Ramazzoite  

\[ \text{[Mg}_8\text{Cu}_{12}(\text{PO}_4)(\text{CO}_3)_4(\text{OH})_{24}(\text{H}_2\text{O})_{20}]\text{[(H}_{0.33}\text{SO}_4)_3(\text{H}_2\text{O})_{36}] } \]

**Crystal Data:** Cubic.  
*Point Group:* 4 3m.  
As cubes to 0.15 mm on edge.  
*Twinning:* Merohedral indicated by the structure refinement.

**Physical Properties:**  
*Cleavage:* Perfect on {100}.  
*Fracture:* Conchoidal.  
*Tenacity:* Very brittle.  
*Hardness:* 2.5  
*D(meas.):* 1.98  
*D(calc.):* 1.962  
Soluble with mild effervescence in dilute HCl.

**Optical Properties:**  
*Color:* Blue to greenish blue.  
*Streak:* Pale blue.  
*Luster:* Vitreous to oily.  
*Optical Class:* Isotropic.  
\( n = 1.491(1) \)

**Cell Data:**  
*Space Group:* \( P4_3 3m \).  
*a = 13.3887(10) \)  
*Z = 1*

**X-ray Powder Pattern:** Monte Ramazzo mine, near Genova, Liguria, Italy.  
13.37 (100), 9.43 (24), 4.043 (11), 3.252 (9), 2.857 (9), 4.224 (8), 2.730 (5)

**Chemistry:**

<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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<tbody>
<tr>
<td>MgO</td>
<td>22.61</td>
<td>16.73</td>
<td>10.75</td>
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<tr>
<td>CuO</td>
<td>30.30</td>
<td>22.43</td>
<td>31.84</td>
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<td>P2O5</td>
<td>3.38</td>
<td>2.50</td>
<td>2.37</td>
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<td>SO3</td>
<td>11.51</td>
<td>8.52</td>
<td>8.01</td>
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<td>CO2</td>
<td>[6.21]</td>
<td></td>
<td>5.87</td>
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<tr>
<td>H2O</td>
<td>[43.60]</td>
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<tr>
<td>Total</td>
<td>99.99</td>
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<td>100.00</td>
</tr>
</tbody>
</table>

(1) Monte Ramazzo mine, Liguria, Italy; average of 5 electron microprobe analyses supplemented by Raman spectroscopy, H2O calculated based on 36 H2O in the interstitial unit to approximate the measured density, CO2 calculated from structure; corresponds to \( [\text{Mg}_{8.00}\text{Cu}_{8.00}\text{Mg}_{3.78}(\text{PO}_4)(\text{CO}_3)_4(\text{OH})_{24}(\text{H}_2\text{O})_{20}][\text{H}_{0.33}\text{SO}_4)_3(\text{H}_2\text{O})_{36}] \).  
(2) Do.; normalized.  
(3) \[ \text{[Mg}_8\text{Cu}_{12}(\text{PO}_4)(\text{CO}_3)_4(\text{OH})_{24}(\text{H}_2\text{O})_{20}][\text{H}_{0.33}\text{SO}_4)_3(\text{H}_2\text{O})_{36}] \].

**Occurrence:** A late-stage, secondary mineral hosted in serpentine in contact with basalt dikes and pillow lavas. Likely crystallized from a low-temperature, aqueous solution.

**Association:** Magnetite, chloraritnine, chrysotile, dypingite, goethite, lepidocrocite, nesquehonite, an unidentified Mg sulfate-carbonate.

**Distribution:** From the Monte Ramazzo mine, near Genova, Liguria, Italy.

**Name:** For the locality, the Monte Ramazzo mine.

**Type Material:** Natural History Museum of Los Angeles County, Los Angeles, California, USA.  
(66691 and 66692).

**References:**  