Genthelvite $Zn_4Be_3(SiO_4)_3S$

Crystal Data: Cubic. *Point Group:* $\bar{4}3m$. As tetrahedra and tristetrahedra, to 5 cm. Also as irregular segregations, to 25 cm.

Physical Properties: *Cleavage:* Poor on {111}, {1$\bar{1}$1}. *Fracture:* Uneven. *Tenacity:* Brittle. Hardness = 6.5 D(meas.) = 3.44–3.70 D(calc.) = 3.70 May fluoresce intense green under LW and SW UV, then phosphorescent.

Optical Properties: Transparent. *Color:* Red, pink, yellow, pale green, emerald-green; colorless or pink in thin section. *Luster:* Vitreous.
Optical Class: Isotropic. n = 1.738–1.752

Cell Data: *Space Group:* $P\bar{4}3n$. a = 8.10–8.15 Z = 2

X-ray Powder Pattern: Mont Saint-Hilaire, Canada.
3.320 (100), 1.916 (80), 2.168 (70), 2.567 (65), 1.657 (65), 1.483 (50), 1.435 (50)

Chemistry:	(1)	(2)		(1)	(2)		(1)	(2)
SiO_2	30.26	30.70	CuO	0.30		LOI	0.21	
Al_2O_3		0.18	ZnO	46.20	40.56	$-O = S$	2.78	2.74
FeO	6.81	11.73	BeO	12.70	12.39	Total	100.41	100.04
MnO	1.22	1.72	S	5.49	5.50			

(1) St. Peters Dome, Colorado, USA; average of two analyses, corresponds to $(Zn_{3.31}Fe^{2+}_{0.56}Mn_{0.10}Cu_{0.02})_{\Sigma=3.99}Be_{2.91}Si_{2.97}O_{11.72}S_{1.00}$. (2) Jos, Nigeria; corresponds to $(Zn_{2.93}Fe^{2+}_{0.96}Mn_{0.14})_{\Sigma=4.03}Be_{2.92}(Si_{3.02}Al_{0.04})_{\Sigma=3.06}O_{11.99}S_{1.01}$.

Polymorphism & Series: Forms two series, with danalite, and with helvite.

Occurrence: In miarolitic cavities in granite pegmatites; in alkaline granites and syenites, greisens, and skarns.

Association: Phenakite, bertrandite, hambergite, siderite, sphalerite, willemite, gahnite, topaz, zircon, quartz, microcline, zeolites.

Distribution: From West Cheyenne Cañon, near St. Peters Dome, El Paso Co., Colorado, and Cumberland, Providence Co., Rhode Island, USA. Large crystals from Mont Saint-Hilaire, Quebec, Canada. At Lågendalen, Tvedalen, Brevik, and on Låven Island, in the Langesundsfjord area, Norway. At the Treburland mine, Altarnun, Cornwall, England. From Coire an Lochain, Cairngorm Mountains, Banffshire, Scotland. In the Jos-Bukuru complex, Nigeria. From the El Criollo pegmatite, Cerro Blanco, Tanti district, 45 km west of Córdoba, Córdoba Province, Argentina. In the Ilímaussaq intrusion and the Motzfeldt centre, Greenland. From Russia, in the Lovozero and Khibiny massifs, Kola Peninsula. At Titkäranta, Karelia.

Name: The prefix for Frederick August Ludwig Karl Wilhelm Genth (1820–1893), German-American mineralogist, who described a zinc-rich *helvite* (danalite), later renamed genthelvite.

Type Material: Pennsylvania State University, University Park, Pennsylvania; National Museum of Natural History, Washington, D.C., USA, 127180; The Natural History Museum, London, England, 1976,427.

References: (1) Dana, E.S. (1899) Dana's system of mineralogy, (6th edition), app. I, 1032 [danalite]. (2) Glass, J.J., R.H. Jahns, and R.E. Stevens (1944) Helvite and danalite from New Mexico and the helvite group. Amer. Mineral., 29, 163–191. (3) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 4, framework silicates, 303–309. (4) Vlasov, K.A., Ed. (1966) Mineralogy of rare elements, v. II, 119–126. (5) Dunn, P.J. (1976) Genthelvite and the helvine group. Mineral. Mag., 40, 627–636. (6) Hassan, I. and H.D. Grundy (1985) The crystal structures of helvite group minerals, $(Mn, Fe, Zn)_8(Be_6Si_6O_{24})S_2$. Amer. Mineral., 70, 186–192. (7) Burt, D.M. (1988) Stability of genthelvite, $Zn_4(BeSiO_4)_3S$: an exercise in chalcophilicity using exchange operators. Amer. Mineral., 73, 1384–1394.