ACUSOL™ 810A Detergent Grade
Rheology Modifier and Stabilizer

Description

ACUSOL 810A is an Alkali Soluble acrylic polymer Emulsion (ASE). ACUSOL 810A can be directly incorporated into formulations without preparation of a separate thickener solution. Viscosity is developed simply by adjusting the pH on the alkaline side with any base. The product is supplied as a low viscosity emulsion and therefore is easy to handle. ACUSOL 810A contains carboxylic groups that immediately swell upon neutralization.

The salt form of ACUSOL 810A also stabilizes heavy-duty liquid cleaners that contain high levels of nonionic surfactants and alkaline builders, by preventing the coalescence of surfactant particles and the separation of other components.

Features

- Alkali compatibility
- Gel appearance
- Salt tolerance
- Liquid
- Anionic
- Emulsion technology
- Instant neutralization
- Stabilizing properties
- Excellent viscosity stability
- Better high shear stability than typical thickeners

Benefits

- Best for stable, viscous formulations containing high levels of alkali.
- Produces thick and stable slightly hazy formulations. At higher concentrations of NaOH or TKPP gives thixotropic mixtures that form gels upon standing.
- Compatible with Ca and Mg. Compatible with up to 7% NaCl. Low sensitivity to water hardness and to ionic strength of inorganic ingredients.
- Supplied as low viscosity easy to handle liquid emulsion. No predissolution, declumping or warming required.
- Thickens instantaneously any alkali. Compatible with both nonionic and anionic surfactants, builders and fillers.
- Water based polymerization. No residual solvents. No residual organic initiators.
- Permits continuous manufacturing process through in-line static mixers.
- Imparts stability to formulations of highly alkaline, highly built or contain high levels of surfactants.
- Formulations exhibit very little viscosity drift over time and remain stable during challenges of temperature variations.
- Gives greater freedom in order of addition during processing when homogenizers are used.

Recommended Applications

- Oven/grill cleaners
- Drain cleaners/destoppers
- Waterless cleaners
- Alkaline paint strippers
- Machine dishwashing formulations
- Alkaline laundry formulations

Note: ACUSOL 810A is not recommended for chlorine containing formulations.

Formulation Advice

ACUSOL 810A thickener/stabilizer must be converted from acid form (as supplied) to salt form to provide thickening/stabilizing action. As a general rule, the emulsion should be diluted in water to the lowest possible concentration before adding the alkaline ingredients slowly with thorough agitation. To prevent possible coagulation of the polymer, use cool water. Strong acids should be at least partially neutralized prior to the addition of the polymer, to avoid its precipitation as an insoluble gel.
Thickening of Alkaline Builders

Figure 1 shows that adding NaOH beyond the equivalence point lowers the viscosity until a new rise in viscosity occurs. The initial value of the viscosity, corresponding to 0% builder, is obtained by adding 1 equivalent of NaOH, pH=8. Figure 1 also shows the effect of varying the concentration of four common alkaline builders on the viscosity of solutions of the sodium salt of ACUSOL 810A stabilizer (1.5% active).

At higher levels of TKPP AND NaOH, ACUSOL 810A gives thixotropic mixtures that form gels upon standing.

**Figure 1**

**Performance Properties**

**Effect of pH**

ACUSOL 810A is an effective thickener/stabilizer over the pH range of 6.5 to 13.5.
Figure 2

Effect of Temperature

The shear thinning effect imparted by ACUSOL 810A is lower than that obtained with ACUSOL 820 and cellulosics. Thickening undergoes a modest decrease throughout a temperature range of 20°C to 75°C, but will recover viscosity on cooling.

Neutralization as a Function of pH

Figure 3 shows the relationship between the degree of neutralization and pH.

Figure 3

Viscosity as a Function of Neutralization

The graph in Figure 4 shows the effect of the degree of neutralization on viscosity of aqueous solutions of ACUSOL 810A stabilizer.

