

# NEW POLYMERS FOR IMPROVED FLOCCULATION OF HIGH DSP- CONTAINING MUDS

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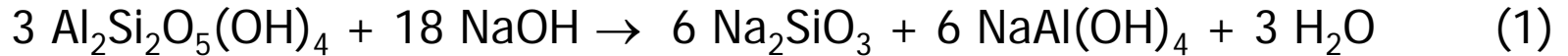
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- **Negative Effect of DSP**
  - Effect on Settling Performance
  - Not overcome by conventional flocculants
- **Introduce New Family of Flocculants**
  - Description of flocculant chemistry
  - Laboratory development results
- **Lab Evaluation on Plant Slurry**
  - Multiple plants processing high reactive silica bauxite
- **Other Topics Covered in Paper**
  - Performance comparison of series of reagents
  - Lab digestion of a high silica bauxite

# Negative Effect of High Reactive Silica

- **Formation of desilication product (DSP) proceeds by the following 2-step reaction:**



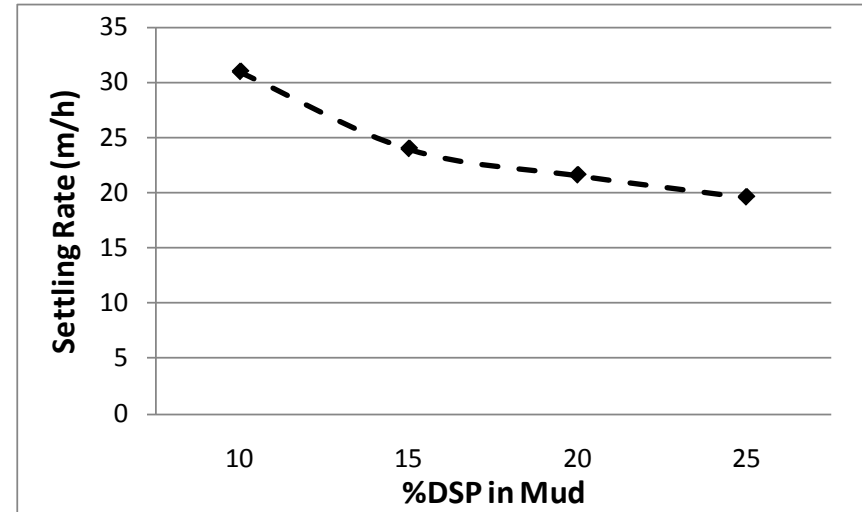
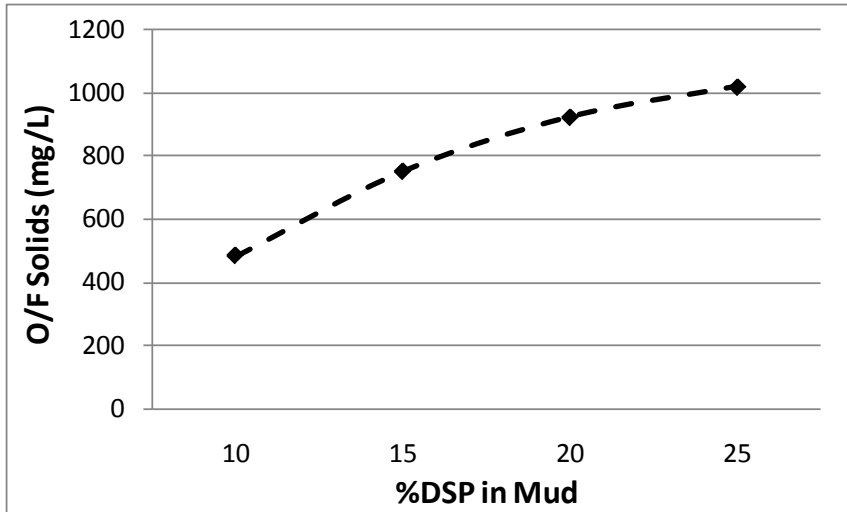
- **The generation of fine DSP particles can have a negative impact on overflow clarity, overflow filtration, mud settling and compaction**



