Hilarionite $Fe^{3+}_2(SO_4)(AsO_4)(OH)\cdot 6H_2O$

Crystal Data: Monoclinic. *Point Group*: 2/*m*, *m*, or 2. As sub-parallel to divergent aggregates of prismatic to acicular crystals, to 0.5 mm, also as crusts or as spherulites, to 1 mm.

Physical Properties: *Cleavage*: Good parallel to elongation. *Fracture*: Uneven or splintery. *Tenacity*: Ductile, flexible fibers. Hardness = 2 D(meas.) = 2.40(5) D(calc.) = 2.486

Optical Properties: Translucent. *Color*: Light green (with olive or grayish tint) to yellowish green, colorless in transmitted light. *Streak*: n.d. *Luster*: Vitreous to silky. *Optical Class*: Biaxial(+). α = 1.575(2) β = n.d. γ = 1.640(2) 2V = Large. *Dispersion*: Strong, $r > v$. *Orientation:* Z is close to elongation.

Cell Data: *Space Group*: $C2/m$, Cm, or $C2$. a = 18.53(4) b = 17.43(3) c = 7.56(1) β = 94.06(15)° Z = 8

X-ray Powder Pattern: Hilarion mine, Lavrion ore district, Atliki Prefecture, Greece. 12.66 (100), 5.00 (10), 4.70 (10), 4.33 (7), 7.60 (6), 2.887 (5), 3.215 (4)

Chemistry:

	(1)
MnO	0.03
CuO	0.18
ZnO	0.17
Fe_2O_3	33.83
P_2O_5	0.22
As_2O_5	18.92
SO_3	22.19
H_2O	26.3
Total	101.82

(1) Hilarion mine, Lavrion ore district, Atliki Prefecture, Greece; average of 7 electron microprobe analyses, Fe^{+3} confirmed by Mössbauer spectroscopy, H_2O determined by Alimarin method, complex anions confirmed by IR spectroscopy; corresponding to $(Fe^{3+}_{1.90}Cu_{0.01}Zn_{0.01})_{\Sigma=1.92}[(SO_4)_{1.24}(AsO_4)_{0.74}(PO_4)_{0.01}]_{\Sigma=1.99}(OH)_{1.01}\cdot 6.03H_2O$.

Occurrence: A secondary mineral in the oxidized zone of a sulfide-rich (pyrite, sphalerite, chalcopyrite, galena) orebody.

Association: Goethite, gypsum, bukovskyite, jarosite, melanterite, chalcanthite, allophane, azurite, hematite, unidentified hydrous copper sulfates.

Distribution: At the Hilarion mine, near Agios Konstantinos (Kamariza), Lavrion ore district, Atliki Prefecture, Greece.

Name: For the mine that produced the first specimens.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia (92988) and the Mineralogical Museum, Athens University, Greece.

References: (1) Pekov, I.V., N.V. Chukanov, V.O. Yapaskurt, V.S. Rusakov, D.I. Belakovskiy, A.G. Turchkova, P. Voudouris, A. Magganas, and A. Katerinopoulos (2013) Hilarionite, $Fe^{3+}_2(SO_4)(AsO_4)(OH)\cdot 6H_2O$, a new supergene mineral from Lavrion, Greece. Zapiski Rossiyskogo Mineralogicheskogo Obtschestva, 142(5), 30-42 (in Russian with English abstract).
(2) (2014) Amer. Mineral., 99, 1515 (abs. ref. 1).