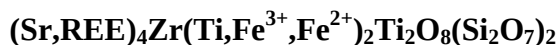


Hezuolinite

Crystal Data: Monoclinic. *Point Group:* 2/m. As grains to several 100 μm .
Twinning: Polysynthetic twins were observed.

Physical Properties: *Cleavage:* None. *Fracture:* Conchoidal. *Tenacity:* Brittle.
 Hardness = 5.5-6 VHN = 683-964 (100 g load). D(meas.) = 4.28 D(calc.) = 4.30

Optical Properties: Translucent. *Color:* Black. *Streak:* Dark brown. *Luster:* Resinous.
Optical Class: Biaxial (-). $n > 1.8$ $2V = 75^\circ$ *Dispersion:* Strong, $r > v$. *Pleochroism:* Strong,
 X = pale brown, Y = brown, Z = dark brown.

Cell Data: *Space Group:* C2/m. $a = 13.973(3)$ $b = 5.6984(11)$ $c = 11.988(2)$ $\beta = 114.10(1)^\circ$
 $Z = 2$

X-ray Powder Pattern: Saima alkaline complex, Fengcheng County, Liaoning Province, China.
 2.98 (100), 3.02 (90), 1.96 (90), 2.18 (80), 2.84 (70), 2.72 (50), 2.51 (50)

Chemistry:	(1)		(1)
SiO ₂	21.90	Na ₂ O	0.35
TiO ₂	24.42	ThO ₂	0.80
Al ₂ O ₃	0.16	UO ₂	0.01
FeO	1.84	La ₂ O ₃	7.12
Fe ₂ O ₃	2.61	Ce ₂ O ₃	8.16
MnO	0.07	Pr ₂ O ₃	0.45
MgO	0.01	Nd ₂ O ₃	1.34
Nb ₂ O ₅	0.28	Sm ₂ O ₃	0.10
ZrO ₂	9.18	Eu ₂ O ₃	0.16
HfO ₂	0.39	Gd ₂ O ₃	0.06
SrO	20.12	Total	101.99
CaO	2.46		

(1) Saima alkaline complex, Liaoning Province, China; average of 25 electron microprobe analyses, oxidation ratio for iron from Mössbauer spectroscopy; corresponding to
 $(\text{Sr}_{2.15}\text{Ce}_{0.55}\text{La}_{0.49}\text{Ca}_{0.49}\text{Na}_{0.12}\text{Nd}_{0.09}\text{Pr}_{0.03}\text{Th}_{0.03}\text{Sm}_{0.01}\text{Eu}_{0.01})_{\Sigma=3.98}(\text{Zr}_{0.82}\text{Fe}^{2+}_{0.14}\text{Hf}_{0.02}\text{Mn}_{0.01})_{\Sigma=1.00}$
 $(\text{Ti}_{1.38}\text{Fe}^{3+}_{0.36}\text{Fe}^{2+}_{0.14}\text{Al}_{0.04}\text{Nb}_{0.02})_{\Sigma=1.94}\text{Ti}_2\text{O}_8(\text{Si}_{2.01}\text{O}_7)_2$.

Mineral Group: Chevkinite group.

Occurrence: In a series of alkaline volcanic and intrusive igneous rocks, associated with aegirine nepheline syenite.

Association: Microcline, nepheline, aegirine, biotite, eudialyte, rinkite, titanite.

Distribution: From the Saima alkaline complex, Fengcheng County, Liaoning Province, NE China.

Name: Honors He Zuolin (1900-1967), for his contributions to optical mineralogy and rare-earths mineralogy in China. Hezuolinite corresponds to the previously discredited "saimaite".

Type Material: Museum of the Institute of Geology and Geophysics, Chinese Academy of Sciences, Beijing, China (KDX016).

References: (1) Yang, Z., G. Giester, K. Ding, and E. Tillmanns (2012) Hezuolinite, $(\text{Sr,REE})_4\text{Zr}(\text{Ti,Fe}^{3+},\text{Fe}^{2+})_2\text{Ti}_2\text{O}_8(\text{Si}_2\text{O}_7)_2$, a new mineral species of the chevkinite group from Saima alkaline complex, Liaoning Province, NE China. *European Journal of Mineralogy*, 24(1), 189-196.
 (2) (2014) *Amer. Mineral.*, 99, 2153-2154 (abs. ref. 1).