Manganoeudialyte $Na_{14}Ca_6Mn_3Zr_3[Si_{26}O_{72}(OH)_2]Cl_2 \cdot 4H_2O$

Crystal Data: Hexagonal. *Point Group*: 3*m*. As cm-wide massive patches in igneous rock.

Physical Properties: *Cleavage*: None. *Fracture*: Uneven. *Tenacity*: Brittle.
Hardness = 5-6 D(meas.) = 2.890 D(calc.) = 2.935

Optical Properties: Transparent to translucent. *Color*: Pink to purple. *Streak*: White.
Luster: Vitreous.
Optical Class: Uniaxial (+). ω = 1.603(2) ε = 1.608(2)

Cell Data: *Space Group*: *R3m.* a = 14.2418(1) c = 30.1143(3) Z = 3

X-ray Powder Pattern: Poços de Caldas massif, Minas Gerais, Brazil.
3.218 (100), 1.609 (77), 3.526 (46), 1.605 (41), 6.421 (37), 4.329 (30), 3.023 (25)

Chemistry:

	(1)	(2)		(1)	(2)
Na_2O	12.01	14.18	SiO_2	48.70	51.05
K_2O	0.59		TiO_2	0.47	
CaO	10.70	11.00	ZrO_2	12.08	12.08
MnO	3.51	6.96	Nb_2O	1.21	
SrO	3.00		HfO_2	0.25	
FeO	2.72		F	0.08	
Al_2O_3	0.41		Cl	0.99	2.32
La_2O_3	0.15		H_2O	3.5	2.94
Ce_2O_3	0.12		$- O = (Cl,F)_2$	0.26	0.52
Nd_2O_3	0.00		Total	100.23	100.00

(1) Poços de Caldas massif, Minas Gerais, Brazil; average of 12 electron microprobe analyses, IR spectroscopy confirms absence of CO_2 and presence of OH and H_2O; corresponding to $[Na_{11.93}Sr_{0.81}(H_3O)_{0.70}K_{0.39}Ce_{0.07}]_{\Sigma=13.90}[Ca_6][^{VI}Mn_{1.56}{}^{V}Fe_{1.20}{}^{V}Na_{0.24}]_{\Sigma=3.00}[Zr_3][^{IV}(Si_{0.38}Al_{0.25})$ $^{VI}(Nb_{0.29}Zr_{0.08})]_{\Sigma=1.00}[^{IV}Si_{0.81}{}^{VI}Ti_{0.19}]_{\Sigma=1.00}[Si_{24}O_{72}][(OH)_2][(H_2O)_{3.55}Cl_{0.88}(OH)_{0.84}O_{0.40}F_{0.13}]_{\Sigma=5.80}$.
(2) $Na_{14}Ca_6Mn_3Zr_3[Si_{26}O_{72}(OH)_2]Cl_2 \cdot 4H_2O$.

Mineral Group: Eudialyte group.

Occurrence: An interstitial phase in nepheline syenite (khibinite).

Association: Eudialyte, K-feldspar, nepheline, aegirine, analcime, sodalite, rinkite, lamprophyllite, astrophyllite, titanite, fluorite, cancrinite.

Distribution: At the northern edge ("Anel Norte"), Poços de Caldas massif, Minas Gerais, Brazil.

Name: As a member of the *eudialyte* group with dominant manganese in the *M2* structural sites and silicon dominant in *M3* and *M4* sites.

Type Material: Museum of Geosciences, Institute of Geosciences, University of São Paulo, São Paulo, Brazil (DR704).

References: (1) Nomura, S.F., D. Atencio, N.V. Chukanov, R.K. Rastsvetaeva, J.M.V. Coutino, and T.K. Karipidis (2010) Manganoeudialyte - a new mineral from Poços De Caldas, Minas Gerais, Brazil. Zap. Ross. Mineral. Obshch., 139(4), 35-47 (in English with Russian abstract). (2) (2012) Amer. Mineral., 97, 1263-1264 (abs. ref. 1).