Carlfrancisite

$Mn^{2+}_3(Mn^{2+},Mg,Fe^{3+},Al)_{42}(As^{3+}O_3)_2(As^{5+}O_4)_4[(Si,As^{5+})O_4]_6[(As^{5+},Si)O_4]_2(OH)_{42}$

Crystal Data: Hexagonal. *Point Group*: $\bar{3}$ 2/*m*. As curved platy aggregates to ~2 cm.

Physical Properties: *Cleavage*: Perfect on {001}. *Fracture*: Hackly. *Tenacity*: Brittle. Hardness = 3 D(meas.) = n.d. D(calc.) = 3.620

Optical Properties: Translucent. *Color*: Yellowy orange to pale yellow. *Streak*: Very pale yellow. *Luster*: Vitreous to opalescent.
Optical Class: Uniaxial (+). ε = 1.756(2) ω = 1.758(2)

Cell Data: *Space Group*: $R\bar{3}\,c$. a = 8.2238(2) c = 205.113(6) Z = 6

X-ray Powder Pattern: Kombat mine, Otavi Valley, Namibia.
2.826 (100), 2.371 (88), 1.552 (84), 2.676 (63), 3.243 (54), 4.107 (48), 2.918 (47)

Chemistry:

	(1)
As_2O_5	13.07
As_2O_3	3.18
P_2O_5	0.50
V_2O_5	0.74
SiO_2	8.96
Al_2O_3	0.78
FeO	0.22
MnO	53.25
MgO	9.37
H_2O	[8.42]
Total	98.49

(1) Kombat mine, Otavi Valley, Namibia; average of 10 electron microprobe analyses, supplemented by Raman and FTIR spectroscopy, H_2O calculated from structure; corresponds to $Mn^{2+}_{33.55}Mg_{10.39}Fe^{2+}_{0.14}Al_{0.68}As^{3+}_{1.44}(Si_{6.67}P_{0.32}V^{5+}_{0.37}As^{5+}_{5.08})O_{54}(OH)_{42}$.

Occurrence: In metamorphosed lenses associated with Cu-Pb-Ag sulfide ores in feldspathic sandstone that have been reworked by late hydrothermal solutions.

Association: Alleghanyite, chlorite, pyrochroite, "spinels", ribbeite.

Distribution: From the E15-11 south stope, 11 level, at the 1241 m elevation, in the Asis West sector, Kombat mine, Otavi Valley, Namibia.

Name: Honors Colonel Eckhard D. Stuart (b. 1939) of Madison, Mississippi, USA., a mineral collector who has provided numerous samples for research, including this new species.

Type Material: Department of Natural History, Royal Ontario Museum, Toronto, Canada (M56375).

References: (1) Hawthorne, F.C., Y.A. Abdu, N.A. Ball, and W.W. Pinch (2013) Carlfrancisite: $Mn^{2+}_3(Mn^{2+},Mg,Fe^{3+},Al)_{42}(As^{3+}O_3)_2(As^{5+}O_4)_4[(Si,As^{5+})O_4]_6[(As^{5+},Si)O_4]_2(OH)_{42}$, a new arseno-silicate mineral from the Kombat mine, Otavi Valley, Namibia. Amer. Mineral., 98, 1693-1696.