ACUSOL™ Opacifiers

For home and institutional care products

ACUSOL™ OP Opacifiers provide a "milky" or "lotionized" appearance to products. This bulletin provides the latest information we have on this useful chemistry.

Dow is committed to provide technology enhancement to the home and institutional care industry. To learn how Dow technology can help you achieve your performance objectives, please contact us. Visit us at **www.dow.com**.

Key features and benefits of ACUSOL™ Opacifiers

Features and benefits

ACUSOL™ Opacifiers offer a number of features and benefits regarding use in home and institutional care applications. ACUSOL™ Opacifiers impart a milky or lotionized appearance to formulated products, while maintaining the product safety that formulators demands.

Features	Benefits
Liquid	• Easy to use • No preparation necessary (warming, declumping, dissolving) • Direct incorporation into the formulation
Processing ease	• Allows for use of continuous production processes with use of in-line static mixers
Appearance	• Dense, creamy-like; uniform opacity; high whiteness
Versatility	• Can be used in a wide variety of applications and product forms
Compatibility	• Enhance the effect of dyes; stable in cationic systems; hide amber caste and haziness
Cost effective	• Effective at very low use levels
Low residual monomer	• Fewer odor concerns
Non-hazardous	• No use concerns

ACUSOL™ Opacifier chemistries

ACUSOL™ Opacifiers are water-based styrene/acrylic emulsions that have been designed to scatter light effectively. These products are offered at pH values between 2 and 5 and may require neutralization.

ACUSOL™ OP301, ACUSOL™ OP302B, and ACUSOL™ OP305

These polymers are synthesized from styrene and acrylate comonomers and are made through emulsion polymerization.

ACUSOL™ OP303B

This polymer is synthesized from styrene and acrylamide comonomers and is produced via an emulsion polymerization route.

Physical and chemical characteristics of ACUSOL™ Opacifiers

The physical and chemical characteristics of ACUSOL™ Opacifiers vary according to the type of polymer. All ACUSOL™ Opacifiers are provided in liquid form at 40% solids level. As supplied, the pH of ACUSOL™ Opacifiers ranges from 2.0 to 5.0 and particle sizes range from 0.17 to 0.30 µm.

The values presented in this chart should not be considered as product specifications.

	ACUSOL™ OP301	ACUSOL™ OP302B	ACUSOL™ OP303B	ACUSOL™ OP305
Chemistry	styrene/acrylate	styrene/acrylate	styrene/acrylate	styrene/acrylate
Ionic nature	anionic	anionic	nonionic	anionic
Appearance	milky liq.	milky liq.	milky liq.	milky liq.
Solvent	water	water	water	water
Solids, %	40	40	40	40
pH (as supplied)	2.05-2.5	3.3-4.3	4.0-5.0	2.05-2.5
Average particle size (µm)	0.17	0.21	0.25	0.30
Density (g/ml)	1.03	1.03	1.03	1.03
Viscosity, cps (as supplied)	<50	<50	<50	<50

Comparative applications of ACUSOL™ Opacifiers

The physical and chemical characteristics of ACUSOL™ Opacifiers vary according to the type of polymer. All ACUSOL™ Opacifiers are provided in liquid form at 40% solids level. As supplied, the pH of ACUSOL™ Opacifiers ranges from 2.0 to 5.0 and particle sizes range from 0.17 to 0.30 µm.

Please note that these behaviors may vary according to specific formulations.

	ACUSOL™ OP301	ACUSOL™ OP302B	ACUSOL™ OP303B	ACUSOL™ OP305
Acid systems				•
Acid toilet cleaners				•
Car shampoos	•			•
Cationic systems			•	
Dishwashing detergents	•	•		
Floor cleaning formulations				•
General purpose formulations	•	•	•	•
Hand wash formulations	•	•		
Liquid soaps	•			
Laundry detergents	•	•	•	•

Features and applications of ACUSOL™ Opacifiers

ACUSOL™ OP301

ACUSOL™ OP301 Opacifier is an aqueous styrene/acrylic emulsion designed for opacifying home and institutional care products. The polymer is used to impart a milky or lotionized appearance to a liquid product, generally at addition levels of 0.1 to 1.0%. ACUSOL™ OP301 is offered at 40% solids and is compatible with most ingredients present in home and institutional care products. The polymer is safe in normal use.

