**Crystal Data**: Monoclinic. *Point Group*: 2/m. As acicular laths elongated along [010] and flattened on {100} to fibrous crystals, to 300  $\mu$ m; 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(meas.) = n.d. D(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 = greenish blue, Y = yellowish orange, Z = yellowish orange. *Absorption*: X > 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
$Fe_2O_3$	[21.16]	19.44
$Al_2O_3$	16.71	18.62
$P_2O_5$	32.64	34.56
$As_2O_5$	2.56	
F	0.53	
$H_2O$	[17.84]	18.64
$-O = F_2$	0.22	<u> </u>
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, H<sub>2</sub>O from stoichiometry, FeO and Fe<sub>2</sub>O<sub>3</sub> from bond-valence calculations and Fe<sub>total</sub> 23.35%; corresponds to  $Zn_{0.52}Fe^{2+}_{0.50}Fe^{3+}_{2.21}Al_{2.75}(PO_4)_{3.86}$  (AsO<sub>4</sub>)<sub>0.19</sub>(OH)<sub>4.60</sub>F<sub>0.23</sub>(OH<sub>2</sub>)<sub>4</sub>·2H<sub>2</sub>O. (2) Fe<sup>2+</sup>Fe<sup>3+</sup><sub>2</sub>Al<sub>3</sub>(PO<sub>4</sub>)<sub>4</sub>(OH)<sub>5</sub>(OH<sub>2</sub>)<sub>4</sub>·2H<sub>2</sub>O.

**Occurrence**: In a cavity in quartz in greisened 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 Tvrdý (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 (P1P 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) Tvrdýite,  $Fe^{2+}Fe^{3+}_2Al_3(PO_4)_4(OH)_5(OH_2)_4 \cdot 2H_2O$ , 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).