

Dualite $\text{Na}_{30}(\text{Ca},\text{Na},\text{Ce},\text{Sr})_{12}(\text{Na},\text{Mn},\text{Fe},\text{Ti})_6\text{Zr}_3\text{Ti}_3\text{MnSi}_{51}\text{O}_{144}(\text{OH},\text{H}_2\text{O},\text{Cl})_9$

Crystal Data: Hexagonal. *Point Group:* 3m. As irregularly shaped grains to 0.5 mm.

Physical Properties: *Cleavage:* None. *Fracture:* Conchoidal. *Tenacity:* Brittle. *Hardness* = 5
D(meas.) = 2.84(3) D(calc.) = 2.814

Optical Properties: Transparent to translucent. *Color:* Yellow. *Streak:* White. *Luster:* Vitreous.
Optical Class: Uniaxial (+). $\omega = 1.610(1)$ $\varepsilon = 1.613(1)$

Cell Data: *Space Group:* R3m. $a = 14.153(9)$ $c = 60.72(5)$ $Z = 3$

X-ray Powder Pattern: Mount Alluaiv, Lovozero Pluton, Kola Peninsula, Russia.
2.964 (100), 2.839 (90), 2.159 (60), 1.770 (60), 4.31 (50), 1.362 (50), 7.11 (40)

Chemistry:	(1)		(1)
Na ₂ O	17.74	Al ₂ O ₃	0.20
K ₂ O	0.08	SiO ₂	51.26
CaO	8.03	TiO ₂	4.40
SrO	1.37	ZrO ₂	5.39
BaO	0.29	Nb ₂ O ₅	1.94
MnO	2.58	Cl	0.58
FeO	1.04	H ₂ O	[1.39]
La ₂ O ₃	0.79	<u>-O = Cl₂</u>	<u>0.13</u>
Ce ₂ O ₃	1.84	Total	99.67
Nd ₂ O ₃	0.88		

(1) Mount Alluaiv, Lovozero Pluton, Kola Peninsula, Russia; average electron microprobe analysis, H₂O calculated; corresponds to $(\text{Na}_{29.79}\text{Ba}_{0.1}\text{K}_{0.10})_{\Sigma=30}(\text{Ca}_{8.55}\text{Na}_{1.39}\text{REE}_{1.27}\text{Sr}_{0.79})_{\Sigma=12}(\text{Na}_{3.01}\text{Mn}_{1.35}\text{Fe}^{2+}_{0.87}\text{Ti}_{0.77})_{\Sigma=6}(\text{Zr}_{2.61}\text{Nb}_{0.39})_{\Sigma=3}(\text{Ti}_{2.52}\text{Nb}_{0.48})_{\Sigma=3}(\text{Mn}_{0.82}\text{Si}_{0.18})_{\Sigma=1}(\text{Si}_{50.77}\text{Al}_{0.23})_{\Sigma=51}\text{O}_{144}[(\text{OH})_{6.54}(\text{H}_2\text{O})_{1.34}\text{Cl}_{0.98}]_{\Sigma=8.86}$.

Mineral Group: Eudialyte group.

Occurrence: Formed during the final stages of peralkaline pegmatite formation.

Association: K-Na feldspar, nepheline, sodalite, cancrinite, aegirine, alkaline amphibole, eudialyte, lovozerite, lomonosovite, vuonnemite, lamprophyllite, sphalerite, villiamite.

Distribution: At Mount Alluaiv, Lovozero Pluton, Kola Peninsula, Russia.

Name: From Latin *dualis* (dual) alluding to the dual taxonomic membership of this mineral, at the same time zirconosilicate and titanosilicate.

Type Material: A.E. Fersman Mineralogical Museum, Russian Academy of Sciences, Moscow.

References: (1) Khomyakov, A.P., G.N. Nechelyustov, and R.K. Rastsvetaeva (2007) Dualite, a new zircono-titanosilicate with a modular eudialyte-like structure from Lovozero alkaline massif, Kola Peninsula, Russia. *Zap. Ross. Mineral. Obshch.*, 136(4), 31-42 (in Russian).
(2) (2002) *Amer. Mineral.*, 87, 997 (abs. ref. 1).