- **Increased amounts of DSP has a severe detrimental effect on overflow clarity**

# Negative Effect of High Reactive Silica

- **Laboratory experiments using synthetic DSP added to the mud demonstrate the negative effect on overflow clarity and settling rate**
  - A standard DSP substrate was prepared by digesting kaolinite in synthetic Bayer liquor



HX-400 Dose = 500 g/T

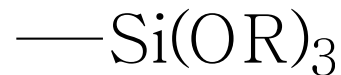
- **The problem is not overcome by the addition of higher doses of polyacrylate or hydroxamated polyacrylamide**

20% added DSP approximately represents  
6% R.SiO<sub>2</sub> in the Bauxite

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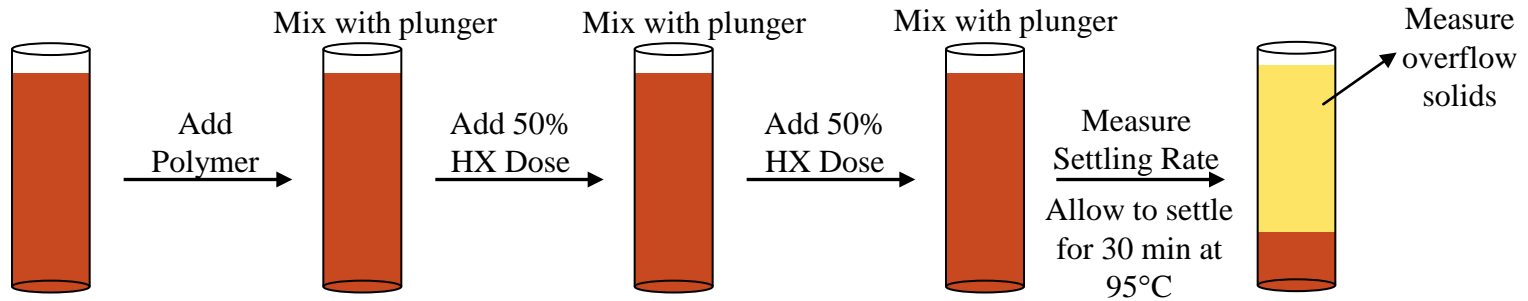
# Description of the Technology

- **It was discovered that polymers incorporating silane functional groups show improved flocculation of suspended DSP particles**
  - The polymers exhibit strong affinity towards silicon-containing minerals
  - Examples include those having pendant silane groups



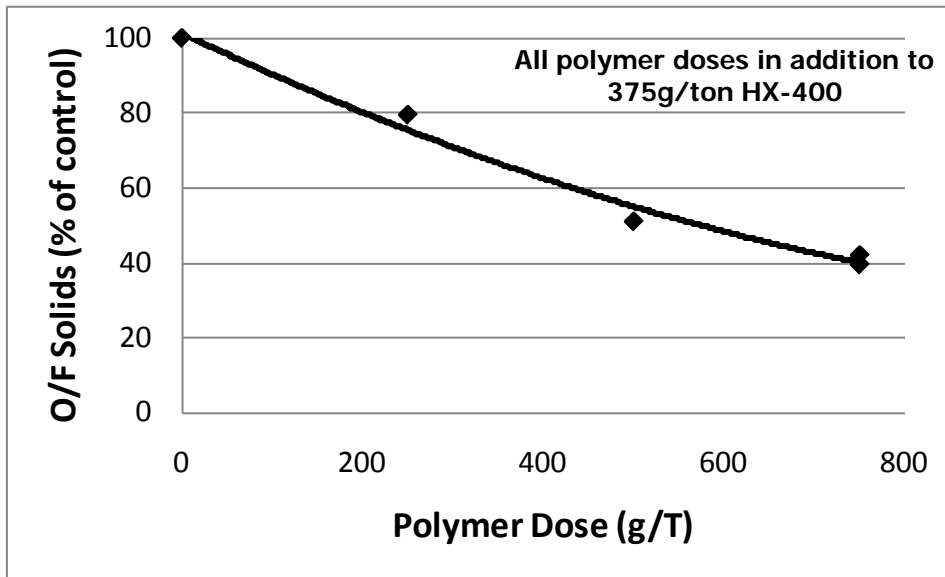
- Used in combination with hydroxamated polyacrylamide flocculants for best results
- **Represents a new molecule for application in the Bayer process**

