

Crystal Data: Monoclinic. *Point Group:* $2/m$. As acicular laths elongated along [010] and flattened on {100} to fibrous crystals, to 300 μm ; in radiating aggregates to 3 mm.

Physical Properties: *Cleavage:* Good on {100}. *Tenacity:* Very brittle, fibers somewhat flexible. *Fracture:* Uneven. Hardness = 3-4 (by analogy to beraunite). $D(\text{meas.}) = \text{n.d.}$ $D(\text{calc.}) = 2.834$

Optical Properties: Transparent to translucent, opaque as aggregates. *Color:* Silvery to olive grayish green. *Streak:* Light olive-green. *Luster:* Pearly.
Optical Class: Biaxial (-). $\alpha = 1.650(2)$ $\beta = 1.671(1)$ $\gamma = 1.667(1)$ $2V(\text{meas.}) = 56(1)^\circ$
 $2V(\text{calc.}) = 56^\circ$ *Orientation:* $Z = b$, $X \approx a$, $Y \approx c$. *Pleochroism:* $X = \text{greenish blue}$,
 $Y = \text{yellowish orange}$, $Z = \text{yellowish orange}$. *Absorption:* $X \gg Y > Z$. *Dispersion:* Strong, $r > v$.

Cell Data: Space Group: $C2/c$. $a = 20.564(4)$ $b = 5.1010(10)$ $c = 18.883(4)$ $\beta = 93.68(3)^\circ$ $Z = 4$

X-ray Powder Pattern: Huber open pit, Krásno ore district, western Bohemia, Czech Republic. 10.227 (100), 7.156 (14), 3.416 (11), 5.120 (7), 9.400 (6), 3.278 (6), 2.562 (5)

Chemistry:	(1)	(2)
MnO	0.01	
ZnO	5.08	
FeO	[4.31]	8.75
Fe ₂ O ₃	[21.16]	19.44
Al ₂ O ₃	16.71	18.62
P ₂ O ₅	32.64	34.56
As ₂ O ₅	2.56	
F	0.53	
H ₂ O	[17.84]	18.64
-O = F ₂	0.22	
Total	100.62	100.00

(1) Huber open pit, Krásno ore district, western Bohemia, Czech Republic; average of 9 electron microprobe analyses supplemented by IR spectroscopy, H₂O from stoichiometry, FeO and Fe₂O₃ from bond-valence calculations and Fe_{total} 23.35%; corresponds to $\text{Zn}_{0.52}\text{Fe}^{2+}_{0.50}\text{Fe}^{3+}_{2.21}\text{Al}_{2.75}(\text{PO}_4)_{3.86}(\text{AsO}_4)_{0.19}(\text{OH})_{4.60}\text{F}_{0.23}(\text{OH}_2)_4 \cdot 2\text{H}_2\text{O}$. (2) $\text{Fe}^{2+}\text{Fe}^{3+}_2\text{Al}_3(\text{PO}_4)_4(\text{OH})_5(\text{OH}_2)_4 \cdot 2\text{H}_2\text{O}$.

Occurrence: In a cavity in quartz in greisenized granite, probably a late hydrothermal or supergene mineral formed from the breakdown of primary triplite (in association with isokite and fluorapatite) in contact with acidic waters.

Association: Al-rich beraunite, fluorapatite, pharmacosiderite, quartz.

Distribution: From the Huber open pit, Krásno ore district, near Horní Slavkov, western Bohemia, Czech Republic.

Name: Honors Czech mineralogist and geologist Dr. Jaromír Tvrđý (b. 1959) from Liberec, northern Bohemia, Czech Republic, for his contributions to mineralogy and economic geology.

Type Material: Department of Mineralogy and Petrology, National Museum, Prague, Czech Republic (PIP 11/2014), the Museum Victoria, Melbourne, Australia (M53361) and the Natural History Museum of Los Angeles County, Los Angeles, California, USA (65560).

References: (1) Sejkora, J., I.E. Grey, A.R. Kampf, J.R. Price, and J. Čejka (2016) Tvrđýite, $\text{Fe}^{2+}\text{Fe}^{3+}_2\text{Al}_3(\text{PO}_4)_4(\text{OH})_5(\text{OH}_2)_4 \cdot 2\text{H}_2\text{O}$, a new phosphate mineral from Krásno near Horní Slavkov, Czech Republic. *Mineral. Mag.*, 80, 1077-1088. (2) (2017) *Amer. Mineral.*, 102, 920 (abs. ref. 1).