1.00}\)O\(_3\)[(OH)\(_{0.70}\)F\(_{0.30}\)]\(_\Sigma=1.00\).

Occurrence: An uncommon accessory mineral in granite pegmatites.

Association: Beryl, danburite, apatite, spodumene, zircon, fluorite, feldspar, quartz.

Distribution: From Helgeroa, Langesundsfsjørd, Norway. In the Czech Republic, from Ctitidružice; Recice; Krasovice, near Tribic; Susice; and elsewhere. From between San Ilario and San Piero in Campo, Elba, Italy. In Madagascar, from Imalo, near Mania; at Maharitra, on Mt. Bity; and large crystals from Anjanabanoana. In the USA, fine crystals from the Little Three mine, near Ramona, and the Himalaya mine, Mesa Grande district, San Diego Co., and in the Jensen quarry, Riverside Co., California; large crystals from the Zapot pegmatite, 25 km northeast of Hawthorne, Mineral Co., Nevada; at the Animinie Red Ace pegmatite, near Pine River, Florence Co., Wisconsin. In Pakistan, around Stak Nala and Drot, Gilgit-Skardu road, Northern Areas. In the Rangkul pegmatite field, eastern Pamir Mountains, Tajikistan. In Russia, from the Mokrusha mine, Ural Mountains, and in the Malikham pegmatite field, Chite region, Transbaikal.

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