ACUSOL™ 445/445N/445ND  Detergent Polymer for Laundry

Description

ACUSOL 445N is a homopolymer of acrylic acid with an optimized molecular weight to be used in different applications such as: liquid fabric wash, laundry additives, industrial and institutional detergents.

It is supplied in liquid form and available as partially (ACUSOL 445) or fully neutralized (ACUSOL 445N) grades. It is also available in a spray-dried form (ACUSOL 445ND).

Physical and Chemical Properties

These properties are typical but do not constitute specifications.

<table>
<thead>
<tr>
<th></th>
<th>445</th>
<th>445N</th>
<th>445ND</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear solution</td>
<td>Clear solution</td>
<td>White to tan,</td>
</tr>
<tr>
<td></td>
<td>to slightly</td>
<td>to slightly</td>
<td>free flowing</td>
</tr>
<tr>
<td>Grade</td>
<td>Partially</td>
<td>Fully neutralized</td>
<td>Fully neutralized,</td>
</tr>
<tr>
<td></td>
<td>neutralized Na</td>
<td></td>
<td>spray dried</td>
</tr>
<tr>
<td></td>
<td>form</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average molecular weight (Mw)</td>
<td>4500</td>
<td>4500</td>
<td>4500</td>
</tr>
<tr>
<td>Total solids (%)</td>
<td>48</td>
<td>45</td>
<td>92-94</td>
</tr>
<tr>
<td>Specific gravity (at 25°C)</td>
<td>1.24</td>
<td>1.32</td>
<td></td>
</tr>
<tr>
<td>pH as is (at 25°C)</td>
<td>3.7</td>
<td>6.9</td>
<td>6.5-7.5</td>
</tr>
<tr>
<td>Viscosity Brookfield (mPa.s/cps at 25°C)</td>
<td>650</td>
<td>800</td>
<td></td>
</tr>
<tr>
<td>Residual acrylic acid</td>
<td>10</td>
<td>10</td>
<td></td>
</tr>
</tbody>
</table>

Chemistry and Mode of Action

ACUSOL 445N is a homopolymer of acrylic acid with selected molecular weight around 4500 in order to optimize the following properties.

- Anti-precipitation: ACUSOL 445N will increase solubility of precipitating salts by threshold effect. This allows to reduce in the wash bath precipitation of inorganic salts (carbonates, phosphates, sulphates of Ca and Mg).
- Crystal distortion: this polymer gets entrapped into crystal lattices, preventing their growth and facilitating their breakage. This minimizes adherence of salts on surfaces and facilitates their elimination by rinsing.
- Dispersing properties: this polymer is a good dispersant for soils and will help to prevent their redeposition on surfaces.
- Processing aids: the polymeric and chemical nature of ACUSOL 445N will bring binding properties which can be useful in several detergent manufacturing processes especially tableting.

Benefits

ACUSOL 445N is a key ingredient in institutional and industrial cleaners and laundry detergents. By using this polymer, the detergent manufacturers will enjoy the following advantages:

- Inhibition of crystal growth, thus preventing precipitation of carbonates phosphates or silicates.
- Dispersion of precipitates in the cleaning bath to avoid settling and scaling on surfaces and fibers.
- Improvement of filming maintenance by soil dispersion, which minimize organic components deposition on glass and dishwares.
- Increase of bleach stability especially in chlorinated formulations by binding heavy metals which destabilize chlorine species through catalytic reactions.
- Use in medium alkaline to very alkaline formulations, due to high solubility of ACUSOL 445N in caustic products. Caustics should be added slowly to a water premix containing polymer to avoid high pH gradients.
- Prevents the redeposition of clay sink onto the fabric or hard surface by keeping the particles suspended in the wash bath.
The use of a dispersant polymer will enhance the cleaning properties (clay soil removal) of laundry detergents based on both zeolite/soda ash and phosphate.

**Conditions:**
- **Zeolite/Soda-Ash-Based:** 150 ppm hardness; 0.15% detergent; 38°C; 10 minute wash.
- **Phosphate-Based:** 150 ppm hardness; 0.1% detergent; 49°C; 10 minute wash.

The cleaning performance of any laundry detergent is inversely related to water hardness. The use of a dispersant polymer such as ACUSOL 445N, however, can help to offset the effect of the hardness.

**Conditions:**
- **Zeolite/Soda-Ash-Based:** 150 ppm hardness; 0.15% detergent; 38°C; 10 minute wash.
- **Phosphate-Based:** 150 ppm hardness; 0.1% detergent; 49°C; 10 minute wash.
ACUSOL dispersant polymers have a remarkable ability to reduce calcium carbonate deposition (encrustation) on laundry during the wash cycle. Even with very hard water (300 ppm calcium), adding 1.0 percent of ACUSOL 445N to a soda-ash-based detergent will virtually eliminate encrustation.

Conditions:
Soda-Ash-Based: 0.1% detergent; 40°C; 10 minute wash/5 minute rinse; 5 cycles.

Dose Rates

To obtain an optimal effectiveness this polymer should be used at levels between 250 and 1000 ppm in the wash baths (household) and 100 to 500 ppm for industrial purposes. This will generally correspond to 2-6% (as is) in liquid formulation.

ACUSOL 445N is designed to be used in phosphate based or phosphate free detergents, the latter based on carbonate, silicate, citrate and NTA.

ACUSOL 445N is a suitable candidate for alkaline and chlorinated cleaners.

In addition, ACUSOL 445N can be incorporated in carbonate rich fabric wash powders, and at low level in liquid laundry formulations.

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 and safety hazards associated with our products. We recommend you obtain copies of MSDS for our 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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