Beusite-(Ca)  
\[ \text{CaMn}^{2+}_2(\text{PO}_4)_2 \]

**Crystal Data:** Monoclinic.  
*Point Group:* 2/m.  
As lamellae (to 1.5 mm wide) in optical orientation with each other, epitaxially intergrown with triphylite.

**Physical Properties:**  
*Cleavage:* Good on \{010\} and \{100\}.  
*Fracture:* Irregular.  
*Tenacity:* Brittle.  
*Hardness = ~5*

\[ \text{D(meas.) = n.d.} \]  
\[ \text{D(calc.) = 3.610} \]

**Optical Properties:**  
*Transparent.*  
*Color:* Pale brown, colorless in transmitted light.  
*Streak:* Very pale brown.  
*Luster:* Vitreous.

**Optical Class:** Biaxial (+).  
\[ \alpha = 1.685(2) \quad \beta = 1.688(2) \quad \gamma = 1.700(5) \quad 2V(\text{meas.}) = 46.0(5)° \]

\[ 2V(\text{calc.}) = 53° \]  
*Orientation:* \( X \parallel b, \ Y \wedge a = 40.3° \) in \( \beta \) obtuse, \( Z \wedge a = 49.7° \) in \( \beta \) acute.  
*Dispersion:* \( r < v \), weak.  
*Pleochroism:* None.

**Cell Data:**  
*Space Group:* \( P2_1/c. \)  
\[ a = 8.7990(18) \quad b = 11.724(2) \quad c = 6.1700(12) \quad \beta = 99.23(3)° \quad Z = 4 \]

**X-ray Powder Pattern:** Calculated pattern.

2.904, (100), 3.564 (97), 2.932 (87), 2.873 (86), 2.718 (86), 2.991 (76), 3.030 (58)

**Chemistry:**

<table>
<thead>
<tr>
<th>Element</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{P}_2\text{O}_5 )</td>
<td>41.63</td>
<td>41.76</td>
</tr>
<tr>
<td>( \text{FeO} )</td>
<td>19.43</td>
<td></td>
</tr>
<tr>
<td>( \text{MnO} )</td>
<td>23.63</td>
<td>41.74</td>
</tr>
<tr>
<td>( \text{MgO} )</td>
<td>nd</td>
<td></td>
</tr>
<tr>
<td>( \text{CaO} )</td>
<td>15.45</td>
<td>16.50</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100.14</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Yellowknife pegmatite field, Northwest Territories, Canada; average of 10 electron microprobe analyses supplemented by Raman and Mössbauer spectroscopy; corresponds to \( \text{Ca}_9\text{Mn}_4(\text{Fe}_{0.92}\text{Mg}_{0.07})_2(\text{PO}_4)_2 \).  
(2) \( \text{CaMn}_2(\text{PO}_4)_2 \).

**Polymorphism & Series:** Forms series with beusite and graftonite members of the group.

**Mineral Group:** Graftonite group.

**Occurrence:** A common primary phosphate in a beusite-triphylite nodule (6×5×3 cm) in beryl-columbite-phosphate subtype of zoned rare-element pegmatites, in a small dike, which cuts an interlayered sequence of amphibolite and granodiorite. The product of exsolution from a (Li,Ca)-rich graftonite-like parent phase crystallized at high temperature from P-bearing hydrosaline melts related to anatetic melts, generated by partial melting of metasedimentary-metavolcanics rocks.

**Association:** Triphylite-lithiophilite, sarcopside.

**Distribution:** In the Yellowknife pegmatite field, between Upper Ross Lake and Redout Lake, 75 km northeast of Yellowknife and 3.5 km east of the Redout granite, Northwest Territories, Canada.

**Name:** The suffix indicates the \( \text{Ca} \)-analogue of beusite.

**Type Material:** Department of Mineral Sciences, National Museum of Natural History, Washington, D.C., USA (177054).

**References:**  
(1) Hawthorne, F.C., M.A. Wise, P. Černý, Y. Abdu, N.A. Ball, A. Pieczka, and A. Włodek (2018) Beusite-(Ca), ideally \( \text{CaMn}^{2+}_2(\text{PO}_4)_2 \), a new graftonite-group mineral from the Yellowknife pegmatite field, Northwest Territories, Canada: Description and crystal structure. Mineral. Mag., 82(6), 1323-1332.  
(2) (2020) Amer. Mineral., 105(7), 972-973 (abs. ref. 1).  