# Laboratory Results on Synthetic System



40 g/L, 95°C

80% Red Mud / 20% Synthetic DSP  
Synthetic Bayer liquor

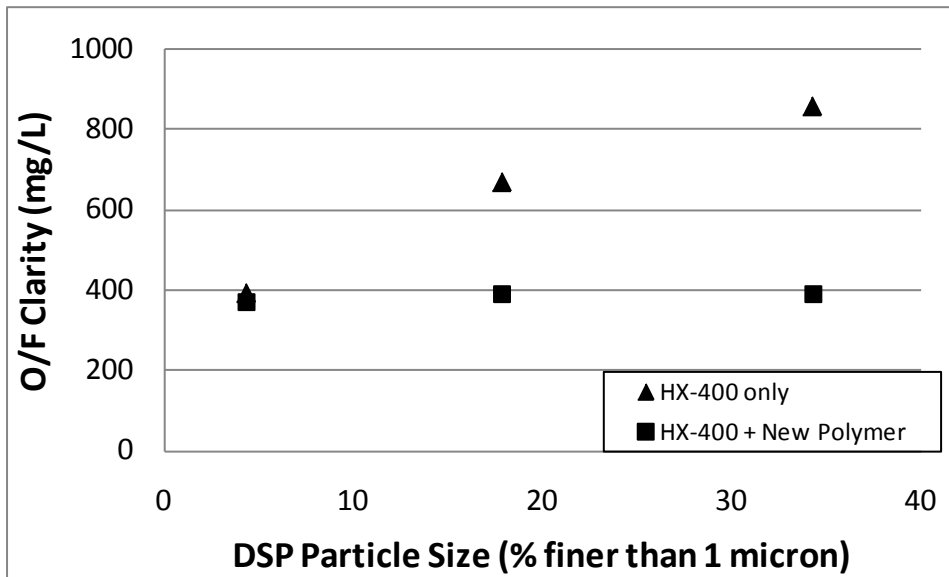


- Optimal performance is achieved when polymers are used in combination with hydroxamated polyacrylamide flocculants
- Significant reduction in O/F solids compared to the control (HX-400 only)

- Polymers are very effective at flocculating fine particle size DSP

# Effect of DSP Particle Size

- **Modification of reaction conditions in the preparation of DSP resulted in samples of varying particle size distributions**
  - A constant mass of each sample was added to red mud prior to settling experiments

