

Crystal Data: Monoclinic. *Point Group:* $2/m$. Anhedral crystals, to 200 μm , incrusting basalt.

Physical Properties: Hardness = n.d. $D(\text{meas.}) = 3.86(5)$ (synthetic). $D(\text{calc.}) = 3.87$

Optical Properties: Opaque, transparent on very thin edges. *Color:* Black; reddish brown to dark reddish brown in transmitted light; white in reflected light. *Streak:* Reddish brown.

Luster: Metallic.

Optical Class: Biaxial. *Absorption:* Weak. $n = [2.055]$ *Anisotropism:* Moderate to strong.

Cell Data: *Space Group:* $C2/c$ (synthetic). $a = 7.6890(8)$ $b = 8.0289(9)$ $c = 10.1065(8)$
 $\beta = 110.252(7)^\circ$ $Z = 2$

X-ray Powder Pattern: Synthetic.

3.60 (10), 3.09 (10), 3.06 (10), 5.34 (8), 2.302 (8), 2.111 (8), 2.641 (6)

Chemistry:

| | (1) | (2) |
|------------------------|-------|--------|
| V_2O_5 | 52.82 | 53.34 |
| CuO | 45.37 | 46.66 |
| Total | 98.19 | 100.00 |

(1) Izalco volcano, El Salvador; by electron microprobe, average of two analyses; corresponds to $\text{Cu}_{1.97}\text{V}_{2.01}\text{O}_7$. (2) $\text{Cu}_2\text{V}_2\text{O}_7$.

Polymorphism & Series: Dimorphous with blossite; stable above 712 $^\circ\text{C}$.

Occurrence: In vanadium-bearing sublimates in fumaroles on a basaltic volcanic cone.

Association: Stoiberite, shcherbinaite, bannermanite, fingerite, mcbirneyite, blossite, chalcocyanite, chalcantinite.

Distribution: From the summit crater of the Izalco volcano, El Salvador.

Name: To honor Dr. Emanuel G. Zies, Carnegie Institute, Washington, D.C., USA.

Type Material: Carnegie Institute, Washington, D.C., USA.

References: (1) Hughes, J.M. and R.W. Birnie (1980) Ziesite, $\beta\text{-Cu}_2\text{V}_2\text{O}_7$, a new copper vanadate and fumarole temperature indicator. *Amer. Mineral.*, 65, 1146–1149. (2) Hughes, J.M. and M.A. Brown (1989) The crystal structure of ziesite, $\beta\text{-Cu}_2\text{V}_2\text{O}_7$, a thortveitite-type structure with a non-linear X–O–X inter-tetrahedral bond. *Neues Jahrb. Mineral., Monatsh.*, 41–47. (3) Mercurio-Lavaud, D. and M.B. Frit (1973) Structure cristalline de la variété haute température du pyrovanadate de cuivre: $\text{Cu}_2\text{V}_2\text{O}_7$. *Compt. Rendus Acad. Sci. Paris, Ser. C.*, 277, 1101–1104 (in French).