Parahibbingite  \( \text{Fe}_2(\text{OH})_3\text{Cl} \)

**Crystal Data:** Hexagonal.  \( \text{Point Group}: \bar{3} \tilde{2}/m. \) As reaction rims or aggregates <100 \( \mu \)m at the contact of orthopyroxene phenocrysts and talc.

**Physical Properties:**  
- **Cleavage:** n.d.  
- **Tenacity:** n.d.  
- **Fracture:** n.d.  
- **Hardness:** n.d.  
- D(meas.) = n.d.  
- D(calc.) = 3.24

Extremely vulnerable to oxidation in contact with air and, in a few hours, it converts to iron oxyhydroxides (typically akaganéite).

**Optical Properties:**  
- **Translucent.**  
- **Color:** Light blue-gray (synthetic); greenish (under the microscope).  
- **Streak:** Gray (synthetic).  
- **Luster:** Nonmetallic.

**Optical Class:**  
\( n(\text{calc.}) = 1.75 \)

**Cell Data:**  
- **Space Group:** \( \text{R}3 \)-m.  
- \( a = 6.94(5) \)  
- \( c = 14.5(2) \)

**X-Ray Diffraction Pattern:** Calculated pattern.
\[2.31 \ (100), \ 2.82 \ (62), \ 5.55 \ (42), \ 1.73 \ (36), \ 2.94 \ (22), \ 1.85 \ (17), \ 1.53 \ (15)\]

**Chemistry:**

<table>
<thead>
<tr>
<th>Element</th>
<th>(1)</th>
<th>(2)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fe</td>
<td>54.29</td>
<td>56.36</td>
</tr>
<tr>
<td>Mn</td>
<td>0.33</td>
<td></td>
</tr>
<tr>
<td>Mg</td>
<td>0.05</td>
<td></td>
</tr>
<tr>
<td>Si</td>
<td>0.03</td>
<td></td>
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<tr>
<td>Cl</td>
<td>16.13</td>
<td>17.87</td>
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<tr>
<td>Na</td>
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<tr>
<td>K</td>
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<tr>
<td>Ca</td>
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<td></td>
</tr>
<tr>
<td>H</td>
<td>1.53</td>
<td></td>
</tr>
<tr>
<td>OH</td>
<td>[25.81]</td>
<td>24.22</td>
</tr>
</tbody>
</table>

Total 96.93 100.00

(1) Karee mine, Rustenburg District, Bushveld complex, South Africa; average electron microprobe analysis supplemented by Raman spectroscopy, OH calculated from stoichiometry; corresponds to \( (\text{Fe}^{2+}_{1.98}\text{Mn}^{2+}_{0.01}\text{Ca}_{0.01})(\text{OH})_{3.08}\text{Cl}_{0.92} \).  
(2) \( \text{Fe}_2(\text{OH})_3\text{Cl} \).

**Polymorphism & Series:** A dimorph of hibbingite.

**Occurrence:** As a replacement product, either after rock-forming silicates with Fe\(^{2+}\) (e.g., orthopyroxenes), iron meteorites, or man-made iron objects if they were in contact with chloride-rich anoxic brines. Could be a large reservoir for Cl and H\(_2\)O in altered mafic and ultramafic rocks.

**Association:** Talc, orthopyroxene (En\(_{74-76}\)Fs\(_{23-24}\)Wo\(_{0-2}\)), cummingtonite, magnesio-ferrihornblende, actinolite, tremolite; also locally, carbonates (siderite, dolomite, calcite), sulfides (pyrrhotite, pentlandite, chalcopyrite), sercite, chrome with a herecynite component, rutile, magnetite (Karee mine). Akaganéite (iron meteorites).

**Distribution:** From the Karee mine, Rustenburg District, Bushveld complex, South Africa.

**Name:** The prefix indicates the dimorphous relation with hibbingite.

**Type Material:** Mineralogical Museum, Comenius University, Bratislava, Slovakia (7601).

**References:** (1) Koděra, P., J. Majzlan, K. Pollok, S. Kiefer, F. Šimko, E. Scholtzová, J. Luptáková, and G. Cawthorn (2022) Ferrous hydroxylchlorides hibbingite [\( \gamma\)-\( \text{Fe}_2(\text{OH})_3\text{Cl} \)] and parahibbingite [\( \beta\)-\( \text{Fe}_2(\text{OH})_3\text{Cl} \)] as a concealed sink of Cl and H\(_2\)O in ultrabasic and granitic systems. Amer. Mineral., 107, 826-841.