Plumboagardite $(Pb,REE,Ca)Cu_6(AsO_4)_3(OH)_6 \cdot 3H_2O$

Crystal Data: Hexagonal. *Point Group:* 6/*m.* As acicular crystals to 0.05 mm in radial fibrous spherulitic aggregates to 0.12 mm.

Physical Properties: *Cleavage:* None. *Fracture*: n.d. *Tenacity*: n.d. Hardness = 3
D(meas.) = n.d. D(calc.) = 3.471 Dissolves in dilute HCl.

Optical Properties: Translucent. *Color:* Grass-green. *Streak:* Greenish. *Luster:* Vitreous.
Optical Class: Uniaxial (+). ω = 1.726(5) ε = 1.805(5)

Cell Data: Space Group: $P6_3/m$. a = 13.77(2) c = 5.94(1) Z = 2

X-ray Powder Pattern: Aitern-Süd mine, near Schönau, Baden-Württemberg, Germany.
12.01 (100), 3.60 (80), 2.49 (70), 4.51 (60), 2.98 (60), 3.31 (50), 2.74 (50)

Chemistry:

	(1)
PbO	8.99
La_2O_3	1.91
Nd_2O_3	1.17
Ce_2O_3	0.96
Sm_2O_3	0.20
Pr_2O_3	0.19
Gd_2O_3	0.17
Dy_2O_3	0.10
Y_2O_3	0.96
CaO	1.44
CuO	40.49
Fe_2O_3	1.54
As_2O_5	29.74
P_2O_5	0.30
SiO_2	1.46
H_2O	[10.38]
Total	100.00

(1) Aitern-Süd mine, near Schönau, Baden-Württemberg, Germany; average of 3 electron microprobe analyses, H_2O by difference; corresponds to $[Pb_{0.44}(La_{0.13}Nd_{0.08}Ce_{0.06}Pr_{0.01}Sm_{0.01}Gd_{0.01}Dy_{0.01}Y_{0.09})_{\Sigma=0.40}Ca_{0.28}]_{\Sigma=1.12}(Cu_{5.59}Fe_{0.21})_{\Sigma=5.80}(As_{2.84}Si_{0.27}P_{0.05})_{\Sigma=3.16}O_{12}(OH)_6 \cdot 3.33H_2O$.

Mineral Group: Mixite group.

Occurrence: Formed in the oxidized zone of hydrothermal Pb-Zn vein deposits, the product of alteration of primary Pb, Cu, REE, and As minerals.

Association: Fluorite, limonite, chrysocolla, quartz.

Distribution: From waste dumps of the Aitern-Süd mine, near Schönau, Baden-Württemberg, Germany. From the Miedzianka-Ciechanowice deposits, Rudawy Janowickie Mountains, Lower Silesia, Poland.

Name: As the lead (*plumbo*) analog of *agardite*.

Type Material: Natural History Museum, Stuttgart, Germany.

References: (1) Walenta, K. and T. Theye (2005) Plumboagardite, a new mineral of the mixite group from an occurrence in the Southern Black Forest, Germany. N. Jb. Mineral. Abh., 181(3), 219-222. (2) (2006) Amer. Mineral., 91, 713 (abs. ref. 1). (3) Siudi, R. and B. Golebiowska (2011) New data on supergene minerals from the Miedzianka-Ciechanowice deposits in the Rudawy Janowickie Mountains, Lower Silesia, Poland. Przeglad Geologiczny, 59(3), 226-234.