Cookeite $\mathbf{LiAl_4(Si_3Al)O_{10}(OH)_8}$

Crystal Data: Triclinic. *Point Group:* $\overline{1}$. Pseudohexagonal platy crystals; curved, radial scales, spherulites, barrel-shaped, fibrous. *Twinning:* Around [310], composition plane {001}.

Physical Properties: *Cleavage:* {001}, perfect. *Tenacity:* Flexible but inelastic. Hardness = 2.5–3.5 D(meas.) = 2.58–2.69 D(calc.) = 2.968

Optical Properties: Transparent to translucent. *Color:* White, yellowish green, pink, brown; in thin section, colorless to pale green or pink. *Luster:* Pearly or silky.
Optical Class: Biaxial (+); rarely with biaxial sectors around a uniaxial core. *Pleochroism:* $X =$ $Y =$ pale green to pink; $Z =$ colorless to pale yellow. *Orientation:* $Y = b$; $X \wedge a = 0°$–$3°$; $Z \wedge a$ $= 90°$–$87°$. *Dispersion:* $r < v$. *Absorption:* $X = Y > Z$. $\alpha = 1.572$–1.578 $\beta = 1.579$–1.584 $\gamma = 1.589$–1.595 2V(meas.) = 0°–80°

Cell Data: *Space Group:* $C\overline{1}$. $a = 5.14$ $b = 8.90$ $c = 14.15$ $\alpha = 90°33'$ $\beta = 90°12'$ $\gamma = 90°$ Z = 2

X-ray Powder Pattern: Londonderry, Western Australia.
2.315 (10), 4.70 (9), 3.52 (9), 14.1 (8), 7.05 (7), 2.505 (7), 1.489 (7)

Chemistry:

	(1)	(2)		(1)	(2)
SiO_2	33.40	38.26	CaO	0.45	
Al_2O_3	47.47	44.28	Li_2O	3.12	2.00
Fe_2O_3	0.00	1.31	$(Na,K)_2O$	0.09	
FeO	0.71	0.48	H_2O^+	14.98	13.00
MnO	trace		H_2O^-	0.23	
MgO	0.20		Total	100.65	99.33

(1) Kalbinsky Range, Ural Mountains, Russia; corresponds to $(Li_{1.11}Na_{0.02}K_{0.01})_{\Sigma=1.14}$ $(Al_{3.89}Fe^{2+}_{0.05}Ca_{0.04}Mg_{0.03})_{\Sigma=4.01}(Si_{2.95}Al_{1.05})_{\Sigma=4.00}O_{10}(OH)_8$. (2) Djalair deposit, "Middle Asia," Russia; corresponds to $Li_{0.7}(Al_{3.96}Fe^{3+}_{0.09}Fe^{2+}_{0.04})_{\Sigma=4.09}(Si_{3.38}Al_{0.62})_{\Sigma=4.00}O_{10.35}(OH)_{7.65}$.

Mineral Group: Chlorite group.

Occurrence: A late-stage hydrothermal alteration product of lithium-bearing minerals in pegmatites; a primary hydrothermal vein mineral.

Association: Lepidolite, spodumene, tourmaline, petalite, quartz, albite, microcline.

Distribution: Good examples from: in the USA, at Hebron, Mt. Mica, near Paris, and Buckfield, Oxford Co., Maine; in the Pala and Rincon districts, San Diego Co., California; from the Jeffrey quarry, North Little Rock, Pulaski Co., Arkansas. At Waitabit Creek, northwest of Donald, British Columbia, Canada. From Ogofau, Carmarthenshire, England. At Radkovice and Dobrá Voda, Czech Republic. In the Varuträsk pegmatite, 15 km northwest of Skellefteå, Västerbotten, Sweden. From Lipovka, Ural Mountains, Russia. In the Muiâne pegmatite, Alto Ligonha district, Mozambique. At Londonderry, Western Australia. Many additional localities are known.

Name: For Josiah B. Cooke, Jr. (1827–1894), American mineralogist and chemist, Harvard University, Cambridge, Massachusetts, USA.

Type Material: Yale University, New Haven, Connecticut, USA, 2.3728 (holotype material probably exhausted in analysis).

References: (1) Dana, E.S. (1892) Dana's system of mineralogy, (6th edition), 625.
(2) Deer, W.A., R.A. Howie, and J. Zussman (1963) Rock-forming minerals, v. 3, sheet

silicates, 131–163. (3) Brown, B.E. and S.W. Bailey (1962) Chlorite polytypism: I. Regular and semi-random one-layer structure. Amer. Mineral., 47, 819–850. (4) Černý, P. (1970) Compositional variations in cookeite. Can. Mineral., 10, 636–647. (5) Vrublevskaja [Vrublevskaya], Z.V., I.S. Delitsin, B.B. Zvyagin, and S.V. Soboleva (1975) Cookeite with a perfect regular structure, formed by bauxite alteration. Amer. Mineral., 60, 1041–1046. (6) Bailey, S.W. and J.S. Lister (1989) Structures, compositions, and X-ray diffraction identification of dioctahedral chlorites. Clays and Clay Minerals, 37, 193–202.