Lavendulan $NaCaCu_5(AsO_4)_4Cl \cdot 5H_2O$

Crystal Data: Orthorhombic. *Point Group:* n.d. Rarely as crystals, to 3 mm; as radiating fibers or rosettes of plates, and as botyroidal crusts.

Physical Properties: *Cleavage:* Good on {010}; distinct on {100} and {001}.
Hardness = 2.5 D(meas.) = 3.54 D(calc.) = [3.59]

Optical Properties: Semitransparent. *Color:* Lavender, greenish blue. *Luster:* Vitreous, waxy, satiny in aggregates.
Optical Class: Biaxial (–), nearly uniaxial (–). *Pleochroism:* O = pale blue to pale greenish blue; E = blue to greenish blue. *Absorption:* $E > O$. $\omega = 1.748$ $\epsilon = 1.645$

Cell Data: *Space Group:* n.d. $a = 9.73$ $b = 41.0$ $c = 9.85$ Z = 8

X-ray Powder Pattern: San Juan, Chile.
9.77 (100), 3.11 (70), 4.87 (50), 7.01 (40), 4.41 (40), 2.90 (20), 2.76 (20)

Chemistry:	(1)	(2)	(3)		(1)	(2)	(3)
P_2O_5		6.0		CaO	5.8	5.7	5.28
As_2O_5	44.8	36.4	43.28	Na_2O	3.1	3.3	2.92
CoO	0.0	0.03		Cl	3.5	5.5	3.34
CuO	36.3	38.2	37.45	H_2O	[7.3]	[6.0]	8.48
MgO		0.04		$-O = Cl_2$	[0.8]	1.2	0.75
				Total	[100.0]	[100.0]	100.00

(1) San Juan, Chile; H_2O by difference. (2) Dome Rock mine, Australia; by electron microprobe, H_2O by difference; corresponds to $Na_{1.07}(Ca_{1.01}Mg_{0.01})_{\Sigma=1.02}Cu_{4.80}[(As_{0.79}P_{0.21})_{\Sigma=1.00}O_4]_4Cl_{1.55} \cdot 5H_2O$. (3) $NaCaCu_5(AsO_4)_4Cl \cdot 5H_2O$.

Occurrence: A rare secondary mineral in the oxidized zone of some copper deposits.

Association: Erythrite, cuprite, malachite, cobaltian wad (San Juan, Chile); chalcophyllite, cyanotrichite, parnauite, mansfieldite, olivenite, tennantite, covellite, chalcanthite, antlerite, brochantite, geminite (Cap Garonne mine, France); cuprian adamite, conichalcite, o'danielite, tsumcorite, fahleite, quartz, calcite, gypsum (Tsumeb, Namibia).

Distribution: From Annaberg, Saxony, Germany. At Jáchymov (Joachimsthal), Czech Republic. In England, from the Littleham Cove area, Budleigh Salterton, Devon; in the Cligga mine, Perranzabuloe, and the Pentireglaze mine, Cornwall. From Bunmahon, Co. Waterford, Ireland. At Southwick Cliffs, near Dalbeattie, Kirkcudbrightshire, Scotland. In France, from the Cap Garonne mine, near le Pradet, Var, and at the Salsigne mine, 15 km north of Carcassone, Aude. Fine crystals from Pastrana Hill, Mazarrón area, Murcia Province, Spain. At Qued Mahisser, Tunisia. From the Talmessi and Meskani mines, Anarak district, Iran. At Tsumeb, Namibia. From the Arhbar (Aghbar) mine, Bou Azzer district, Morocco. In Chile, at the Blanca mine, San Juan, Freirina, and at several mines in the Sierra Gorda district, southwest of Calama, Antofagasta. In Australia, in the Dome Rock copper mine, about 40 km northwest of Mingary, and the Preamimma mine, near Callington, South Australia; from the Anticline prospect, 11 km west-southwest of Ashburton Downs homestead, Capricorn Range, at the Alice Mary copper mine, Kundip, and several other places in Western Australia. From Gold Hill, Tooele Co., Utah, USA.

Name: For its conspicuous *lavender* color.

Type Material: Mining Academy, Freiberg, Germany, 20944.

References: (1) Palache, C., H. Berman, and C. Frondel (1951) Dana's system of mineralogy, (7th edition), v. II, 750–751, 920–921 [freirinite = lavendulan]. (2) Guillemin, C. (1956) Contribution a la minéralogie des arséniates, phosphates et vanadates de cuivre. I. Arséniates de cuivre. Bull. Minéral., 79, 7–95, esp. 43–54 (in French). (3) Kleeman, A.W. and A.R. Milnes (1973) Phosphorian lavendulan from Dome Rock mine, South Australia. Royal Society of South Australia, Transactions, 97(2), 135–137.