Landauite $\mathbf{NaMn^{2+}Zn_2(Ti, Fe^{3+})_6Ti_{12}O_{38}}$

Crystal Data: Hexagonal. *Point Group:* $\overline{3}$. As prismatic crystals and irregular grains, to 1 mm, in aggregates. *Twinning:* Commonly as complex cyclic twins.

Physical Properties: *Fracture:* Conchoidal. Hardness = 7.5 D(meas.) = 4.42 D(calc.) = 4.46

Optical Properties: Opaque, translucent through thin edges. *Color:* Black; brownish green through thin edges. *Streak:* Gray. *Luster:* Submetallic.
Optical Class: Biaxial (–). *Pleochroism:* Strong; $X = Z$ = bottle-green; Y = green.
Dispersion: $r > v$, weak. *Absorption:* $Z > Y > X$. $\alpha = 2.373$ β = n.d. $\gamma = 2.388$
2V(meas.) = ∼60°

Cell Data: *Space Group:* $R\overline{3}$. $a = 10.366(7)$ $c = 20.77(1)$ Z = 3

X-ray Powder Pattern: Burpala massif, Russia.
2.83 (10), 2.11 (9), 1.780 (8), 1.582 (8), 1.429 (8), 2.21 (7), 3.36 (6)

Chemistry:

	(1)
Nb_2O_5	0.29
TiO_2	72.59
ZrO_2	0.30
Fe_2O_3	6.77
FeO	1.26
MnO	4.12
ZnO	10.85
PbO	2.10
Na_2O	1.36
K_2O	0.45
Total	100.09

(1) Burpala massif, Russia; by electron microprobe, Fe^{2+}:Fe^{3+} ratio approximated from charge balance; corresponds to $(Na_{0.76}K_{0.16}Pb_{0.16})_{\Sigma=1.08}Mn_{1.00}Zn_{2.30}Ti_{15.70}Fe_{1.75}(Nb, Zr)_{0.08}O_{38}$.

Mineral Group: Crichtonite group.

Occurrence: An accessory mineral in albite veins cutting syenite pegmatite associated with an alkalic pluton.

Association: Albite, polylithionite, brookite, chabazite, monazite, bastnäsite, murataite.

Distribution: In the Burpala massif, 120 km north of Lake Baikal, eastern Siberia, Russia.

Name: Honors Lev Davidovich Landau (1908–1968), noted Russian physicist.

Type Material: A.E. Fersman Mineralogical Museum, Academy of Sciences, Moscow, Russia, 67187, vis5882, vis5883; National Museum of Natural History, Washington, D.C., USA, 144009.

References: (1) Portnov, A.M., L.Y. Nikolayeva, and T.I. Stolyarova (1966) A new titanium mineral, landauite. Doklady Acad. Nauk SSSR, 166, 1420–1421 (in Russian). (2) (1966) Amer. Mineral., 51, 1546 (abs. ref. 1). (3) Il'menev, E.S., A.M. Portnov, S.V. Bochkov, and S.I. Vostrova (1972) New type of baumhauer twins in landauite crystals. Doklady Acad. Nauk SSSR, 202, 1321–1323 (in Russian). (4) Grey, I.E. and B.M. Gatehouse (1978) The crystal structure of landauite, $Na[MnZn_2(Ti, Fe)_6Ti_{12}]O_{38}$. Can. Mineral., 16, 63–68.