

Crystal Data: Triclinic. *Point Group:* $\bar{1}$. Crystals, to 0.2 mm, are tabular on {001}, slightly to distinctly elongated along [010], and display {001}, {100}, {011}, {201}. In aggregates to 0.3 mm.

Physical Properties: *Cleavage:* Good on {001}. *Fracture:* Conchoidal. *Tenacity:* Brittle. Hardness = 4.5 D(meas.) = n.d. D(calc.) = 5.81

Optical Properties: Transparent to translucent. *Color:* Brown. *Streak:* Light brown. *Luster:* Adamantine.

Optical Class: Biaxial (-). $\alpha = 2.02(2)$ $\beta(\text{calc.}) = 2.07$ $\gamma = 2.12(2)$ $2V(\text{calc.}) = 65(5)^\circ$
Pleochroism: Strong, X = brown to opaque, Y = yellow, Z = pale yellow. *Orientation:* X \approx [010]; crystals lying on (001) X' show an oblique extinction of $\sim 7^\circ$ relative to [010].

Cell Data: Space Group: $P\bar{1}$. $a = 9.144(3)$ $b = 6.146(2)$ $c = 9.337(3)$ $\alpha = 83.30(2)^\circ$
 $\beta = 70.67(2)^\circ$ $\gamma = 87.14(2)^\circ$ $Z = 2$

X-ray Powder Pattern: Guldener Falk mine near Schneeberg-Neustädtel, Saxony, Germany. 3.752 (100), 2.901 (96), 1.751 (79), 2.667 (72), 8.757 (55), 3.552 (55), 3.507 (44)

Chemistry:	(1)	(2)	(1)	(2)
Bi_2O_3	51.54	53.09	NiO	1.61
PbO	0.08		ZnO	0.39
CaO	0.32		CuO	-
Fe_2O_3	10.90	9.10	As_2O_5	25.91 26.19
Al_2O_3	0.07		P_2O_5	0.43
CoO	5.47	8.54	H_2O	[3.01] 3.08
			Total	99.73 100.00

(1) Guldener Falk mine near Schneeberg-Neustädtel, Saxony, Germany; average of 15 electron microprobe analyses, supplemented by Mössbauer and IR spectroscopy, H_2O calculated; corresponds to $(\text{Bi}_{1.91}\text{Ca}_{0.05})_{\Sigma=1.96}\text{Fe}_{1.02}(\text{Co}_{0.63}\text{Fe}_{0.16}\text{Ni}_{0.19}\text{Zn}_{0.04}\text{Al}_{0.01})_{\Sigma=1.03}[(\text{OH})_{2.88}\text{O}_{1.12}]_{\Sigma=4.00}[(\text{AsO}_4)_{1.95}(\text{PO}_4)_{0.05}]_{\Sigma=2.00}$. (2) $\text{Bi}_2\text{Fe}^{3+}\text{Co}^{2+}\text{O}(\text{OH})_3(\text{AsO}_4)_2$.

Polymorphism & Series: Forms a series with neustädtelite.

Mineral Group: Medenbachite group.

Occurrence: In vugs in quartz collected on waste piles from mining activity.

Association: Neustädtelite, quartz, preisingerite, "limonite"/goethite, mixite, zeunerite, bismutite.

Distribution: Studied material from the dumps of the Guldener Falk mine near Schneeberg-Neustädtel, Saxony, Germany. Other mines with confirmed occurrence in the same district are Siebenschleken, Junge Kalbe, Friedefürst, and Peter und Paul.

Name: Recognizes the compositional importance of *cobalt* and relation with *neustädtelite*.

Type Material: State Museum for Geology and Mineralogy, Dresden, Germany (18329).

References: (1) Krause, W., H-J. Bernhardt, C. McCammon, and H. Effenberger (2002) Neustädtelite and cobaltneustädtelite, the Fe^{3+} - and Co^{2+} -analogues of medenbachite. *Amer. Mineral.*, 87, 726-738.