

Huanghoite-(Ce)

BaCe(CO₃)₂F

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Crystal Data: Hexagonal. *Point Group:* $\bar{3} 2/m$. As platy to granular crystals and in aggregates, to 10 cm.

Physical Properties: *Cleavage:* On {0001}, distinct. *Fracture:* Irregular. Hardness = 4.5
D(meas.) = 4.51–4.67 D(calc.) = 4.84

Optical Properties: Translucent. *Color:* Honey-yellow to yellowish green, orange.
Luster: Greasy.

Optical Class: Uniaxial (-). *Pleochroism:* Weak; in shades of greenish yellow. $\omega = 1.765$ – 1.770
 $\epsilon = 1.588$ – 1.610

Cell Data: *Space Group:* $R\bar{3}m$. $a = 5.072(1)$ $c = 38.46(1)$ $Z = 6$

X-ray Powder Pattern: Bayan Obo deposit, China.
3.21 (10), 1.937 (10), 2.01 (9), 3.91 (7), 2.50 (7), 1.616 (7), 1.557 (7)

Chemistry:	(1)	(2)
CO ₂	20.90	21.13
Ce ₂ O ₃		39.41
RE ₂ O ₃	38.40	
BaO	36.46	36.82
F	4.00	4.56
H ₂ O	0.93	
-O = F ₂	1.68	1.92
Total	99.01	100.00

(1) Bayan Obo deposit, China; Ce > La confirmed by X-ray spectrophotographic analysis.

(2) BaCe(CO₃)₂F.

Occurrence: An uncommon mineral in hydrothermal veins associated with rare-earth-bearing carbonatite deposits in alkaline igneous complexes.

Association: Aegirine, fluorite, magnetite, hematite, monazite, bastnäsite, parisite, aeschynite, calcite (Bayan Obo, China); “chlorite”, barite, strontianite, pyrite, hematite, ankerite, dolomite (Siberia, Russia).

Distribution: From the Bayan Obo Fe–Nb–RE deposit, 130 km north of Baotou, Inner Mongolia, China. In Russia, from an unspecified carbonatite in Siberia, and in the Khibiny massif, Kola Peninsula. From the Aley carbonatite, east of Williston Lake, British Columbia, Canada. At the Qaqarsuk carbonatite, near Sukkertoppen, Greenland.

Name: For the Huang Ho (Yellow River), China, 150 km south of the Bayan Obo deposit, China, where the first specimens were collected.

Type Material: National Museum of Natural History, Washington, D.C., USA, 144184.

References: (1) Semenov, E.I. and P’ei-Shan Chang (1961) Huanghoite, a new rare-earth mineral. *Scientia Sinica*, 10, 1007–1011 (in Russian). (2) (1963) *Amer. Mineral.*, 48, 1179 (abs. ref. 1). (3) Kapustin, Y.L. (1972) First find of huanghoite in the USSR. *Doklady Acad. Nauk SSSR*, 202, 422–425 (in Russian). (4) Z. Yang and F. Pertlik (1993) Huanghoite-(Ce), BaCe(CO₃)₂F, from Khibina, Kola Peninsula, Russia: redetermination of the crystal structure with a discussion on space group symmetry. *Neues Jahrb. Mineral., Monatsh.*, 163–171. (5) Mercier, N. and M. Leblanc (1993) Crystal growth and structures of rare earth fluorocarbonates: I. Structures of BaSm(CO₃)₂F and Ba₃La₂(CO₃)₅F₂: revision of the corresponding huanghoite and cebaite type structures. *Eur. J. Solid State Inorg. Chem.*, 30, 195–205.

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