Features

- Uniform opacity
- Hides amber caste and haziness
- High whiteness
- Effective at very low use levels
- Enhances the effect of dyes
- APE-free
- Liquid
- Low residual monomer

Applications

- Liquid hand dishwash
- General purpose formulations
- 2-in-1 Liquid detergent
- Liquid laundry detergent
- Household cleaners
- Unit Dose Detergents
- Car shampoos
- Automatic dishwashing detergents

ACUSOL™ OP302B

ACUSOL™ OP302B Opacifier is an aqueous styrene/acrylic emulsion designed for opacifying home and institutional care products. The polymer is used to impart a milky or lotionized appearance to a liquid product, generally at addition levels of 0.1 to 1.0%. ACUSOL™ OP302B is offered at 40% solids and possesses greater stability and compatibility in some formulations as compared to many other commercially available opacifiers. The polymer is safe in normal use.

Features

- Uniform opacity
- Enhanced stability in some formulas
- High whiteness
- Effective at very low use levels
- Enhances the effect of dyes
- Liquid
- Hides amber caste and haziness
- APE-free
- Low residual monomer

Applications

- General purpose formulations
- Dishwashing detergents
- Household cleaners
- Laundry detergents

ACUSOL™ OP303B

ACUSOL™ OP303B Opacifier is an aqueous styrene/acrylamide emulsion designed for opacifying home and institutional care products and is stable in cationic systems. The polymer is used to impart a milky or lotionized appearance to a liquid product, generally at addition levels of 0.1 to 1.0%. ACUSOL™ OP303B is offered at 40% solids and is compatible with most ingredients present in home and institutional care products. The polymer is safe in normal use.

Features

- Uniform opacity
- Stable in cationic systems
- High whiteness
- Enhanced stability in some formulas
- Enhances the effect of dyes
- Effective at very low use levels
- Hides amber caste and haziness
- Liquid
- APE-free
- Low residual monomer

Applications

- Cationic systems
- General purpose formulations
- Fabric softeners

ACUSOL™ OP305

ACUSOL™ OP305 Opacifier is an aqueous styrene/acrylic emulsion designed for opacifying home and institutional care products. The polymer is used to impart a milky or lotionized appearance to a liquid product, generally at addition levels of 0.1 to 1.0%. ACUSOL™ OP305 is offered at 40% solids and is compatible with most ingredients present in home and institutional care products. The polymer is safe in normal use.

Features

- Uniform opacity
- Hides amber castle and haziness
- High whiteness
- Effective at very low use level
- Liquid
- Suitable for acidic systems
- Enhances the effect of dyes
- Low residual monomer

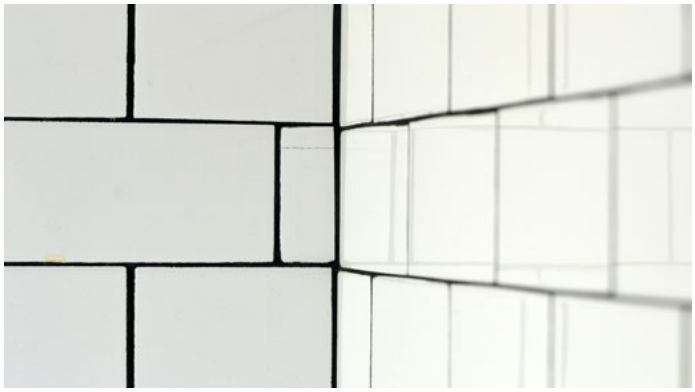
Applications

- General purpose formulations
- Acid toilet cleaners
- Car shampoos
- Floor cleaning formulations
- Detergent applications
- Liquid dishwash
- Low pH household cleaners
- 2-in-1 liquid detergents
- Unit dose detergents

Behavior profile of ACUSOL™ Opacifiers

Corrosion resistance

Tests have been performed for corrosion resistance under several different conditions on ACUSOL™ OP301 as representative of the ACUSOL™ Opacifier range. In the presence of a 304L stainless steel coupon heated to “sensitizing” temperature, no visible corrosion was noted nor was any change in product color observed, even at 60˚C for 378 hours. The same results were obtained using 304L and 316L stainless steel coupons with welds present.



Formulation and use guidelines

Order of addition

It is recommended that the ACUSOL™ Opacifiers be added last in the manufacturing cycle, after addition of dye, salt, perfume, etc. and following final pH adjustment. To avoid potential “shock” the product should be diluted with at least four times its own weight of product water (held out from the formulation), then added very slowly to the final mix, maintaining good agitation throughout the addition process.

