Utilization of Industrial Residuals for Prevention of Sulfide Oxidation in Mine Wastes

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Inhibition of sulfide oxidation

The subproject aims at developing techniques for prevention of sulfide oxidation in mine waste and subsequent improve leachate quality during mining operations.

Specific objectives:

• Evaluate inhibition techniques useful from economic, environmental and technical perspectives.

• Use remnants from mining and other industries in inhibition techniques.
Problem

• ARD from waste rock heaps with low NNP is limed

• Application of NNP to waste rock during operation can decrease amount of NNP needed through inhibition of sulfide oxidation by formation of coatings
  - Decrease metal(loid) and sulfate release
  - Decrease cost for lime, energy, and sludge
Inhibition of sulfide oxidation

Industrial remnants/by-products are tested in laboratory and pilot scale

- Lower material cost
- Limited or no use
## Results

**Table 1** Average concentrations of metalloid(s) in leachate from leaching of solely waste rock as well as waste rock with addition of industrial remnants

<table>
<thead>
<tr>
<th></th>
<th>pH (mS/cm)</th>
<th>EC (μg/L)</th>
<th>As (μg/L)</th>
<th>Cu (mg/L)</th>
<th>Fe (μg/L)</th>
<th>Hg (μg/L)</th>
<th>Pb (μg/L)</th>
<th>S (mg/L)</th>
<th>Sb (μg/L)</th>
<th>U (μg/L)</th>
<th>Zn (μg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Waste rock¹</td>
<td>1.4</td>
<td>32</td>
<td>9526</td>
<td>1589</td>
<td>9990</td>
<td>5.5</td>
<td>567</td>
<td>10290</td>
<td>515</td>
<td>59</td>
<td>8487</td>
</tr>
<tr>
<td>LKD (5wt%)²</td>
<td>7</td>
<td>0.77</td>
<td>0.18</td>
<td>&lt;0.5</td>
<td>&lt;0.001</td>
<td>&lt;0.05</td>
<td>&lt;0.02</td>
<td>149</td>
<td>3</td>
<td>0.13</td>
<td>4</td>
</tr>
<tr>
<td>Fly ash (1wt%)³</td>
<td>4.6</td>
<td>0.51</td>
<td>0.12</td>
<td>6.5</td>
<td>1.9</td>
<td>&lt;0.05</td>
<td>5.7</td>
<td>82</td>
<td>0.32</td>
<td>0.55</td>
<td>308</td>
</tr>
<tr>
<td>Fly ash (2.5wt%)³</td>
<td>6.7</td>
<td>0.61</td>
<td>0.12</td>
<td>&lt;0.5</td>
<td>1.3</td>
<td>&lt;0.05</td>
<td>&lt;0.02</td>
<td>77</td>
<td>2</td>
<td>0.82</td>
<td>33</td>
</tr>
</tbody>
</table>

¹Average concentration of 300 days (day 400-700)
²Concentration at day 700
³Concentration at day 400
Future activities

• Identify secondary minerals (coatings) formed
• Identify how and where trace elements are captured
• Determine long-term evaluation of water quality and stability of secondary minerals formed