

**[K(Mg, Fe<sup>2+</sup>)<sub>3</sub>(Al, Fe<sup>3+</sup>)Si<sub>3</sub>O<sub>10</sub>(OH, F)<sub>2</sub>] •  
[(Mg, Fe<sup>2+</sup>, Al)<sub>3</sub>(Si, Al)<sub>4</sub>O<sub>10</sub>(OH)<sub>2</sub> • 4H<sub>2</sub>O]**

**Hydrobiotite**

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**Crystal Data:** [Monoclinic] (by analogy to biotite and vermiculite). *Point Group:* [2/*m*.] In cleavage plates and flakes.

**Physical Properties:** *Cleavage:* [{001}, perfect.] *Tenacity:* [Brittle to flexible, elastic.]  
Hardness = [~2] D(meas.) = 2.49–2.64 D(calc.) = n.d.

**Optical Properties:** Semitransparent. *Color:* Blackish, brownish; golden yellow, pinkish.  
*Luster:* [Dull.]

*Optical Class:* Biaxial (-). *Pleochroism:* X = light brown; Y = Z = brown. *Absorption:* X > Y = Z. α = n.d. β = 1.560–1.562; 1.575 γ = 1.565–1.567 2V(meas.) = 10°–13°

**Cell Data:** *Space Group:* [C2/*m*.] a = n.d. b = n.d. c = 24.5–25.5 β = n.d. Z = n.d.

**X-ray Powder Pattern:** Northeastern Transvaal, South Africa.  
12.23 (60), 3.493 (50), 4.909 (30), 2.725 (20), 2.041 (16) 3.071 (15), 24.3 (7)

<b>Chemistry:</b>	(1)	(2)	(1)	(2)
SiO <sub>2</sub>	35.60		SrO	0.01
TiO <sub>2</sub>	1.13		BaO	0.17
Al <sub>2</sub> O <sub>3</sub>	11.85		Na <sub>2</sub> O	0.16
Fe <sub>2</sub> O <sub>3</sub>	10.28		K <sub>2</sub> O	3.17
Cr <sub>2</sub> O <sub>3</sub>	0.03		Rb <sub>2</sub> O	0.01
FeO	0.81		F	0.21
MnO	0.08		H <sub>2</sub> O <sup>+</sup>	7.56
MgO	20.17		H <sub>2</sub> O <sup>-</sup>	7.20
CaO	1.44		P <sub>2</sub> O <sub>5</sub>	0.07
			-O = F <sub>2</sub>	0.09
			Total	99.86

(1) Libby, Montana; corresponds to (Mg<sub>2.38</sub>Fe<sub>0.61</sub><sup>3+</sup>K<sub>0.32</sub>Ca<sub>0.12</sub>Ti<sub>0.07</sub>Fe<sub>0.05</sub><sup>2+</sup>Na<sub>0.03</sub>Ba<sub>0.01</sub>)<sub>Σ=3.59</sub>(Si<sub>2.82</sub>Al<sub>1.18</sub>)<sub>Σ=4.00</sub>O<sub>10</sub>[(OH)<sub>1.95</sub>F<sub>0.05</sub>]<sub>Σ=2.00</sub> • 3.01H<sub>2</sub>O.

**Polymorphism & Series:** A 1:1 regular interstratification of biotite and vermiculite.

**Mineral Group:** Mica group.

**Occurrence:** As an alteration product of other micas.

**Association:** Vermiculite, biotite, apatite, zircon.

**Distribution:** Perhaps at Křemž, Czech Republic. A few other localities for well-characterized material include: in the USA, in the Rainy Creek complex, near Libby, Lincoln Co., Montana, and from the Enoree area, Spartanburg Co., South Carolina. At Phalaborwa, Transvaal, South Africa.

**Name:** For its resemblance to *biotite*, but hydrated.

**References:** (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 632 [biotite], 664 [vermiculite]. (2) Gruner, J.W. (1934) The structures of vermiculites and their collapse by dehydration. *Amer. Mineral.*, 19, 557–575. (3) Boettcher, A.L. (1966) Vermiculite, hydrobiotite, and biotite in the Rainy Creek igneous complex near Libby, Montana. *Clay Minerals*, 6, 283–296. (4) Brindley, G.W., P.E. Zalba, and C.M. Bethke (1983) Hydrobiotite, a regular 1:1 interstratification of biotite and vermiculite layers. *Amer. Mineral.*, 68, 420–425.