Caryinite  \((\text{Na, Pb})(\text{Ca, Na})(\text{Ca, Mn}^{2+})(\text{Mn}^{2+}, \text{Mg})_{2}(\text{AsO}_4)_3\)

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**Crystal Data:** Monoclinic. Point Group: 2\(/m\). As cleavable masses; fine-grained massive, in veins to 10 cm.

**Physical Properties:** Cleavage: On \{110\} and \{010\}, distinct. Hardness = 4
D(meas.) = 4.29  D(calc.) = 4.45

**Optical Properties:** Subtranslucent. Color: Nut-brown to yellowish brown; in transmitted light, pale yellow-brown. Luster: Greasy.
Optical Class: Biaxial (+). Orientation: X = c; Y = a; Z = b. Dispersion: r > v, slight.
\(\alpha=1.776(5)\)  \(\beta=1.780(5)\)  \(\gamma=1.805(5)\)  \(2V(\text{meas.}) = 41(3)^{\circ}\)

**Cell Data:** Space Group: I\(2/a\). a = 6.855(2)  b = 13.147(3)  c = 11.479(4)  \(\beta = 98.97(2)^{\circ}\)  Z = 4

**X-ray Powder Pattern:** Långban, Sweden.

**Chemistry:**

\begin{align*}
\text{P}_2\text{O}_5 & \quad 0.19 \quad 0.8 \quad 0.95 \quad \text{MgO} \quad 3.09 \quad 3.1 \quad 3.24 \\
\text{As}_2\text{O}_5 & \quad 49.78 \quad 47.8 \quad 48.84 \quad \text{CaO} \quad 12.12 \quad 10.8 \quad 10.82 \\
\text{V}_2\text{O}_5 & \quad 0.24 \quad \text{BaO} \quad 1.03 \quad 0.8 \quad 0.17 \\
\text{SiO}_2 & \quad 0.21 \quad \text{Na}_2\text{O} \quad 5.16 \quad 4.18 \quad 4.82 \\
\text{FeO} & \quad 0.54 \quad 0.5 \quad 0.10 \quad \text{K}_2\text{O} \quad 0.37 \\
\text{MnO} & \quad 18.66 \quad 19.1 \quad 17.90 \quad \text{Cl} \quad \text{trace} \\
\text{PbO} & \quad 9.21 \quad 11.5 \quad 12.73 \quad \text{H}_2\text{O} \quad 0.53 \\
\end{align*}

Total 100.89  98.6  99.81

(1) Långban, Sweden; Si\(\text{O}_2\) determined separately and thought to be in berzeliiite. (2) Do.; by electron microprobe, total Fe as FeO, Mn as MnO, Na determined by flame photometry. (3) Do.; by electron microprobe, average of two analyses, total Fe as FeO, Mn as MnO; cations apportioned by structure refinement, corresponding to \((\text{Na}_{0.61}\text{Pb}_{0.39})_{\Sigma=1.00}(\text{Ca}_{0.56}\text{Na}_{0.43}\text{Ba}_{0.01})_{\Sigma=1.00}(\text{Ca}_{0.74}\text{Mn}_{0.26})_{\Sigma=1.00}(\text{Mn}^{2+}_{1.45}\text{Mg}_{0.54}\text{Fe}^{3+}_{0.01})_{\Sigma=2.00}(\text{AsO}_4)_{2.89}(\text{PO}_4)_{0.09}(\text{VO}_4)_{0.02})_{\Sigma=3.06}\).

**Mineral Group:** Alluaudite group.

**Occurrence:** In veinlets in skarn in a metamorphosed Fe–Mn orebody.

**Association:** Berzeliiite, adelite, hedyphane, hausmannite, rhodonite, diopside, calcite.

**Distribution:** At Långban, Värmland, Sweden.

**Name:** From the Greek for nut-brown, for its common color.

**Type Material:** Swedish Museum of Natural History, Stockholm, Sweden, 221444.