EFFECTS OF ORGANIC DEPRESSANTS ON TALC FLOTATION
INTRODUCTION

- Talc is a laminate magnesium silicate

- HYDROPHOBICITY is a result of the van der Waals forces that exist between sheets (Leya, 2004)

- The edge is hydrophilic due to electric charge instability created by the Si – O bond cleavage (Miller et al., 2007)

Source: Geocaching, 2013
EFFECTS OF ORGANIC DEPRESSANTS ON TALC FLOTATION

PROCESSING ROUTE OF SULPHIDE NICKEL ORES

- Cominuition
- Classification
- Flotation
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- Cominuition
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Enables the fines recovery, which cannot be beneficiated by other methods.
EFFECTS OF ORGANIC DEPRESSANTS ON TALC FLOTATION

- Natural flotability
- Metalurgic recovery decreases
- Decrease of the hidrophobic feature on the mineral surface
- Increase Metalurgic recovery

Hidrophobic minerals
Nickel recovery
Organic Depressants
Nickel recovery
EFFECTS OF ORGANIC DEPRESSANTS ON TALC FLOTATION

- Carboxymethyl Cellulose (CMC)
- Guar Gum
- Anionic Polymers
EFFECTS OF ORGANIC DEPRESSANTS ON TALC FLOTATION

Carboxymethyl Cellulose (CMC)

Guar Gum

Anionic Polymers

Repulsion between its anionic group and the talc negatively charged surface (MacFadzean, 2011).

MacFadzean (2011) points out that guar gum behaves similarly to a neutralized CMC molecule.
Gum Arabic

- Can be an effective talc depressant due to long nonpolar chain that could bond to the talc hydrophobic surface.

- Although it was postulated that this reagents requires a certain level of calcium ions to bond with the mineral surface, this was never experimentally proved (Bulatovic, 2007).
Polyacrylamides

Syntetic polymers

Improve the microstructural control, prevent performances fluctuations.

Morris et al (2002): nonionic polyacrylamide is not effective depressing talc, anionic polyacrilamide is very effective at pH 3,5
MATERIALS AND METHODS

- The talc sample was originated from district Santa Rita located in Ouro Preto city/Brazil.

- The selected particle size range for the microflotation tests was 45-150 μm.

- Particles smaller than 45 μm were selected for the zeta potential measures tests.
## Microflotation

### Depressant reagent
- CMC
- Guar Gum
- Gum Arabic
- Polyacrilamide *Praestol 2510*

### Conditioning Concentration
- **CMC**
  - 50 mg/L
- **Guar Gum**
  - 500 mg/L
- **Gum Arabic**
  - 5000 mg/L

### Other Conditions
- **pH**: 7.0
- **Talc Sample**: 0.8 g
- **N₂ output**: 60ml/min
- **Conditioning time**: 5 min
- **Collect time**: 2 min
Nickel flotation reagents influence

<table>
<thead>
<tr>
<th>Test</th>
<th>Activator Conc. (mg/L)</th>
<th>Collectors Conc. (mg/L)</th>
<th>Frother Conc. (mg/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Initial</td>
<td>Final</td>
<td>Initial</td>
</tr>
<tr>
<td>1</td>
<td>75</td>
<td>15</td>
<td>50</td>
</tr>
<tr>
<td>2</td>
<td>40</td>
<td>8</td>
<td>25</td>
</tr>
<tr>
<td>3</td>
<td>2.9</td>
<td>0.6</td>
<td>2.5</td>
</tr>
</tbody>
</table>

Table 1 – Reagents Concentration
Zeta potential measurements

- Initial Depressants solutions concentrations: 20, 200 and 2000 mg/L
- Indifferent electrolyte: sodium chloride. $2.0 \times 10^{-3}$ mol/L solution concentration
- Stirring time: 5 minutes
- Sedimentary time: 8 minutes
- pH: 7.0
RESULTS AND DISCUSSION

X-Ray Diffraction

[Graph showing X-ray diffraction peaks and a pie chart indicating 96% and 4% contributions]
## Micro-flotation

<table>
<thead>
<tr>
<th>Conditioning time</th>
<th>CMC</th>
<th>guar gum</th>
<th>gum arabic</th>
<th>anionic polyacrylamide</th>
</tr>
</thead>
<tbody>
<tr>
<td>2 minutes</td>
<td>16.88</td>
<td>1.45</td>
<td>45.12</td>
<td>51.92</td>
</tr>
<tr>
<td>5 minutes</td>
<td>13.86</td>
<td>3.95</td>
<td>12.63</td>
<td>42.16</td>
</tr>
</tbody>
</table>

Table 2 - Conditioning time influence
Talc Flotability Versus Depressant Collecting Concentration
Influence of Nickel Flotation Reagents in the Guar Gum Depression Action on Talc
Zeta Potential Determinations

![Graph showing the effects of organic depressants on talc flotation. The graph plots zeta potential (\(\zeta\)) against concentration (mg/L) for various depressants: CMC, guar gum, gum arabic, and polyacrylamide. The data indicates the reduction in zeta potential with increasing concentration, suggesting the effectiveness of these depressants in altering the electrokinetic properties of talc particles.](image)
CONCLUSIONS

• The talc natural mass flotability obtained in this study was 71.52 %.
• The lowest talc flotability was promoted by 500 mg/L guar gum solutions, proving guar gum as the best depressant compared with gum arabic, CMC and the anionic polyacrylamide tested.
• Among the polyacrylamide concentrations tested, 500 mg/L was less effective than the others.
• The guar gum at 50 mg/L and 500 mg/L solutions promoted a flotability of 4.51% and 3.38% respectively. At 5000 mg/L guar gum solutions weren’t as good depressant as the smaller concentration tested.
• The reagents followed the following depressant efficiency tendency: CMC> gum arabic> polyacrylamide. This tendency was true for all the concentrations tested.
• As the CMC and gum arabic concentrations increased, the talc flotability diminished.
• Generally, the zeta potential measures were consistent with the results obtained in the microflotation tests.
GRACIAS.