Figure 4

Effect of Alkalis

ACUSOL 810A can be neutralized with a wide range of both inorganic and organic bases. Choice of the base is dependent upon the intended application, specific ingredients and personal preference. In many simple detergent systems the choice is often NaOH, KOH or NH₄OH. although amines are sometimes preferred, such as TEA (triethanolamine), DEA (diethanolamine), AMP™ (aminomethylpropanol), AMPD™ (aminomethylpropanediol), etc. AMP and AMPD are trademarks of DOW Chemical Company.

Examples of typical salt preparations are presented in the table below. Other water-soluble bases may be substituted with slightly different results.
Preparation of Salts of ACUSOL 810 Thickener/Stabilizer

Comparative Viscosity

Figure 5 compares the viscosity of the sodium salt of ACUSOL 810A (1 equivalent) with that of other water soluble thickeners.

![Figure 5](image)

**Parts by Weight**

<table>
<thead>
<tr>
<th>Salt</th>
<th>Level %</th>
<th>ACUSOL 810A</th>
<th>Water</th>
<th>10% Base Solution</th>
<th>Viscosity (mPa.s) Spindle #1, 12 rpm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sodium</td>
<td>3</td>
<td>14.2</td>
<td>77.6</td>
<td>8.2</td>
<td>17,200</td>
</tr>
<tr>
<td>Sodium</td>
<td>5</td>
<td>23.6</td>
<td>62.7</td>
<td>13.7</td>
<td>44,600</td>
</tr>
<tr>
<td>Potassium</td>
<td>3</td>
<td>12.7</td>
<td>76.9</td>
<td>10.4</td>
<td>15,600</td>
</tr>
<tr>
<td>Ammonium</td>
<td>3</td>
<td>14.6</td>
<td>81.7</td>
<td>3.7</td>
<td>17,600</td>
</tr>
</tbody>
</table>

**Typical Physical Properties**

These properties are typical but do not constitute specifications.

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Milky liquid</td>
</tr>
<tr>
<td>Polymer type</td>
<td>Crosslinked non associative acrylic</td>
</tr>
<tr>
<td>Emulsion type</td>
<td>Anionic</td>
</tr>
<tr>
<td>Solids, %</td>
<td>18</td>
</tr>
<tr>
<td>pH (as supplied)</td>
<td>2.4 - 3.5</td>
</tr>
<tr>
<td>Specific gravity #25 °C</td>
<td>1.05</td>
</tr>
<tr>
<td>Viscosity as supplied</td>
<td>20 - 55 mPa.s/cps</td>
</tr>
<tr>
<td>Equivalent weight *</td>
<td>124</td>
</tr>
</tbody>
</table>

* grams of dry polymer neutralized by 1 eq of NaOH

**Storage/Handling**

Keep from freezing. This emulsion product as supplied will irreversibly coagulate upon freezing. Extended exposure to temperatures above 40°C may also coagulate the polymer emulsion and render it unsuitable for use.
Toxicology Profile

Overall Evaluation

ACUSOL 810A is considered non-toxic by single oral and dermal exposure and only slightly irritating to the skin and eyes. Based on aquatic toxicity testing, ACUSOL 810A is considered non-toxic to Daphnia and fish.

**Test/Species** | **Results**
--- | ---
**Toxicity, Acute** |  
Oral LD$_{50}$ - rat | > 5gr/kg - non toxic  
Dermal LD$_{50}$ - rabbit | > 5gr/kg - non toxic  
Skin irritation - rabbit | slightly irritating  
Eye irritation - rabbit | slightly irritating  
**Toxicity, Environmental** |  
Daphnia magna EC$_{50}$ - 48 hr | > 100 mg/l - non toxic  
Carp LC$_{50}$ - 96 hr | > 100 mg/l - non toxic

Material Safety Data Sheets

Rohm and Haas company maintains Material Safety Data Sheets (MSDS) on all of its products. These contain important information that you may need to protect your employees and customers against any known health or safety hazards associated with our products.

We recommend you obtain copies of the MSDS for your products from your local Rohm and Haas technical representative or the Rohm and Haas Company. In addition, we recommend you obtain copies of MSDS from your suppliers of other raw materials used with our products.

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