ACUMER™ 9300
Dispersant Polymer for Mineral Slurries

Typical Properties

<table>
<thead>
<tr>
<th>ACUMER 9300</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear solution*</td>
</tr>
<tr>
<td>Chemical nature</td>
<td>Acrylic homopolymer</td>
</tr>
<tr>
<td>Grade</td>
<td>Sodium salt</td>
</tr>
<tr>
<td>Average molecular weight</td>
<td>4500 (Mw)</td>
</tr>
<tr>
<td></td>
<td>3000 (Mn)</td>
</tr>
<tr>
<td>Total solids (%)</td>
<td>~ 45</td>
</tr>
<tr>
<td>pH as is (@ 25°C)</td>
<td>~ 7</td>
</tr>
<tr>
<td>Bulk density (@ 25°C)</td>
<td>~ 1.32</td>
</tr>
<tr>
<td>Viscosity Brookfield (mPa.s/cps @ 25°C)</td>
<td>~ 600</td>
</tr>
</tbody>
</table>

These properties are typical but do not constitute specifications.

Chemistry and Mode of Action

ACUMER 9300 is the sodium salt of a polyacrylic acid selected for optimizing the factors affecting dispersancy:
- polymer molecular weight
- polymer composition
- polymer structure
- mode of surface adsorption

Dispersion Performance

Without dispersant, the particles in a slurry aggregate resulting in an unstable slurry with unacceptable high viscosity.

ACUMER 9300 stabilizes high solids slurries and allows lowering the viscosity to relatively low levels at the time of initial formulation and maintains a low viscosity during storage.

Dosage

ACUMER 9300 is effective at low dosage between 0.2 to 0.6% polymer solids on slurry solids depending on the nature of the slurry and on the grinding (coarse or fine particles).

Applications

ACUMER 9300 can be used efficiently for the dispersion of different slurries:
- Coarse grade
- Precipitated calcium carbonate (PCC)
- Low solids Kaolin clay (70%)
- Titanium dioxide
- Talc (typically in conjunction with a low foam surfactant for wetting purposes)
- Aluminum hydroxide
- Iron oxides
- Clay/barbotine for ceramics
- Ceramic tile
Ceramic Applications Replacement for Phosphates (STPP)

Performance
ACUMER dispersants benefit most ceramic applications whether it be kaolin slurries, ball clay slurries, or ceramic slip grinding and dispersion. ACUMER dispersants aid in:

- wettability
- slip viscosity
- grinding
- slip stability

Figures 1 and 2 show the relationship of slip viscosity versus slip solids for two ceramic tile manufacturers.

![Figure 1: Ceramic Slip A—Effect of Slurry Solids on Viscosity](image)
**Conclusion:** In both cases, the ACUMER™ polymers outperformed STPP even at the higher STPP dosage. The rapidly increasing cost of phosphates make the ACUMER polymer option even more attractive.

**Figure 3** shows the relationship of specific gravity to solids for a typical ceramic slip. The ceramic mix was wet ground to 5% retained on 200 mesh screen. This relationship held for all dispersants tested on this particular slip.

**Conclusion:** As the slip solids increase, the slurry density increases.
A ceramic tile manufacturer had a starting point formulation using 50 kg sodium tripolyphosphate (STPP) and 40 kg sodium metasilicate (SMS) as dispersants. ACUMER™ 9300 dispersant polymer was used to replace STPP in this formulation to increase performance.

A 72% body was prepared from the dry ground ceramic blend by blending the slurry on a Hamilton Beach mixer for 10 minutes at high speed. Solids, specific gravity, and viscosity were measured. A series of dilutions were made by adding deionized water to the body slurry and the properties were remeasured. Data was collected on a given body slurry over a solids range of 67 to 72%.

Solids were measured by drying a sample of the body for one hour at 150°C. Slip viscosity was measured using a Brookfield RVT Viscometer (No. 2 to 4 spindle, 20 rpm, 24°C) and using a Ford Cup No. 4. Specific gravity was measured by calibrated hydrometers that covered the range of 1.600 to 1.820 and 1.800 to 2.000 respectively, both graduated in 0.002 units. All dispersant dosages are expressed on the product basis. Figure 4 is a plot of the viscosity versus solids for formulations using ACUMER 9300 to replace the STPP.

![Figure 4](image_url)

**Figure 4**

Comparison of Dispersant Systems in Tile Body

Conclusion: ACUMER 9300/SMS blends outperformed STPP/SMS blends.
The samples were stored for one week at room temperature without agitation. They were then stirred on the Hamilton Beach Mixer for one minute at low speed and the viscosity was measured. A comparison of the initial and aged body viscosity is given in Table 2. A plot of the results from the 0.31% STPP/0.25% SMS study versus that of the 0.20% ACUMER™ 9300 dispersant polymer/0.30% SMS study is given in Figure 5.

<table>
<thead>
<tr>
<th>Run No</th>
<th>Acumer 9300 %</th>
<th>STPP %</th>
<th>SMS %</th>
<th>Initial Viscosity, cps</th>
<th>Aged Viscosity, cps</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>—</td>
<td>0.031</td>
<td>0.25</td>
<td>184</td>
<td>355</td>
</tr>
<tr>
<td>2</td>
<td>0.22</td>
<td>—</td>
<td>0.30</td>
<td>182</td>
<td>200</td>
</tr>
<tr>
<td>3</td>
<td>0.22</td>
<td>—</td>
<td>0.25</td>
<td>176</td>
<td>202</td>
</tr>
<tr>
<td>4</td>
<td>0.20</td>
<td>—</td>
<td>0.30</td>
<td>170</td>
<td>178</td>
</tr>
<tr>
<td>5</td>
<td>0.24</td>
<td>—</td>
<td>0.30</td>
<td>182</td>
<td>178</td>
</tr>
</tbody>
</table>

**Conclusion:** ACUMER 9300/SMS blends outperformed STPP/SMS blends regarding slurry stability.

**Figure 5**

*Slurry Stability Study (Slurries stored one week at room temperature without agitation)*

- 50 Kg STPP/16 T and 49 Kg SMS/16 T
- 32 Kg ACUMER 9300/16 T and 48 Kg SMS/16 T

**Conclusion:** A blend of ACUMER 9300/SMS provides lower viscosity than the STPP/SMS blend over time.
Fresh 69.0% body slurries were made for the two deflocculant systems of interest and placed on the laboratory roller and periodically evaluated for viscosity over a 22 hour period. A comparison is given in Figure 6.

**Conclusion:** ACUMER™ 9300 dispersant polymer /SMS blend provides lower viscosity over time than STPP/SMS blend.
Handling Precautions

Before using this product, consult the Material Safety Data Sheet (MSDS)/Safety Data Sheet (SDS) for details on product hazards, recommended handling precautions and product storage.

Freezing or long term cold storage of ACUMER™ 9300 dispersant polymer may cause some separation of the components. Although product performance is not impaired as long as the whole container is heated and well mixed, it is recommended to keep ACUMER 9300 from freezing.

Storage

Store products in tightly closed original containers at temperatures recommended on the product label.

Dispose in accordance with all local, state (provincial) and federal regulations.

Disposal Considerations

Empty containers may contain hazardous residues. This material and its container must be disposed in a safe and legal manner.

It is the user’s responsibility to verify that treatment and disposal procedures comply with local, state (provincial) and federal regulations. Contact your Dow Technical Representative for more information.

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Contact:
North America: 1-800-447-4369
Latin America: (+55)-11-5188-9000
(+800)-3-694-6367
(Toll) +31-11567-2626
(Toll) +66-3-7965-5392
http://www.dow.com

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