Kannanite $Ca_4[(Al, Mn^{3+}, Fe^{3+})_5Mg](VO_4)(SiO_4)_2(Si_3O_{10})(OH)_6$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As incomplete tabular and columnar anhedral grains to 15 μm.

Physical Properties: *Cleavage*: None observed. [Expected to be perfect on {010} by analogy with ardennite.] *Fracture*: n.d. *Tenacity*: n.d. Hardness = 6 D(meas.) = n.d. D(calc.) = 3.43

Optical Properties: Translucent. *Color*: Brownish orange to orange. *Streak*: n.d.
Luster: Vitreous.
Optical Class: [Biaxial.] *n*(calc.) = 1.788 *Pleochroism*: Weak, orange to brownish orange.

Cell Data: Space Group: *Pnmm*. *a* = 8.8802(14) *b* = 5.9919(13) *c* = 18.882(3) [Z = 2]

X-ray Powder Pattern: Kannan Mountain, Ozu district, Ehime Prefecture, Japan.
3.001 (100), 2.658 (67), 2.715 (66), 2.531 (47), 3.234 (37), 2.306 (37), 2.809 (35)

Chemistry:

	(1)	(2)
V_2O_3	6.04	7.45
As_2O_3	1.52	
SiO_2	29.73	29.89
Al_2O_3	14.40	15.21
Fe_2O_3	5.18	3.97
MnO	[3.89]	
Mn_2O_3	[9.74]	11.78
CaO	19.02	22.31
MgO	2.70	4.01
CuO	0.34	
NiO	0.40	
H_2O	[5.22]	5.39
Total	97.83	100.00

(1) Kannan Mountain, Ozu district, Ehime Prefecture, Japan; average of 12 electron microprobe analyses supplemented by Raman spectroscopy, MnO/Mn_2O_3 apportioned from total Mn as MnO = 12.65 and H_2O calculated from stoichiometry; corresponds to $(Ca_{3.60}Mn^{2+}_{0.40})_{\Sigma=4}(Al_{3.00}Mn^{3+}_{1.31}Fe^{3+}_{0.69}Mg_{0.71}Mn^{2+}_{0.19}Ni_{0.06}Cu_{0.05})_{\Sigma=6}[(V^{5+}_{0.70}Si_{0.16}As_{0.14})_{\Sigma=1}O_{3.84}(OH)_{0.16}](SiO_4)_2(Si_3O_{10})(OH)_6$.
(2) $Ca_4[(Al_3Mn^{3+}_{1.5}Fe^{3+}_{0.5})Mg](VO_4)(SiO_4)_2(Si_3O_{10})(OH)_6$.

Polymorphism & Series: Ardennite series.

Occurrence: A product of pumpellyite-actinolite-facies metamorphism of Fe-Mn-ore (quartz, hematite, braunite) in metachert.

Association: Ardennite-(V), piemontite, hematite, quartz.

Distribution: From Kannan Mountain, Ozu district, Ehime Prefecture, Japan.

Name: For the locality that produced the first specimen, *Kannan* Mountain, Japan.

Type Material: National Museum of Nature and Science, Tokyo, Japan (NSM M-44527).

References: (1) Nishio-Hamane, D., M. Nagashima, N. Ogawa, and T. Minakawa (2018) Kannanite, a new mineral from Kannan Mountain, Japan. J. Mineral. Petrol. Sci., 113(5), 245-250. (2) (2020) Amer. Mineral., 105, 1112-1113 (abs. ref. 1).