

Hungchaoite

MgB₄O₅(OH)₄•7H₂O

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Crystal Data: Triclinic, pseudohexagonal. *Point Group:* $\bar{1}$. As tabular crystals, to 0.5 mm, composed of {100}, {1 $\bar{1}$ 0}, {2 $\bar{1}$ 0}, {1 $\bar{1}$ 1}, {001}, {111}, and several others.

Physical Properties: *Cleavage:* {1 $\bar{1}$ 1}, perfect; {1 $\bar{1}$ 1}, good; {010}, imperfect. *Tenacity:* Brittle. Hardness = 2–2.5 D(meas.) = 1.706(5) D(calc.) = 1.703

Optical Properties: Transparent. *Color:* Colorless. *Luster:* Vitreous. *Optical Class:* Biaxial (–). *Orientation:* $X \wedge a = 28^\circ$ (in acute axial angle); $Z \wedge b = 37^\circ$; $Y \wedge c = -66^\circ$. *Dispersion:* $r < v$, distinct. $\alpha = 1.445(2)$ $\beta = 1.485(2)$ $\gamma = 1.490(2)$ $2V(\text{meas.}) = 15(2)^\circ$ $2V(\text{calc.}) = 36^\circ$

Cell Data: *Space Group:* $P\bar{1}$. $a = 8.807(1)$ $b = 10.657(1)$ $c = 7.897(1)$ $\alpha = 103.39(1)^\circ$ $\beta = 108.53(1)^\circ$ $\gamma = 97.18(1)^\circ$ $Z = 2$

X-ray Powder Pattern: Death Valley, California, USA.
6.71 (100), 3.356 (92), 5.36 (85), 4.093 (78), 2.912 (73), 4.079 (64), 7.14 (59)

Chemistry:	(1)	(2)
B ₂ O ₃	39.58	40.75
MgO	11.86	11.80
H ₂ O	49.74	47.45
Total	101.18	100.00

(1) China; original total given as 100.00%. (2) MgB₄O₅(OH)₄•7H₂O.

Occurrence: In lacustrine saline borate deposits (China); an efflorescence on weathered colemanite and priceite veins (Death Valley, California, USA).

Association: Ulexite, hydroboracite, szaibélyite, gypsum (China); ginorite, mcallisterite, sborgite, sassolite, nobleite, ulexite, gypsum, kurnakovite, inderite, montmorillonite, analcime (Death Valley, California, USA).

Distribution: From China, at an unspecified locality [the Qinghai-Xizang Plateau, Tibet]. From the Hard Scramble claim and elsewhere in the Furnace Creek district, Death Valley, Inyo Co., California, USA.

Name: Honors Professor Chang Hung-chao (1877–1951), Chinese geologist and mineralogist.

Type Material: n.d.

References: (1) I-Hua Chu, Hsien-Te Hsieh, Tze-Chiang Chien, and Lai-Pao Liu (1964) Preliminary report on the occurrence of a new magnesium borate – hungchaoite, MgO•2B₂O₃•9H₂O, in China. *Scientia Sinica*, 13, 525–527 (in Russian). (2) (1965) *Amer. Mineral.*, 50, 262 (abs. ref. 1). (3) C. Wan and S. Ghose (1977) Hungchaoite, Mg(H₂O)₅B₄O₅(OH)₄•2H₂O: a hydrogen-bonded molecular complex. *Amer. Mineral.*, 62, 1135–1143. (4) Erd, R.C., J.F. McAllister, and G.D. Eberlein (1979) New data on hungchaoite, the second world occurrence, Death Valley region, California. *Amer. Mineral.*, 64, 369–375.