

**Crystal Data:** Triclinic. *Point Group:*  $\bar{1}$ . Crystals, to 0.1 mm, are tabular on {001} and slightly to distinctly elongated along [010] and display {001},  $\{\bar{1}01\}$ ,  $\{01\bar{1}\}$ ; 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:  $P\bar{1}$ .  $a = 4.566(3)$   $b = 6.158(4)$   $c = 8.972(5)$   $\alpha = 95.52(3)^\circ$   
 $\beta = 99.51(3)^\circ$   $\gamma = 92.85(3)^\circ$  Z = 1

**X-ray Powder Pattern:** Güldener Falk mine near Schneeberg-Neustädtel, Saxony, Germany. 2.913 (100), 3.542 (94), 3.505 (87), 3.766 (83), 2.668 (72), 8.827 (67), 2.798 (48)

Chemistry:	(1)	(2)		(1)	(2)
Bi <sub>2</sub> O <sub>3</sub>	52.58	53.35	NiO	0.34	
PbO	0.08		ZnO	0.09	
CaO	0.15		CuO	0.07	
Fe <sub>2</sub> O <sub>3</sub>	13.92	18.28	As <sub>2</sub> O <sub>5</sub>	26.82	26.31
Al <sub>2</sub> O <sub>3</sub>	0.29		P <sub>2</sub> O <sub>5</sub>	0.23	
CoO	3.35		H <sub>2</sub> O	[2.56]	2.06
			Total	100.48	100.00

(1) Güldener Falk mine near Schneeberg-Neustädtel, Saxony, Germany; average of 13 electron microprobe analyses, supplemented by Mössbauer and IR spectroscopy, H<sub>2</sub>O calculated; corresponds to  $(\text{Bi}_{1.94}\text{Ca}_{0.02})_{\Sigma=1.96}\text{Fe}_{1.00}(\text{Fe}_{0.50}\text{Co}_{0.38}\text{Ni}_{0.04}\text{Al}_{0.05}\text{Zn}_{0.01}\text{Cu}_{0.01})_{\Sigma=0.99}[(\text{OH})_{2.44}\text{O}_{1.40}]_{\Sigma=3.84}[(\text{AsO}_4)_{2.01}(\text{PO}_4)_{0.03}]_{\Sigma=2.04}$ . (2)  $\text{Bi}_2\text{Fe}^{3+}\text{Fe}^{3+}\text{O}_2(\text{OH})_2(\text{AsO}_4)_2$ .

**Polymorphism & Series:** Forms a series with cobaltneustädtelite.

**Mineral Group:** Medenbachite group.

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

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

**Distribution:** Studied material from the dumps of the Güldener 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. Also, from the Friedrich-Wilhelm adit, Friedensgruber vein, near Lichtenberg, Bavaria, Germany.

**Name:** Recognizes the locality, *Neustädtel*, that produced the first specimens.

**Type Material:** State Museum for Geology and Mineralogy, Dresden, Germany (18328).

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