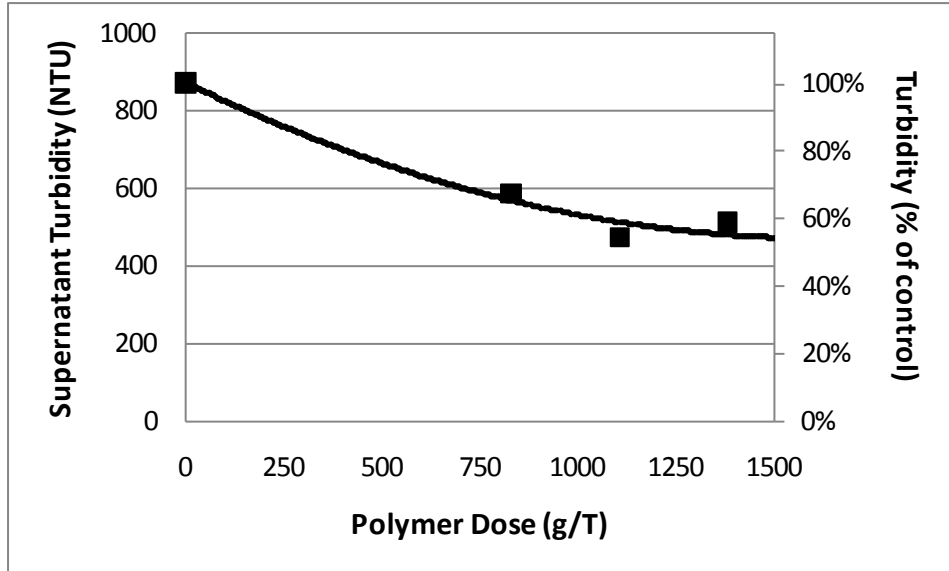


Less Fines ← → More Fines

- **As DSP becomes increasingly fine, HX-400 becomes less effective at flocculating.**
- **The addition of the new polymer improves flocculation of the fine particle size DSP**
- **The magnitude of improvement is greater for finer substrates**

# Evaluation on Plant Slurry

- The performance of a new silane-containing polymer was evaluated at a Bayer refinery processing bauxite containing 5.5%  $R.SiO_2$ 
  - Static settling tests conducted in 1 L graduated cylinders
  - Mud solids = 57 g/L
  - Polymer added prior to fixed dose of HX-300 (300 g/T)
  - Supernatant turbidity was measured after 15 minutes

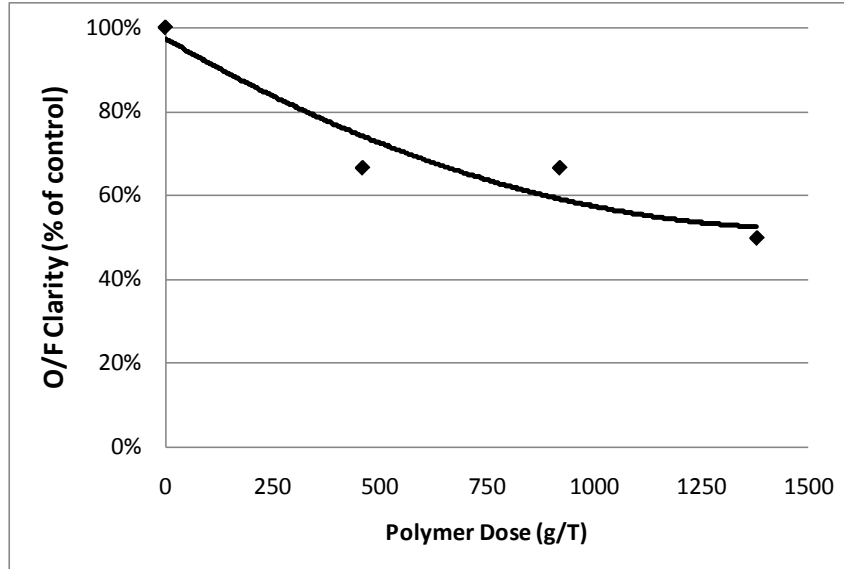


- Improved turbidity achieved by increasing polymer dose

- However, in this set of experiments, the polymer had no effect on settling rate

# Evaluation on Plant Slurry

- **The dose response of the same reagent was investigated at another Bayer refinery processing high silica bauxite (average = 5%)**
  - Static settling tests conducted in 1 L graduated cylinders
  - Mud solids = 45 g/L
  - Polymer added prior to fixed dose of HX-200 (920 g/T)
  - O/F Clarity was measured gravimetrically after 15 minutes



- **Improved clarity achieved by increasing polymer dose**

- Intermittent improvements in settling rate were observed during the course of the field evaluations

# Conclusions

- **Laboratory experiments on synthetic and plant slurry demonstrate the effectiveness of new silane-containing polymers for the flocculation of high DSP-containing muds**
- **The reagents have a positive impact on flocculation performance by capturing fine DSP particles that normally report to the settler overflow**
- **This new family of flocculants represents a new molecule for use in the Bayer process and a possible solution to overcome the negative effects of DSP**

**Thank you for your attention.**

**Questions?**

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