Angarfite $NaFe^{3+}_5(PO_4)_4(OH)_4 \cdot 4H_2O$

Crystal Data: Orthorhombic. *Point Group*: 222. Crystals prismatic to needle-like, elongate on [001], with poorly formed chisel-like terminations, to 2 mm.

Physical Properties: *Cleavage*: Poor on {010}. *Fracture*: Splintery. *Tenacity*: Brittle, slightly flexible splinters. Hardness = 2.5 D(meas.) = 2.76(3) D(calc.) = 2.771

Optical Properties: Transparent. *Color*: Orange-brown to red-brown. *Streak*: Pale brown. *Luster*: Vitreous.
Optical Class: Biaxial (+). α = 1.688(1) β = 1.696(1) γ = 1.708(2) 2V(meas.) = 80(3)° 2V(calc.) = 79° *Orientation*: $X = b$, $Y = c$, $Z = a$. *Pleochroism*: X = tan, Y = medium red-brown, Z = dark red-brown. *Absorption*: $X < Y < Z$. *Dispersion*: Strong, $r > v$.

Cell Data: *Space Group*: $C222_1$. a = 12.788(3) b = 17.894(4) c = 8.195(2) Z = 4

X-ray Powder Pattern: Angarf-Sud pegmatite, Tazenakht, Souss-Massa-Draâ region, Morocco. 9.016 (100), 3.355 (51), 10.463 (43), 6.459 (42), 1.463 (36), 1.926 (33), 3.026 (29)

Chemistry:

	(1)
Na_2O	2.69
MgO	4.76
Mn_2O_3	1.79
Fe_2O_3	37.36
P_2O_5	34.68
H_2O	[14.63]
Total	95.91

(1) Angarf-Sud pegmatite, Tazenakht, Souss-Massa-Draâ region, Morocco; average of 5 electron microprobe analyses, H_2O calculated from structure analysis; corresponding to $Na_{0.71}(Fe^{3+}_{3.83}Mg_{0.97}Mn^{3+}_{0.19})_{\Sigma=4.99}(P_{1.00}O_4)_4(OH)_{2.71}(H_2O)_{1.29} \cdot 4H_2O$.

Occurrence: Occurs in phosphate nodules in the intermediate zone of a granitic pegmatite by the reaction of Na-bearing hydrothermal solutions with primary triphylite.

Association: Triphylite, lipscombite–barbosalite, jahnsite-(NaFeMg), bederite.

Distribution: Angarf-Sud pegmatite, Tazenakht, Ouarzazate Province, Souss-Massa-Draâ region, Morocco.

Name: For the pegmatite body from which the first specimens were collected.

Type Material: Natural History Museum of Los Angeles County, California, USA (63428 and 63429).

References: (1) Kampf, A.R., S.J. Mills, R.M. Housley, G. Favreau, J.-C. Boulliard, and V. Bourgoin (2012) Angarfite, $NaFe_5^{3+}(PO_4)_4(OH)_4 \cdot 4H_2O$, a new mineral species from the Angarf-Sud Pegmatite, Morocco: Description and crystal structure. Can. Mineral., 50, 781-791. (2) (2014) Amer. Mineral., 99, 1511 (abs. ref. 1).