Arangasite $Al_2(PO_4)(SO_4)F•7.5H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*. As elongated lamellar crystals, to 200 μm. Typically in parallel or divergent aggregates, forming dense chalklike masses to 3 cm.

Physical Properties: *Cleavage*: Imperfect basal. *Fracture*: n.d. *Tenacity*: Brittle. Hardness = 1-2 D(meas.) = 2.01(1) D(calc.) = 2.001

Optical Properties: Transparent. *Color*: Colorless. *Streak*: White. *Luster*: Dull to silky. *Optical Class*: Biaxial (+) [by analogy to sanjuanite]. α = 1.493(5) β = n.d. γ = 1.485(5) *Pleochroism*: None. *Orientation*: $Z \perp$ to elongation, $X \parallel$ to elongation.

Cell Data: *Space Group*: *P*2/*a*. a = 7.073(1) b = 9.634(2) c = 10.827(2) β = 100.40(1)° Z = 2

X-ray Powder Pattern: Alyaskitovy deposit, Arangas Creek, eastern Sakha (Yakutia), Russia. 9.64 (100), 4.201 (51), 10.64 (29), 5.325 (25), 3.142 (18), 3.482 (14), 3.216 (14)

Chemistry:

	(1)	(2)	(3)
Al_2O_3	25.36	26.64	25.54
P_2O_5	18.50	17.20	17.78
SO_3	20.95	19.10	20.06
F	5.22	4.58	4.76
$–O=F_2$		1.93	2.00
H_2O		34.24	33.86
Total		99.83	100.00

(1) Alyaskitovy deposit, eastern Sakha (Yakutia), Russia; average of 6 electron microprobe analyses, presence of H_2O, $(SO_4)^{2-}$, $(PO_4)^{3-}$ confirmed by IR spectroscopy. (2) Alyaskitovy deposit, eastern Sakha (Yakutia), Russia; average of 2 wet chemical analyses, H_2O by the Penfield method; corresponding to $Al_{2.08}(P_{0.97}O_4)(S_{0.95}O_4)F_{0.96}·7.48H_2O$. (3) $Al_2(PO_4)(SO_4)F·7.5H_2O$.

Occurrence: In cavities in quartz–muscovite–tourmaline–sulfide veins and adjacent rock, as a secondary mineral from near-surface oxidation and weathering of a strongly greisenized Li–F two-mica, leucogranite porphyry containing Sn and W mineralization.

Association: Phosphorscorodite, fluellite, gypsum, colquiriite, strengite, mansfieldite, sinkankasite.

Distribution: From the Alyaskitovy cassiterite-silicate-sulfide deposit, lower reaches of Arangas Creek, a tributary of the Elga River, Indigirka River basin, eastern Sakha (Yakutia), Russia.

Name: For *Arangas* Creek, located near the site from which the first specimens were collected.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (# 4254/1).

References: (1) Gamyanin, G.N., N.V. Zayakina, and L.T. Galenchikova (2013) Arangasite, $Al_2(PO_4)(SO_4)F·7.5H_2O$, a new mineral from Alyaskitovoye deposit (Eastern Yakutia, Russia). Zap. Ross. Mineral. Obshch., 142(5), 21-30 (in Russian, English abstract). Geol. Ore Deposits, 56(7), 560-566 (in English). (2) (2014) Amer. Mineral., 99, 2150-2151 (abs. ref. 1). (3) Yakubovich, O. V., I. M. Steele, V. V. Chernyshev, N. V. Zayakina, G. N. Gamyanin, and O. V. Karimova (2014) The crystal structure of arangasite, $Al_2F(PO_4)(SO_4)·9H_2O$ determined using low-temperature synchrotron data. Mineral. Mag., 78(4), 889-903.