## 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 (+). $\omega$ = 1.709(3)-1.712(3) $\varepsilon$ = 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).