Stability testing

Stability testing should be carried out on all opacified products. Four-week stability tests under the following conditions are recommended:

1) Room temperature (20 to 25˚C)
2) Oven (40˚C)
3) Cold (4 to 6˚C)
4) Freeze/thaw, 3 cycles

Stability in formulations

ACUSOL™ Opacifiers offer excellent formulation stability. The following guidelines are provided to optimize their performance in this regard.

If ACUSOL™ Opacifiers are being formulated with anionic surfactant systems, it may be necessary to add 1 to 3% of a hydrotrope (e.g. propylene glycol, isopropanol or sodium xylene sulphonate) to increase the solubility/compatibility of the surfactants at colder temperatures. Without the added hydrotrope, the anionic surfactants may have decreased solubility at lower temperatures and can crystallize out of solution, causing the ACUSOL™ Opacifiers to precipitate as well.

If ACUSOL™ Opacifiers are being formulated with nonionic surfactants at warm temperatures, the formation of water insoluble, non-transparent droplets may result (cloud point). If a cloud point is observed, try selecting a surfactant with more ethylene oxide/ethoxylate groups (> 15) and possessing a higher HLB - hydrophilic/hydrophobic (lipophilic) balance value. Other suggestions include increasing the concentration of nonionic or presolubilizing the fragrance in a pre-warmed nonionic surfactant.

If instability of a formulation containing ACUSOL™ opacifiers is observed at both cold and warm temperatures, check the compatibility of the Opacifier with the other ingredients in the formulation such as cationic surfactants, solvents and oxidizing agents. Then try using the suggested solutions listed above.

In all cases, it is important to follow the recommended addition sequence when using ACUSOL™ Opacifiers to ensure their optimum performance.

Process equipment cleaning

Dow recommends that equipment containing ACUSOL™ Opacifiers be cleaned with high pressure washing or the use of the following cleaning solution:

1) 90 parts water
2) 2.5 parts Sodium Lauryl Ether Sulfate (SLES) (27%)
3) 2.5 parts nonionic surfactant (e.g. alcohol ethoxylate alternative)
4) 5 parts sodium hydroxide (25%) or monoethanolamine (90%)

Storage and handling

Storage

Keep from freezing; material may coagulate. The ACUSOL™ Opacifiers are not freeze/ thaw stable and should therefore be kept at temperatures of 5 to 35°C. If kept under these conditions and in their unopened containers, the products will have a shelf life of 18 months or greater from the date of manufacture. If the ACUSOL™ Opacifiers are stored diluted, then they must be suitably preserved.

Handling

ACUSOL™ Opacifiers are provided in the acid form. Appropriate precautions should be taken when handling these acidic materials.

Material Safety Data Sheets

Dow Material Safety Data Sheets (MSDS) contain pertinent information that you may need to protect your employees and customers against any known health or safety hazards associated with our products. Under the OSHA Hazard Communication Standard, workers must have access to and understand MSDS on all hazardous substances to which they are exposed. Thus, it is important that you provide appropriate training and information to your employees and make sure they have available to them MSDS on any hazardous products in the workplace.

Upon initial shipment of non-OSHA-hazardous and OSHA-hazardous products (including samples), Dow sends the appropriate MSDS to the recipient. If you do not have access to one of these MSDS, please contact your local Dow representative for a copy. Updated MSDS are sent upon revision to all customers of record. MSDS are also sent annually to all customers receiving products deemed hazardous under the Superfund Amendments and Reauthorization Act (SARA). MSDS should be obtained from suppliers of other materials recommended in this bulletin.

Dow is a member of the American Chemistry Council (ACC) and is committed to the ACC's Responsible Care® Program.

Consumer Solutions

US

Toll Free	800 441 4DOW
	989 832 1542

International

Europe / Middle East	+ 800 36 94 63 67
Italy	+ 800 783 825
Asia / Pacific	+ 800 77 76 77 76
	+ 60 37 958 3392
South Africa	+ 800 99 5078

dow.com

Images: dow_58442899750, dow_64007373944, dow_58909306972, dow_55937237344, dow_57800113367, dow_54314064669, dow_58166643630, dow_54845323686

2000013580

Form No. 27-2988-01-1021 S2D