Agardite-(Nd) $NdCu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$

Crystal Data: Hexagonal. *Point Group:* 6/*m*. As acicular crystals, elongated along [001], with hexagonal cross sections, to 0.5 mm, in divergent sprays to 2 mm. Typically as rims on zálesíite.

Physical Properties: *Cleavage*: None. *Fracture:* Uneven. *Tenacity*: Brittle. Hardness = < 3 D(meas.) = n.d. D(calc.) = 3.81

Optical Properties: Transparent. *Color*: Colorless to light bluish green (turquoise-colored). *Streak*: White. *Luster*: Vitreous; silky (aggregates).
Optical Class: Uniaxial (+). ω = 1.709(3)-1.712(3) ε = 1.775(5)-1.780(5) *Absorption*: *E* > *O*. *Pleochroism*: Strong; *O* = pale turquoise, *E* = bright green-blue.

Cell Data: *Space Group: P*$6_3/m$. *a* = 13.548(8) *c* = 5.894(6) Z = 2

X-ray Powder Pattern: Hilarion Mine, Lavrion, Greece.
11.70 (100), 2.453 (30), 4.443 (22), 3.545 (18), 2.935 (18), 2.695 (13), 2.559 (10)

Chemistry:	(1)	(2)
CuO	42.63	43.45
ZnO	3.52	
CaO	2.15	
Y_2O_3	1.27	
La_2O_3	2.16	
Ce_2O_3	0.38	
Pr_2O_3	0.79	
Nd_2O_3	3.05	15.32
Sm_2O_3	0.32	
Gd_2O_3	0.40	
Dy_2O_3	0.02	
As_2O_5	33.65	31.39
H_2O	[9.37]	9.84
Total	[100.00]	100.00

(1) Hilarion Mine, Lavrion, Greece; average of 6 electron microprobe analyses, H_2O by difference; corresponds to $[(Nd_{0.19}La_{0.14}Y_{0.12}Pr_{0.05}Gd_{0.02}Ce_{0.02}Sm_{0.02}Dy_{0.02})_{\Sigma=0.58}Ca_{0.39}]_{\Sigma=0.97}(Cu_{5.49}Zn_{0.44})_{\Sigma=5.93}(AsO_4)_3(OH)_{5.38} \cdot 2.64H_2O$. (2) $NdCu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$.

Mineral Group*:* Mixite group.

Occurrence: In the oxidation zone of polymetallic sulfide deposits.

Association: Zálesíite, zincolivenite, azurite, malachite, calcite, goethite.

Distribution: From the Hilarion Mine, Agios Konstantinos (Kamariza), Lavrion, Attikí Prefecture, Greece.

Name: By analogy to agardite-(Y), with its rare-earth content dominated by neodymium.

Type Material: The A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (4020/1).

References: (1) Pekov, I.V., N.V. Chukanov, A.E. Zadov, P. Voudouris, A. Magganas, and A. Katerinopoulos (2011) Agardite-(Nd), $NdCu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$, from the Hilarion Mine, Lavrion, Greece: mineral description and chemical relations with other members of the agardite-zálesíite solid-solution system. Journal of Geosciences, 57, 249-255. (2) (2012) Amer. Mineral., 97, 2064 (abs. ref. 1).