Ferraioloite  \( \text{MgMn}^{2+}_{4} (\text{Fe}^{2+}_{0.5} \text{Al}^{3+}_{0.5})_{4} \text{Zn}_{4} (\text{PO}_4)_8 (\text{OH})_4 (\text{H}_2\text{O})_{20} \)

**Crystal Data:** Monoclinic.  *Point Group:* 2/m.  As plates or blades to 0.2 mm, in books or rosettes to 0.4 mm. Crystals display {101}, {100} and {011} and may have curved faces.

**Physical Properties:** *Cleavage:* Perfect on {100}.  *Fracture:* Irregular.  *Tenacity:* Flexible.  *Hardness:* \(~2\)  \(D(\text{meas.}) = \text{n.d.}\)  \(D(\text{calc.}) = 2.59\)

**Optical Properties:** Transparent.  *Color:* Greenish gray to lemon-yellow.  *Streak:* n.d.  *Luster:* Vitreous.  *Optical Class:* Biaxial (-).  \(\alpha = 1.575(\text{calc.})\)  \(\beta = 1.5825(5)\)  \(\gamma = 1.5835(5)\)  \(2V(\text{meas.}) = 40(5)^\circ\)  *Dispersion:* Weak, \(r > v\)  *Orientation:* \(X \approx a, Y = b, Z \approx c\)  *Absorption:* \(Y \gg X \approx Z\)  *Pleochroism:* \(X, Z = \text{colorless}, Y = \text{blue-grey}\).

**Cell Data:** *Space Group:* \(\text{I}2/m\).  \(a = 25.333(3)\)  \(b = 6.299(1)\)  \(c = 15.161(3)\)  \(\beta = 90.93(3)\)^\circ  \(Z = 2\)

**X-ray Powder Pattern:** Foote mine, Kings Mountain district, North Carolina, USA.  2.6648 (100), 2.924 (8), 3.245 (7), 3.499 (5), 2.869 (5), 4.78 (4), 4.22 (4)

**Chemistry:**

<table>
<thead>
<tr>
<th>Element</th>
<th>Formula</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>CaO</td>
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<tr>
<td>MgO</td>
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<tr>
<td>MnO</td>
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<td>15.26</td>
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<tr>
<td>ZnO</td>
<td>18.90</td>
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<tr>
<td>FeO</td>
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<td>Al_2O_3</td>
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<td>P_2O_5</td>
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<td>H_2O</td>
<td>[21.30]</td>
<td>21.30</td>
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<tr>
<td>Total</td>
<td>102.49</td>
<td>100.00</td>
<td></td>
</tr>
</tbody>
</table>

(1) Foote mine, Kings Mountain district, North Carolina, USA: average of 10 electron microprobe analyses, H_2O calculated; corresponds to Ca_{0.21}MgO_{0.50}Mn^{2+}_{4.16}Fe^{2+}_{2.05}Al^{3+}_{2.01}Zn_{4.27}P_{8.00}H_{43.59}O_{56}.

(2) MgMn^{2+}_{4}(Fe^{2+}_{0.5}Al^{3+}_{0.5})_{4}Zn_{4}(PO_4)_8(OH)_4(H_2O)_{20}.

**Occurrence:** A secondary phase in sugary pegmatite.

**Association:** Vivianite, fairfieldite/messelite, phosphophyllite, scholzite/parascholzite, rittmannite, mangangordonite, kingsmountite, kastningite, metaswitzerite.

**Distribution:** At the Foote Lithium Company mine, Kings Mountain district, Cleveland County, North Carolina, USA.

**Name:** Honors James (Jim) Anthony Ferraiolo (1947-2014), author of *A Systematic Classification of Nonsilicate Minerals* (Bulletin 172 of the American Museum of Natural History, 1982).

**Type Material:** Museum Victoria, Melbourne, Australia (M53492 and M53493) and the Natural History Museum of Los Angeles County, Los Angeles, California, USA (65593 and 65594).