Hubeite $Ca_2Mn^{2+}Fe^{3+}Si_4O_{12}(OH)\cdot 2H_2O$

Crystal Data: Triclinic. *Point Group*: $\bar{1}$. As radiating fan-like or "bow-tie" aggregates to 5 mm composed of intergrown well-terminated bladed crystals not exceeding 2 mm; dominant forms are {001}, {100}, and {101}.

Physical Properties: *Cleavage*: Good on {001}. *Tenacity*: Brittle. *Fracture*: Conchoidal. Hardness = 5.5 D(meas.) = 3.02(2) D(calc.) = 3.01 Nonfluorescent.

Optical Properties: Transparent. *Color:* Pale to dark brown. *Streak*: Pale orange-brown. *Luster*: Vitreous.
Optical Class: Biaxial. $\alpha = 1.667(1)$ $\beta = 1.679(1)$ $\gamma = 1.690(1)$ 2V(meas.) = 89(2)°
2V(calc.) = 87(5)° *Pleochroism*: Strong; X = yellow-brown (greenish tint), Z = dark yellow-brown.
Absorption: $Z > X$, (Y = n.d.). *Orientation*: $X \wedge b = 20°$ (in γ obtuse), $Y \wedge c = 13°$ (in α acute), $Z = a$.

Cell Data: *Space Group*: $P\bar{1}$. $a = 9.9653(3)$ $b = 13.9171(3)$ $c = 6.5703(2)$ $\alpha = 133.264(1)°$ $\beta = 101.414(1)°$ $\gamma = 66.302(1)°$ $Z = 2$

X-ray Powder Pattern: Daye Fe-Cu-Au mine, near Huangshi, Hubei province, China.
9.072 (100), 8.238 (90), 3.126 (70), 3.095 (70), 2.781 (60), 5.000 (30), 3.192 (30)

Chemistry:

	(1)
SiO_2	44.39
Al_2O_3	0.38
Fe_2O_3	13.94
MgO	0.29
MnO	11.34
CaO	21.91
H_2O	[8.32]
Total	100.57

(1) Daye Fe-Cu-Au mine, near Huangshi, Hubei province, China; average electron microprobe analysis supplemented by IR spectroscopy, H_2O calculated; corresponds to $Ca_{2.00}(Mn^{2+}_{0.87}Ca_{0.12})_{\Sigma=0.99}(Fe^{3+}_{0.94}Al_{0.04}Mg_{0.04})_{\Sigma=1.02}Si_{4.00}O_{12}(OH)(H_2O)_2$.

Occurrence: In a skarn assemblage.

Association: Inesite, natroapophyllite-fluorapophyllite, quartz, pyrite, calcite.

Distribution: At the Daye Fe-Cu-Au mines, near Huangshi, Hubei province, China [TL].

Name: For the province in China where the first specimens were collected.

Type Material: Canadian Museum of Nature, Ottawa, Ontario, Canada (CMNMC 83268).

References: (1) Hawthorne, F.C., M.A. Cooper, J.D. Grice, A.C. Roberts, W.R. Cook, JR., and R.I. Lauf (2002): Hubeite, a new mineral from the Daye mine near Huangshi, Hubei Province, China. Mineral. Rec., 33(6), 465-471. (2) (2003) Amer. Mineral., 88, 1177 (abs. ref. 1).
(3) Cooper, M.A. and F.C. Hawthorne (2004) The crystal structure of hubeite, a novel sorosilicate mineral. Can. Mineral., 42, 825-834.