Michalskiite $Fe^{3+}_{1.33}Cu^{2+}_{2}(MgFe^{3+})_2(VO_4)_6$

Crystal Data: Orthorhombic. *Point Group*: 2/*m* 2/*m* 2/*m*. As striated prisms and needles with rectangular cross-sections, elongated along [001], to ~0.2 mm.

Physical Properties: *Cleavage*: Good on {001}. *Tenacity*: Brittle. *Fracture*: Curved. Hardness = ~3.5 D(meas.) = n.d. D(calc.) = 3.848 Nonfluorescent.

Optical Properties: Transparent. *Color*: Brown-red. *Streak*: Light orange. *Luster*: Adamantine. *Optical Class*: Biaxial (-). $\alpha = 2.12$ $\beta = 2.16$ $\gamma = 2.17$ 2V(meas.) = 49(1)° 2V(calc.) = 52.3° Non-pleochroic. *Orientation*: $X = c$.

Cell Data: *Space Group: Pmcn*. $a = 10.2356(9)$ $b = 17.369(2)$ $c = 4.9406(4)$ Z = 2

X-Ray Diffraction Pattern: Lichtenberg open pit, Ronneburg mining district, Thuringia, Germany. 3.27 (100), 2.52 (50), 2.74 (40), 1.55 (30), 1.42 (25), 3.20 (20), 2.90 (20)

Chemistry:

	(1)	(2)
ZnO	0.07	
CuO	10.10	7.86
MgO	10.80	11.95
NiO	1.16	
TiO_2	1.09	
Mn_2O_3	0.49	
Al_2O_3	1.05	
Fe_2O_3	21.39	26.27
V_2O_5	52.72	53.92
SiO_2	0.12	.
Total	98.99	100.00

(1) Lichtenberg open pit, Ronneburg mining district, Thuringia, Germany; average electron microprobe and Raman spectroscopic analyses; corresponds to $(Cu^{2+}_{1.33}Mg_{2.76}Fe^{3+}_{2.75}Al_{0.21}Ni_{0.16}Ti^{4+}_{0.14}Mn^{3+}_{0.06}Zn_{0.01})_{\Sigma=7.40}(V^{5+}_{5.96}Si_{0.02})_{\Sigma=5.98}O_{24}$. (2) $Fe^{3+}_{1.33}(Cu^{2+}Mg)(Fe^{3+}Mg)_2(VO_4)_6$.

Occurrence: Secondary alteration product probably formed at low temperature under oxidizing conditions in a uranium deposit.

Association: Arcanite, epsomite, hematite, syngenite, quartz, K-feldspar, mica.

Distribution From the dump of the Lichtenberg open pit, Ronneburg mining district, Thuringia, Germany.

Name: Honors German mineral collector and dealer Dipl. Min. Steffen *Michalski* (b. 1974), who discovered this mineral and provided the studied material.

Type Material: Natural History Museum of Los Angeles County, Los Angeles, California, USA (67614).

References: (1) Kampf, A.R., J. Plášil, R. Škoda, and J. Čejka (2022) Michalskiite, $Cu^{2+}Mg_3Fe^{3+}_{3.33}(VO_4)_6$, an Mg analogue of lyonsite, from the Ronneburg uranium deposit, Thuringia, Germany. J. Geosciences, 67(1), 33-40.