Ferro-papikeite $NaFe^{2+}_2(Fe^{2+}_3Al_2)(Si_5Al_3)O_{22}(OH)_2$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As isolated subhedral grains to 3 mm and as sheaf-like bundles of subhedral prisms to 4 mm.

Physical Properties: *Cleavage*: Perfect on {210} intersecting at ~56°. *Tenacity*: Brittle. *Fracture*: Splintery. Hardness = ~6 D(meas.) = n.d. D(calc.) = 3.488 Nonfluorescent.

Optical Properties: Translucent. *Color*: Pale brown. *Streak*: Colorless to very pale brown. *Luster*: [Vitreous.]
Optical Class: Biaxial (+). α = 1.674(2) β = 1.692(2) γ = 1.716(2) 2V(meas.) = 86.2(9)° 2V(calc.) = 88.3° *Dispersion*: Weak, $r < v$. *Orientation*: $X \parallel a$, $Y \parallel b$, $Z \parallel c$.
Pleochroism: Moderate, X = very pale brown, $Y = Z$ = honey brown. *Absorption*: $X < Y = Z$.

Cell Data: *Space Group*: *Pnma*. a = 18.628(4) b = 17.888(4) c = 5.3035(11) Z = 4

X-Ray Diffraction Pattern: Simulated pattern.
8.255 (100), 3.057 (68), 2.572 (56), 2.501 (50), 2.674 (41), 3.223 (39), 2.549 (38)

Chemistry:

	(1)	(2)
SiO_2	36.50	31.18
Al_2O_3	22.24	26.45
TiO_2	0.09	
FeO	30.50	37.28
Fe_2O_3	1.15	
MnO	0.65	
MgO	5.48	24.15
CaO	0.08	
Na_2O	2.35	3.22
F	0.22	
H_2O	[1.85]	1.87
$-O = F_2$	0.09	.
Total	100.88	100.00

(1) Filipstad, Värmland, Sweden; average electron microprobe analysis, H_2O calculated; corresponds to $(Na_{0.70}Ca_{0.01})(Fe^{2+}_{3.90}Al_{1.62}Mg_{1.25}Fe^{3+}_{0.13}Mn^{2+}_{0.08}Ti^{4+}_{0.01})_{\Sigma=6.99}(Si_{5.60}Al_{2.40})_{\Sigma=8}O_{22}[(OH)_{1.89}F_{0.11}]_{\Sigma=2.}$
(2) $NaFe^{2+}_2(Fe^{2+}_3Al_2)(Si_5Al_3)O_{22}(OH)_2$.

Mineral Group: Amphibole supergroup, orthorhombic magnesium-iron-manganese group.

Occurrence: In medium-grade felsic metavolcanic rock.

Association: Quartz, albite, biotite, chlorite.

Distribution: From the Filipstad municipality, Värmland, Sweden [TL].

Name: The prefix identifies an amphibole of the *papikeite* group with Fe^{2+} dominant in the C site. Honors James J. *Papike* (1937-2020), America crystallographer and geochemist whose work catalyzed renewed interest in amphiboles in the 1960s and 1970s.

Type Material: Department of Natural History, Royal Ontario Museum, Toronto, Canada (M60100).

References: (1) Hawthorne, F.C., M.C. Day, M. Fayek, K. Linthout, W.J. Lustenhouwer, and R. Oberti (2022) Ferro-papikeite, ideally $NaFe^{2+}_2(Fe^{2+}_3Al_2)(Si_5Al_3)O_{22}(OH)_2$, a new orthorhombic amphibole from Nordmark (Western Bergslagen), Sweden: Description and crystal structure. Amer. Mineral., 107, 306-312. (3) Hawthorne, F.C., R. Oberti, G.E. Harlow, W.V. Maresch, R.F. Martin, J.C. Schumacher, and M.D. Welch (2012) Nomenclature of the amphibole supergroup. Amer. Mineral., 97, 2031-2048.