Hydrowoodwardite  

\[
\text{Cu}_2\text{Al}_2(\text{SO}_4)(\text{OH})_8\cdot\text{nH}_2\text{O}. 
\]

(\text{C}2001-2005\text{ Mineral Data Publishing, version 1})

Crystal Data:  Hexagonal.  \text{Point Group: 7 2/m (probable)}.  As porous botryoidal crusts and small stalactitic aggregates.


Optical Properties:  Translucent.  Color: Blue to pale blue.  \text{Streak: Pale blue.}  Luster: Vitreous.  \text{Optical Class: [Uniaxial.]}  \( n = 1.549(5)–1.565(5) \)  \( \omega = \text{n.d.} \)  \( \epsilon = \text{n.d.} \)

Cell Data:  \text{Space Group: \textit{R}\text{3}m (probable).}  \( a = 3.070(7) \)  \( c = 31.9(2) \)  \( Z = 3 \)

X-ray Powder Pattern:  St. Briccius mine, Germany.  
10.5 (100), 5.26 (17), 3.50 (6), 2.60 (5b), 1.524 (4b), 2.46 (2b), 2.23 (2b)

Chemistry: 

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<table>
<thead>
<tr>
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<tbody>
<tr>
<td>( \text{SO}_3 )</td>
<td>15.50</td>
</tr>
<tr>
<td>( \text{SiO}_2 )</td>
<td>5.60</td>
</tr>
<tr>
<td>( \text{Al}_2\text{O}_3 )</td>
<td>19.20</td>
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<tr>
<td>( \text{CuO} )</td>
<td>28.39</td>
</tr>
<tr>
<td>( \text{ZnO} )</td>
<td>0.41</td>
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<tr>
<td>( \text{Na}_2\text{O} )</td>
<td>0.10</td>
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<tr>
<td>( \text{H}_2\text{O} )</td>
<td>30.10</td>
</tr>
<tr>
<td>\text{Total}</td>
<td>[99.30]</td>
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</tbody>
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(1) St. Briccius mine, Germany; by ICP-MS, \( \text{SiO}_2 \) from admixed amorphous silica, \( \text{H}_2\text{O} \) by TGA, \( (\text{SO}_4)^{2-} \), \( \text{(OH)}^{1-} \) and \( \text{H}_2\text{O} \) confirmed by IR; original total given as 99.3%; corresponds to 
\( (\text{Cu}_{1.92}\text{Zn}_{0.04})\Sigma=1.96\text{Al}_{2.04}(\text{SO}_4)_{1.04}(\text{OH})_{7.96}\cdot5.08\text{H}_2\text{O}. \)

(2) St. Christoph mine, Germany; analysis not given, \( (\text{CO}_3)^{2-} \) from stoichiometry and presence confirmed by IR; then stated to correspond to 
\( (\text{Cu}_{1.96}\text{Zn}_{0.04})\Sigma=2.00(\text{UO}_2)_{0.04}\text{Al}_{2.00}[(\text{SO}_4)_{0.64}(\text{CO}_3)_{0.36}]\Sigma=1.00(\text{OH})_8\cdot\text{nH}_2\text{O}. \)

Occurrence:  Rare in the oxidized portions of base metal sulfide mines.

Association:  Woodwardite, schulenbergite, namuwite, brianyoungite, langite, linarite, allophane, amorphous silica.

Distribution:  In Germany, in Saxony, from the St. Briccius mine, Königswalde, near Annaberg; 
in the Gelbe Birke mine, Schwarzenberg; at the St. Johannes mine, Wolkenstein, near Marienberg; 
and from the St. Christoph mine, Bärenhecke.  At Simdde Dyllhan, Drws-y-Coed, near Nantlle, 
Gwynedd, Wales.

Name:  As the hydrated analog of woodwardite.

Type Material:  Mining Academy, Freiberg, Germany, 76639.