Gerdtremmelite \((\text{Zn, Fe}^{2+})(\text{Al, Fe}^{3+})_2(\text{AsO}_4)(\text{OH})_5\)  

Crystal Data: Triclinic.  
Point Group: \(\overline{1}\) or 1. Crystals are tabular, to 0.5 mm, in spherulitic aggregates.

Physical Properties:  
Hardness = n.d.  
D(meas.) = > 3.3  
D(calc.) = 3.66

Optical Properties:  
Transparent.  
Color: Brown, yellowish brown, dark brown.  
Streak: White.  
Luster: Adamantine.  
Optical Class: Biaxial; high birefringence.  
\(n = 1.735(5)\)  
2V(meas.) = n.d.

Cell Data:  
Space Group: \(\text{P} \overline{1} \text{ or P}1\).  
\(a = 5.169(5)\)  
\(b = 13.038(9)\)  
\(c = 4.931(4)\)  
\(\alpha = 98.78(7)^\circ\)  
\(\beta = 100.80(6)^\circ\)  
\(\gamma = 78.73(6)^\circ\)  
\(Z = 2\)

X-ray Powder Pattern: Tsumeb, Namibia.  
12.77 (100), 3.878 (50), 3.631 (50), 3.140 (50), 4.801 (40), 4.695 (40), 4.220 (40)

Chemistry:  
<table>
<thead>
<tr>
<th></th>
<th>(1)</th>
<th>(2)</th>
<th>(3)</th>
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</thead>
<tbody>
<tr>
<td>MoO$_3$</td>
<td>1.08</td>
<td>1.08</td>
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<tr>
<td>As$_2$O$_5$</td>
<td>32.53</td>
<td>31.54</td>
<td>32.79</td>
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<tr>
<td>Al$_2$O$_3$</td>
<td>23.76</td>
<td>26.74</td>
<td>24.73</td>
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<tr>
<td>Fe$_2$O$_3$</td>
<td>11.38</td>
<td>10.01</td>
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<tr>
<td>FeO</td>
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<tr>
<td>CuO</td>
<td>0.01</td>
<td>0.04</td>
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<tr>
<td>ZnO</td>
<td>19.51</td>
<td>19.58</td>
<td>19.73</td>
</tr>
<tr>
<td>H$_2$O</td>
<td>11.25</td>
<td>11.25</td>
<td>12.85</td>
</tr>
<tr>
<td>Total</td>
<td>99.52</td>
<td>100.24</td>
<td>100.00</td>
</tr>
</tbody>
</table>

(1) Tsumeb, Namibia; by electron microprobe, total Fe as Fe$_2$O$_3$, H$_2$O by TGA on a separate sample; corresponds to \((\text{Zn}_{0.83}\text{Fe}_{0.45}\text{Al}_{1.60})\Sigma=2.92[(\text{As}_{0.97}\text{Mo}_{0.03})\Sigma=1.00\text{O}_4]\text{OH}_{4.30}\).  
(2) Do.; corresponds to \((\text{Zn}_{0.85}\text{Fe}_{0.15})\Sigma=1.00(\text{Al}_{1.70}\text{Fe}_{0.30})\Sigma=2.00(\text{AsO}_4)\text{OH}_{5}\).

Occurrence: A very rare secondary mineral from the deep oxidized zone of a dolostone-hosted hydrothermal polymetallic ore deposit.

Association: Powellite, betpakdalite, scorodite, wilhelmkleinite, adamite, hematite, kaolinite, quartz.

Distribution: From Tsumeb, Namibia.

Name: To honor Dr. Gerd Tremmel (1940–), of Overath-Steinbrück, Germany, who submitted the mineral for identification.

Type Material: Mineralogical-Petrographical Institute, University of Heidelberg, Heidelberg, Germany; National Museum of Natural History, Washington, D.C., USA, 162488.

References:  