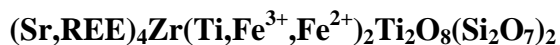


**Hezuolinite**

**Crystal Data:** Monoclinic. *Point Group:* 2/m. As grains to several 100  $\mu\text{m}$ .  
*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,  
 $X = \text{pale brown}$ ,  $Y = \text{brown}$ ,  $Z = \text{dark brown}$ .

**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 <sub>2</sub>	21.90	Na <sub>2</sub> O	0.35
TiO <sub>2</sub>	24.42	ThO <sub>2</sub>	0.80
Al <sub>2</sub> O <sub>3</sub>	0.16	UO <sub>2</sub>	0.01
FeO	1.84	La <sub>2</sub> O <sub>3</sub>	7.12
Fe <sub>2</sub> O <sub>3</sub>	2.61	Ce <sub>2</sub> O <sub>3</sub>	8.16
MnO	0.07	Pr <sub>2</sub> O <sub>3</sub>	0.45
MgO	0.01	Nd <sub>2</sub> O <sub>3</sub>	1.34
Nb <sub>2</sub> O <sub>5</sub>	0.28	Sm <sub>2</sub> O <sub>3</sub>	0.10
ZrO <sub>2</sub>	9.18	Eu <sub>2</sub> O <sub>3</sub>	0.16
HfO <sub>2</sub>	0.39	Gd <sub>2</sub> O <sub>3</sub>	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).