Manganbabingtonite $Ca_2(Mn^{2+},Fe^{2+})Fe^{3+}Si_5O_{14}(OH)$

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. Crystals short prismatic, to 5 mm.

Physical Properties: *Cleavage:* Perfect on {001}, less perfect on {010}, poor on {100}. *Fracture:* Subconchoidal. *Tenacity:* Brittle. Hardness = 6.5–7 D(meas.) = 3.452 D(calc.) = [3.59]

Optical Properties: Translucent to opaque. *Color:* Dark greenish black to yellowish green. *Optical Class:* Biaxial (+). *Pleochroism:* X = emerald-green; Y = faint rose to nearly colorless; Z = purple-brown to rose-brown. *Orientation:* $Y \simeq c$; $Z = b$. *Dispersion:* $r > v$, strong. $\alpha = 1.716$ $\beta = 1.730$ $\gamma = 1.746$ 2V(meas.) = 78°–82° 2V(calc.) = 86°

Cell Data: *Space Group:* $P\bar{1}$. $a = 6.88$ $b = 11.80$ $c = 6.77$ $\alpha = 90°30'$ $\beta = 93°30'$ $\gamma = 104°54'$ Z = 2

X-ray Powder Pattern: Rudnyi Kaskad deposit, Russia.
3.104 (10), 2.998 (10), 2.938 (10), 2.162 (10), 3.442 (8), 1.654 (7), 1.427 (6)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	51.85	52.45	K_2O	0.09	
TiO_2	0.15		F	0.12	
Al_2O_3	0.56		Cl	0.06	
Fe_2O_3	12.26	13.94	H_2O^+	1.95	
FeO	4.52	6.27	H_2O^-	0.26	
MnO	7.91	6.19	H_2O		1.57
MgO	0.60		CO_2	0.13	
CaO	19.00	19.58	$-O=(F,Cl)_2$	0.06	
Na_2O	0.25		Total	99.65	100.00

(1) Rudnyi Kaskad deposit, Russia. (2) $Ca_2(Mn^{2+},Fe^{2+})Fe^{3+}Si_5O_{14}(OH)$, calculated for Mn^{2+}:Fe^{2+} = 1:1.

Polymorphism & Series: Forms a series with babingtonite.

Occurrence: In thin stringers in amphibolized garnet-pyroxene-magnetite skarn associated with an iron deposit (Rudnyi Kaskad deposit, Russia); replacing hedenbergite-johannsenite skarn (Iron Cap mine, Arizona, USA).

Association: Epidote, calcite, quartz (Rudnyi Kaskad deposit, Russia); ilvaite, andradite, epidote, thaumasite, calcite, quartz, pyrite, galena, sphalerite (Iron Cap mine, Arizona, USA).

Distribution: From the Rudnyi Kaskad deposit, eastern Sayan Mountains, Siberia, Russia. In the Iron Cap Pb–Zn mine, near Aravaipa, Graham Co., Arizona, USA.

Name: For the *manganese* content and relation to *babingtonite*.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 72039.

References: (1) Vinogradova, R.A., V.A. Sychkova, and Y.K. Kabalov (1966) Manganiferous babingtonite from the Rudnyi Kaskad deposit, Eastern Sayan. Doklady Acad. Nauk SSSR, 169, 434–437 (in Russian). (2) Vinogradova, R.A. and I.N. Plyusinna (1967) Composition, properties, and crystallochemical features of minerals of the isomorphous series ferrobabingtonite-manganbabingtonite. Vestn. Moskov. Univ. Ser. IV, Geol., 54–67 (in Russian). (3) (1968) Amer. Mineral., 53, 1064–1065 (abs. refs. 1 and 2). (4) Burt, D.M. and D. London (1978) Manganbabingtonite and ilvaite from a hedenbergite-johannsenite skarn, Aravaipa, Arizona. Geol. Soc. Amer., Abs. with Prog., 10, 98 (abs.).