Abswurmbachite $(Cu, Mn^{2+})Mn_6^{3+}SiO_{12}$

Crystal Data: [Tetragonal] (by analogy to braunite). *Point Group:* [$4/m$ $2/m$ $2/m$.] Anhedral grains, to 50 μm.

Physical Properties: Hardness = n.d. VHN = 870–950, average 920 (25 g load). D(meas.) = n.d. D(calc.) = 4.96 (synthetic).

Optical Properties: Opaque. *Color:* Black; gray in reflected light. *Streak:* Brownish black. *Luster:* Metallic. *Anisotropism:* Weak.

Cell Data: *Space Group:* [$I4_1/acd$.] $a = 9.406(1)$ $c = 18.546(3)$ Z = [8]

X-ray Powder Pattern: Synthetic $(Cu_{0.98}Mn^{2+}_{0.02})_{\Sigma=1.00}Mn^{3+}_6SiO_{12}$.
2.702 (100), 1.6507 (30), 2.350 (15), 2.133 (15), 1.459 (14), 1.4016 (11), 1.6627 (10)

Chemistry:

	(1)
SiO_2	10.1
TiO_2	0.23
Al_2O_3	0.58
Fe_2O_3	4.7
Mn_2O_3	72.1
CuO	11.6
MgO	< 0.04
CaO	0.16
Total	99.47

(1) Evvia Island, Greece; by electron microprobe, corresponds to $(Cu_{0.88}Mn^{2+}_{0.10}Ca_{0.02})_{\Sigma=1.00}$ $(Mn^{3+}_{5.51}Fe^{3+}_{0.36}Al_{0.07}Ti_{0.02}Cu_{0.02})_{\Sigma=5.98}Si_{1.03}O_{12}$.

Polymorphism & Series: Forms a series with braunite.

Occurrence: In very low-grade, high-pressure metamorphic Mn, Al-rich quartzites.

Association: Quartz, shattuckite, tenorite, sursassite, piemontite, ardennite, rutile, hollandite, clinochlore.

Distribution: At Mili, Evvia Island, and Apikia, Andros Island, Cyclades Islands, Greece.

Name: To honor Dr. Irmgard Abs-Wurmbach (1938–), German mineralogist.

Type Material: Institute for Mineralogy, Ruhr University, Bochum, Germany; National Museum of Natural History, Washington, D.C., USA.

References: (1) Reinecke, T., E. Tillmanns, and H.-J. Bernhardt (1991) Abswurmbachite, $Cu^{2+}Mn^{3+}_6[O_8/SiO_4]$, a new mineral of the braunite group: natural occurrence, synthesis, and crystal structure. Neues Jahrb. Mineral., Abh., 163, 117–143. (2) (1992) Amer. Mineral., 77, 670 (abs. ref. 1).