

# Muthmannite

# (Ag, Au)Te

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**Crystal Data:** Monoclinic. *Point Group:*  $2/m$ . As tabular crystals, typically elongated in one direction; as rims and aggregates, to 0.2 mm; in anhedral grains.

**Physical Properties:** *Cleavage:* One perfect, in zone of elongation. *Fracture:* Uneven. Hardness = 2.5 VHN = 172–207, 194 average (10 to 20 g load). D(meas.) = n.d. D(calc.) = 11.04

**Optical Properties:** Opaque. *Color:* Brassy yellow to pale bronze, pale gray on fresh fracture surface; pale gray in reflected light. *Streak:* Black to gray-black. *Luster:* Bright metallic. *Pleochroism:* Very low. *Bireflectance:* Very low.

$R_1$ – $R_2$ : (400) —, (420) 42.3, (440) 41.3, (460) 40.4, (480) 39.7, (500) 39.2, (520) 38.7, (540) 38.4, (560) 38.2, (580) 38.1, (600) 38.0, (620) 38.0, (640) 38.0, (660) 38.1, (680) 38.2, (700) 38.4

**Cell Data:** *Space Group:*  $P2/m$ .  $a = 7.211(9)$   $5.124(2)$   $b = 4.425(5)$   $4.419(1)$   
 $c = 5.100(6)$   $7.437(2)$   $\beta = 89.96(1)^\circ$   $Z = 2$

**X-ray Powder Pattern:** Baia-de-Arieş, Romania.

3.03 (10), 2.113 (8), 2.94 (5), 1.954 (3), 1.322 (3), 1.038 (3), 5.09 (2)

## Chemistry:

	(1)	(2)	(3)
Ag	16.69	18.63	19.25
Au	30.03	33.51	35.20
Fe		0.06	
Cu		0.27	
Hg		0.47	
Sb	[9.75]		
Te	39.14	46.39	45.55
S	4.39		
Total	[100.00]	99.33	100.00

(1) Săcăriş, Romania; neglecting Sb, calculated by difference, and S from stibnite impurity, then corresponds to  $\text{Ag}_{1.01}\text{Au}_{0.99}\text{Te}_{2.00}$ . (2) Baia-de-Arieş, Romania; by electron microprobe, corresponds to  $\text{Ag}_{0.97}\text{Au}_{0.98}\text{Cu}_{0.02}\text{Fe}_{0.01}\text{Hg}_{0.01}\text{Te}_{2.04}$ . (3)  $\text{AgAuTe}_2$ .

**Occurrence:** In close intergrowths with other tellurides, especially krennerite, in epithermal hydrothermal veins, and in ores enriched by secondary processes (Săcăriş, Romania); replacing calaverite (Baia-de-Arieş, Romania).

**Association:** Krennerite, stibnite, hessite, nagyágite, petzite, pyrargyrite, sylvanite, calaverite, pyrite, sphalerite, altaite, tetrahedrite–tennantite, alabandite, (Săcăriş, Romania); calaverite (Baia-de-Arieş, Romania).

**Distribution:** In Romania, from Săcăriş (Nagyág) [TL] and Baia-de-Arieş (Offenbánya).

**Name:** To honor the chemist and crystallographer, Professor Friedrich Wilhelm Muthmann (1861–1913), Technische Hochschule, Munich, Germany.

**Type Material:** University of Naples Museum, Naples, Italy.

**References:** (1) Palache, C., H. Berman, and C. Frondel (1944) Dana's system of mineralogy, (7th edition), v. I, 260–261. (2) Spiridonov, E.M. and T.N. Chvileva (1985) New data on muthmannite,  $\text{AuAgTe}_2$ . Doklady Acad. Nauk SSSR, 280, 994–997 (in Russian). (3) Bayliss, P. (1991) ICDD 42-1377. ??ck if superceded?? (4) Bindi, L. and C. Cipriani (2004) Ordered distribution of Au and Ag in the crystal structure of muthmannite,  $\text{AuAgTe}_2$ , a rare telluride from Sacarîmb, western Romania. Amer. Mineral., 89, 15–5–1509. [from abs - ck entire article??]

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