New structural data on Belgian ardenntes

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**Conclusions**

- Single-crystal X-ray diffraction measurements and structure refinements were performed on three new occurrences of Belgian ardenntes.
- The knowledge of the cation distributions in these three new occurrences, combined with chemical data, will help us to better understand the crystal chemistry of the complex ardennte group.

**Ardennite**

- **First described** by von Lasaulx and Pisani in 1872.
- **General formula**: \( A_4M_6T_6O_{22}(OH)_6 \) \( Mn^{2+}(Al,Mg)_{12}(Si_3O_{10})_2(As, V)O_4(OH)_6 \)
- **Crystallography**: orthorhombic, space group \( Pnnm, a \approx 8.8 \text{ Å}, b \approx 5.8 \text{ Å}, c \approx 18.6 \text{ Å}, Z = 2 \)
- **Geological setting**: Manganiferous sediments affected by low- to high-grade metamorphism
- **Type localities**: Salmchâteau (Belgium), Piedmont (Italy)

**Ardennite samples**

- **Ardennite-(As)** (Salmchâteau)
- **Ardennite-(V)** (Piedmont)

**Ardennite-(As) crystal** (Salmchâteau)

**Crystallographic forms**

**New Belgian occurrences**

<table>
<thead>
<tr>
<th>Samples</th>
<th>Thier del preu</th>
<th>Regné</th>
<th>Bihain</th>
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</thead>
<tbody>
<tr>
<td>( a (\text{Å}) )</td>
<td>5.7981</td>
<td>5.7995</td>
<td>5.8035</td>
</tr>
<tr>
<td>( b (\text{Å}) )</td>
<td>18.4765</td>
<td>18.467</td>
<td>18.4792</td>
</tr>
<tr>
<td>( c (\text{Å}) )</td>
<td>8.6953</td>
<td>8.6888</td>
<td>8.6959</td>
</tr>
<tr>
<td>As SOF on ( T4 )</td>
<td>0.96</td>
<td>0.85</td>
<td>0.81</td>
</tr>
</tbody>
</table>

Proportions of As and V calculated from de refined occupancies on the \( T4 \) site

**Crystal structure**

- \( M_1, M_2 = \text{Al} \)
- \( A_1, A_2 = \text{Mn}^{2+} \)
- \( M_3 = \text{Mg} \)
- \( T_1, T_2, T_3 = \text{Si} \)
- \( T_4 = \text{As}^{5+}, \text{V}^{5+} \)

\( A2: \) seven-fold coordination

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