ECO-FRIENDLY TECHNOLOGY FOR GOLD RECOVERY FROM Cu AND Pb BEARING MINING WASTE

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Background
The unprecedented increase of electric and electronic devices production determined an increased request for materials with good electrical conductivity and corrosion resistance, such as gold. Consequently, the recovery of gold from various mining wastes gained an increased interest.

The strict environmental regulations and low social acceptance of highly polluting Au recovery methods as amalgamation and cyanidation boosted the development of innovative, eco-friendly technologies for the recovery of gold.

Aim
The objective of the study is to test the ammonium thiosulphate leaching in alkaline media in the presence of air as oxidant and copper ions as catalyzer for the recovery of gold from mining wastes.

Experimental method
The experiments were conducted on flotation tailings collected from Central Dam (Baia Mare, Romania). This tailings resulted from processing complex and gold-bearing ores and contains about 0.7 g/t Au and 11 g/t Ag. Before leaching the tailings were dried and grinded to <100 µm particle size.

The following experimental conditions were used:
- 1.2 solid to liquid ratio
- 20 g/l (NH₄)₂S₂O₃
- 0.1-0.5 g/l Cu²⁺
- pH >9.5
- 15 - 30 ºC
- 1000 rpm mixing speed
- 2l/min air flow
- 4 h reaction time

After extraction, the exhausted tailings are separated from the solution by filtration. The extract is recirculated for a new extraction, until a minimum concentration of 10 ppm Au is reached.

Results

<table>
<thead>
<tr>
<th>Metal</th>
<th>Raw tailing (mg/kg)</th>
<th>Exhausted tailing (mg/kg)</th>
<th>Extraction efficiency (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Au</td>
<td>0.7</td>
<td>0.16</td>
<td>77</td>
</tr>
<tr>
<td>Ag</td>
<td>7.5</td>
<td>1.4</td>
<td>80</td>
</tr>
</tbody>
</table>

Advantages
- low environmental impact
- high reaction selectivity
- low corrosivity of leachate
- cheap reagents
- reduced interference of foreign ions
- acceptable gold leaching rate

Disadvantages
- high thiosulphate consumption
- slow dissolution process
- low stability of the Au complexes

Conclusions
The ammonium thiosulphate leaching technology in alkaline media in the presence of air as oxidant and copper ions as catalyzer is suitable for the recovery of gold from mining wastes. The method gives an extraction efficiency of 77% for Au. Moreover, the tailings reprocessing could reduce the environmental impact of the tailings deposit and could potentially yield more than 5 t of gold from the 8.5 million tones of tailings present.