Waimirite-(Y) YF_3

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. Bladed crystals display {$10\bar{1}$}, {101}, and {111}, to ~ 0.5 mm, are flattened on {$10\bar{1}$}, and elongated and striated along [010]. Commonly intergrown in subparallel bundles and less commonly in sprays.

Physical Properties: *Cleavage*: None. *Fracture*: Irregular to conchoidal. *Tenacity*: Brittle. Hardness = 5-6 VHN = 700 (100 g load). D(meas.) = n.d. D(calc.) = 5.586, 5.678

Optical Properties: Transparent to translucent. *Color*: Pink. *Streak*: White. *Luster*: Vitreous. *Optical Class*: Biaxial (+). n = 1.54-1.60. 2V = 70-80°

Cell Data: *Space Group*: *Pnma*. a = 6.38270(12) b = 6.86727(12) c = 4.39168(8) Z = 4

X-ray Powder Pattern: Pitinga mine, Presidente Figueiredo Co., Amazonas State, Brazil.
3.205 (100), 3.438 (99), 3.623 (78), 2.894 (59), 1.937 (33), 1.862 (27), 3.707 (26)

Chemistry:	(1)	(2)		(1)	(2)
F	29.27	34.34	Dy	8.06	7.77
Y	37.25	44.61	Ho	1.85	2.27
La	0.19	n.d.	Er	6.38	5.39
Ce	0.30	0.08	Tm	1.00	0.69
Pr	0.15	n.d.	Yb	5.52	1.36
Nd	0.65	0.04	Lu	0.65	n.d.
Sm	0.74	0.14	Ca	0.83	0.08
Gd	1.86	2.95	Na	n.d.	0.06
Tb	0.78	0.72	O	[2.05]	[0.80]
			Total	97.53	101.30

(1) Pitinga mine, Presidente Figueiredo Co., Amazonas State, Brazil; average of 24 electron microprobe analyses supplemented by IR spectroscopy, O calculated for charge balance; corresponding to $(Y_{0.69}Dy_{0.08}Er_{0.06}Yb_{0.05}Ca_{0.03}Gd_{0.02}Ho_{0.02}Nd_{0.01}Sm_{0.01}Tb_{0.01}Tm_{0.01}Lu_{0.01})_{\Sigma=1.00}$ $[F_{2.54}\square_{0.25}O_{0.21}]_{\Sigma=3.00}$. (2) Jabal Tawlah (Mount Tawlah), Kingdom of Saudi Arabia; average of 24 electron microprobe analyses supplemented by IR spectroscopy, O calculated for charge balance; corresponding to $(Y_{0.79}Dy_{0.08}Er_{0.05}Gd_{0.03}Ho_{0.02}Tb_{0.01}Tm_{0.01}Yb_{0.01})_{\Sigma=1.00}[F_{2.85}O_{0.08}\square_{0.07}]_{\Sigma=3.00}$.

Occurrence: In veins cutting A-type granite formed by reaction with fluorine and REE-rich fluids.

Association: Biotite, albite, muscovite, microcline, columbite-(Fe), zircon, thorite, xenotime-(Y), samarskite-(Y), ilmenite, euxenite-(Y), fergusonite-(Y), rutile, illite, barite, calcite, goethite (Saudi Arabia); halloysite, albite, quartz, riebeckite, muscovite, cryolite, zircon, polylithionite, cassiterite, pyrochlore-group minerals, 'columbite', thorite, native lead, hematite, galena, fluorite, xenotime-(Y), gagarinite-(Y), fluocerite-(Ce), genthelvite-helvite, topaz, kaolinite (Brazil).

Distribution: From the Pitinga mine, Presidente Figueiredo Co., Amazonas State, Brazil and at Jabal Tawlah (Mount Tawlah), Kingdom of Saudi Arabia.

Name: For the Waimiri-Atroari people of Roraima and Amazonas, Brazil.

Type Material: Geology Museum, University of São Paulo, Brazil (DR919); Luiz Englert Mineralogy Museum, University of Rio Grande do Sul, Brazil (#3620); University of Arizona Mineral Museum, RRUFF Project, Tucson, Arizona, USA.

References: (1) Atencio, D., A.C. Bastos Neto, V.P. Pereira, J.T.M.M. Ferron, M. Hoshino, T. Moriyama, Y. Watanabe, R. Miyawaki, J.M.V. Coutinho, M.B. Andrade, K. Domanik, N.V. Chukanov, K. Momma, H. Hirano, and M. Tsunematsu (2015) Waimirite-(Y), orthorhombic YF_3, a new mineral from the Pitinga mine, Presidente Figueiredo, Amazonas, Brazil and from Jabal Tawlah, Saudi Arabia: description and crystal structure. Mineral. Mag., 79(3), 767-780. (2) (2016) Amer. Mineral., 101, 2360 (abs. ref. 1).