

Lindsleyite

(Ba, Sr)(Ti, Cr, Fe, Mg, Zr)₂₁O₃₈

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Crystal Data: Hexagonal. *Point Group:* $\bar{3}$ or 3. Grains, to 5 mm, rimmed by and enclosed in other minerals.

Physical Properties: *Fracture:* Conchoidal. Hardness = n.d. VHN = [1378–1714, 1505 average (100 g load)] (“comparable to mathiasite”). D(meas.) = n.d. D(calc.) = 4.63

Optical Properties: Opaque. *Color:* Black; tan in reflected light. *Luster:* Metallic. *Optical Class:* Uniaxial. *Pleochroism:* Weak; buff-white to tan. *Anisotropism:* Weak; pale tan to brown.

R₁–R₂: (400) 19.4–19.8, (420) 19.0–19.2, (440) 18.6–18.9, (460) 18.1–18.4, (480) 17.8–18.1, (500) 17.5–17.8, (520) 17.2–17.5, (540) 17.1–17.3, (560) 16.9–17.1, (580) 16.7–17.0, (600) 16.7–16.9, (620) 16.6–16.9, (640) 16.5–16.8, (660) 16.5–16.9, (680) 16.5–16.9, (700) 16.5–16.9

Cell Data: *Space Group:* $R\bar{3}$ or $R3$. *a* = 10.37 *c* = 20.52 *Z* = 3

X-ray Powder Pattern: South Africa.

2.13 (100), 1.80 (100), 1.59 (100), 1.44 (100), 2.87 (70), 2.83 (70), 1.50 (50)

Chemistry:	(1)	(2)	(1)	(2)
Nb ₂ O ₅	0.02	2.04	V ₂ O ₃	0.78
Ta ₂ O ₅	0.03		FeO	11.20
V ₂ O ₅	0.98		MnO	0.19
SiO ₂	0.00	0.17	PbO	0.07
TiO ₂	54.28	53.30	MgO	3.54
ZrO ₂	4.02	4.39	CaO	0.42
Al ₂ O ₃	0.09	0.27	SrO	1.69
La ₂ O ₃		1.48	BaO	4.60
CeO ₂		0.11	Na ₂ O	0.01
RE ₂ O ₃	2.21		K ₂ O	0.21
Cr ₂ O ₃	16.22	17.19	Total	99.78
				99.08

(1) De Beers mine, South Africa; by electron microprobe, all Fe as FeO, RE₂O₃ = La₂O₃ 0.05%, Ce₂O₃ 1.36%, Nd₂O₃ 0.01%, Eu₂O₃ 0.08%, Tb₂O₃ 0.04%, Ho₂O₃ 0.03%, Er₂O₃ 0.27%, Tm₂O₃ 0.19%, Lu₂O₃ 0.18%; corresponds to (Ba_{0.55}Sr_{0.30}RE_{0.25}Ca_{0.14}Pb_{0.11}K_{0.08}Na_{0.01})_{Σ=1.44}(Ti_{12.36}Cr_{3.88}Fe_{2.84}Mg_{1.60}Zr_{0.59}V_{0.20}Mn_{0.05}Al_{0.03})_{Σ=21.55}O₃₈. (2) Shandong Province, China; corresponds to (Ba_{0.58}La_{0.16}Ca_{0.12}K_{0.11}Ce_{0.01})_{Σ=0.98}(Ti_{11.8}Cr_{4.00}Fe_{2.19}Mg_{1.65}Zr_{0.63}Nb_{0.27}V_{0.15}Al_{0.09}Si_{0.05})_{Σ=20.83}O₃₈.

Mineral Group: Crichtonite group.

Occurrence: A mantle-derived phase in veinlets in metasomatized kimberlite (South Africa).

Association: Mathiasite, phlogopite, perovskite, chromian diopside, potassian richterite, Nb–Cr rutile, Mg–Cr–Nb ilmenite, chromian spinel (South Africa).

Distribution: From the De Beers and Bultfontein diamond mines, Kimberley, Cape Province, South Africa. At an undisclosed locality [Yimeng Mountain area] in Shandong Province, China.

Name: For Professor Donald Hale Lindsley (1934–), State University of New York, Stony Brook, New York, USA, for his work in high-pressure petrology.

Type Material: South African National Museum, Cape Town, South Africa; The Natural History Museum, London, England; National Museum of Natural History, Washington, D.C., USA.

References: (1) Haggerty, S.E., J.R. Smyth, A.J. Erlank, R.S. Rickard, and R.V. Danchin (1983) Lindsleyite (Ba) and mathiasite (K): two new chromium-titanates in the crichtonite series from the upper mantle. *Amer. Mineral.*, 68, 494–505. (2) Zhang Jianhong, Ma Jianguo, and Li Liangjing (1988) The crystal structures and crystal chemistry of lindsleyite and mathiasite. *Dizhi Lump'ing [Geological Review]*, 34(2), 132–144 (in Chinese with English abs.).

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