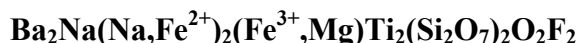


Emmerichite

Crystal Data: Monoclinic. *Point Group:* 2/m. As lamellar to plank-like crystals to 0.5 mm that display {100}, {110} and faces in the {h0l} zone; in clusters to 1 mm. Epitaxial on lileiyite.

Physical Properties: *Cleavage:* Perfect on {001}. *Fracture:* n.d. *Tenacity:* Brittle. Hardness = 3-4 D(meas.) = n.d. D(calc.) = 3.864

Optical Properties: Transparent. *Color:* Brown. *Streak:* White. *Luster:* Vitreous. *Optical Class:* Biaxial (+). $\alpha = 1.725(4)$ $\beta = 1.728(4)$ $\gamma = 1.759(4)$ $2V(\text{meas.}) = 80(5)^\circ$ $2V(\text{calc.}) = 79^\circ$ *Dispersion:* Medium, $r > v$. *Orientation:* $X = a$, Y and $Z \parallel (100)$, $Y \parallel$ elongation. *Pleochroism:* Moderate; $Z =$ brown, $Y =$ light brown, $X =$ greenish gray. *Absorption:* $Z \geq Y > X$.

Cell Data: *Space Group:* C2/m. $a = 19.9601(3)$ $b = 7.0989(1)$ $c = 5.4074(1)$ $\beta = 96.367(1)^\circ$ $Z = 2$

X-ray Powder Pattern: Rother Kopf, Eifel Mountains, Germany. 2.792 (100), 3.461 (65), 2.140 (57), 2.670 (56), 9.97 (55), 2.629 (45), 3.312 (40)

Chemistry:	(1)	(2)	(1)	(2)	
Na ₂ O	5.44	10.31	TiO ₂	15.21	17.72
K ₂ O	1.03		ZrO ₂	0.52	
CaO	1.98		Nb ₂ O ₅	1.32	
SrO	3.23		SiO ₂	27.13	26.65
BaO	25.94	34.02	F	3.54	4.21
MgO	3.13		<u>-O = F₂</u>	<u>1.49</u>	<u>1.77</u>
MnO	2.22		Total	100.78	100.00
FeO	[4.85]				
Fe ₂ O ₃	[6.73]	8.86			

(1) Rother Kopf, Eifel Mountains, Germany; average of 5 electron microprobe analyses supplemented by IR spectroscopy, FeO and Fe₂O₃ from structure analysis; corresponding to Ba_{1.49}Sr_{0.27}K_{0.19}Na_{1.54}Ca_{0.31}Mn_{0.28}Mg_{0.68}Fe²⁺_{0.59}Fe³⁺_{0.74}Ti_{1.67}Zr_{0.04}Nb_{0.09}Si_{3.97}O_{16.36}F_{1.64}.

(2) Ba₂Na₃Fe³⁺Ti₂(Si₂O₇)₂O₂F₂.

Mineral Group: Lamprophyllite group.

Occurrence: A high-temperature pneumatolitic mineral in cavities within alkaline basalt.

Association: Nepheline, leucite, augite, phlogopite, fluorapatite, götzenite, åkermanite, günterblässite, magnetite, perovskite.

Distribution: From Rother Kopf (near Roth) and Graulay (near Hillesheim) quarries, Eifel Mountains, Rheinland-Palatinate, Germany.

Name: Honors Franz-Josef Emmerich (b. 1940), German amateur mineralogist and collector of minerals from the Eifel region.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow, Russia (94122).

References: (1) Chukanov, N.V., R.K. Rastsvetaeva, S.M. Aksenov, G. Blass, I.V. Pekov, D.I. Belakovskiy, J. Tschörtner, W. Schüller, and B. Ternes (2014) Emmerichite, Ba₂Na(Na,Fe²⁺)₂(Fe³⁺,Mg)Ti₂(Si₂O₇)₂O₂F₂, a new lamprophyllite-group mineral from the Eifel volcanic region, Germany. *New Data on Minerals*, 49, 5-13 (in Russian; English version on CD). (2) Aksenov, S.M., R.K. Rastsvetaeva, and N.V. Chukanov (2014) The crystal structure of emmerichite Ba₂Na₃Fe³⁺Ti₂(Si₂O₇)₂O₂F₂, a new lamprophyllite-group mineral. *Z. Kristallog.*, 229(1), 1-7. (3) (2016) *Amer. Mineral.*, 101, 1491-1492 (abs. refs. 1 & 2).