



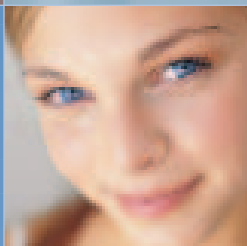
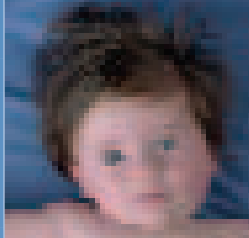
Sun Care



Hair Care



Skin Care



Rohm and Haas 
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CARE**
The Ingredients of Creativity



Aculyn™ 60

Rheology Modifier/Stabilizer

An Excellent Thickener for adding lipid texture to High Surfactant Personal Care Products

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This bulletin focuses on our Aculyn™ 60 rheology modifier, which is ideal for adding lipid texture to high surfactant formulations. Our Aculyn rheology modifiers find utility in an ever-increasing breadth of personal care applications because of their unique ease of use, wide compatibility, cost effectiveness and favorable balance of rheological properties.

Rohm and Haas Company is committed to providing technology enhancement to the personal care industry. To learn how our expertise in polymers and preservatives can complement your own creativity, please contact us. You can call our nearest office (see back cover), log on to www.rhpersonalcare.com or visit us at major personal care trade shows around the world.

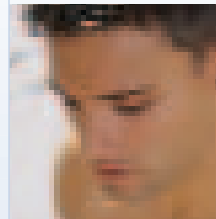
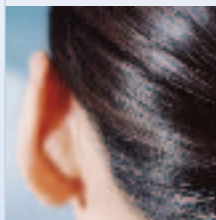


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Rohm and Haas and Personal Care.

For over thirty years, technologies pioneered by the Rohm and Haas Company have been used by formulating chemists worldwide to inspire innovation and add value to personal care products ■ Our expertise in polymer design and product preservation has resulted in a growing portfolio of products for the personal care industry ■ We are working hard to develop even more ingredients of creativity to propel your own quest for invention ■

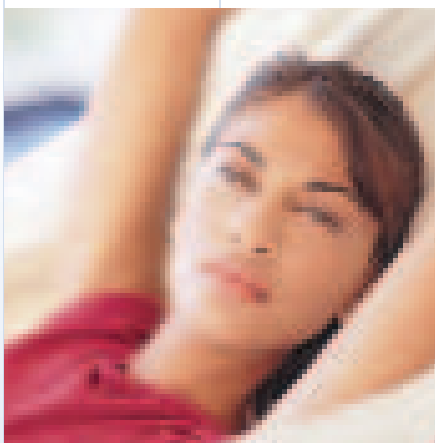
The Ingredients of Creativity.



Features, Benefits and Applications of Aculyn™ 60 Rheology Modifier

Aculyn 60 rheology modifier is an associative, nonionic thickener based upon hydrophobically-modified polyethylene glycol chemistry and is designed for personal care applications. This product is offered as a water-soluble solid. Aculyn 60 is stable from pH 4 to 9, has excellent salt tolerance, and provides clear solutions in the presence of high surfactant levels.

CTFA/INCI Name:
PEG-150 Distearate



Features

- Associative
- Water soluble
- Nonionic
- Yields clear gels
- Solid
- Broad compatibility
- Compatible in high surfactant systems
- Salt tolerant
- Lacks odor
- Stable in acidic media
- Replacement for inorganic salts and fatty acid amides
- Ideal for sulfosuccinic acid ester formulations
- Lipid nature
- Soluble in glycols and surfactants

Applications

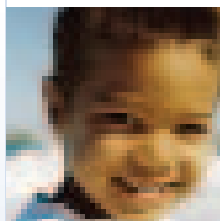
- Aftershave formulations
- Bath foams
- Body washes
- Creams and lotions
- Formulations from pH 4 to 9
- Hair conditioners
- Hand soaps
- High surfactant formulations
- Hospital soap formulations
- “Intimate” cleansing products
- Post shampoo treatments
- Professional hand cleaners
- Shampoos with non-irritating ingredients
- Shower gels

Features, Benefits and Applications [Continued]

Benefits

- No neutralization necessary
- Imparts good washing action
- Provides good skin tolerance
- Reproducible viscosity
- Positive organoleptic effects
- Able to formulate clear products
- Imparts softening and substantive effect
- Excellent for high surfactant formulations
- Flexibility in choice of preservative system
- Excellent for non-irritating formulations
- Does not promote or support contamination, unlike natural thickeners
- Can be used with electrolytes
- Stable in pH 4 to 9 formulations
- Supported by comprehensive environmental, health and safety data
- Contributes conditioning effect to formulations
- Improves foam texture
- Enhances cutaneous action of surface active ingredients

Physical and Chemical Characteristics*

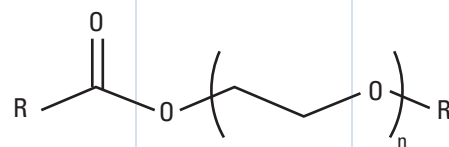


Chemistry	HNP
Association	very high
Ionic nature	nonionic
Appearance	ivory white chips
Melting Point (°C)	52 – 57
Acid Value (mg KOH/g)	max 9
Saponification value (mg KOH/g)	17 - 23
pH (aqueous suspension 3%)	4.5 – 6.5
Iodine value	max 1
Rheology	short
Shear thinning	low
Pseudoplastic index (viscosity @ 6 rpm/ viscosity @ 60 rpm)	1.0

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

Aculyn™ 60 Chemistry

Aculyn 60 rheology modifiers is a Hydrophobically-modified Nonionic Polyol (HNP). It is a polyethylene glycol diester and is synthesized from an alcohol and a polyethylene glycol. The general structure for Aculyn 60 rheology modifier is shown opposite.

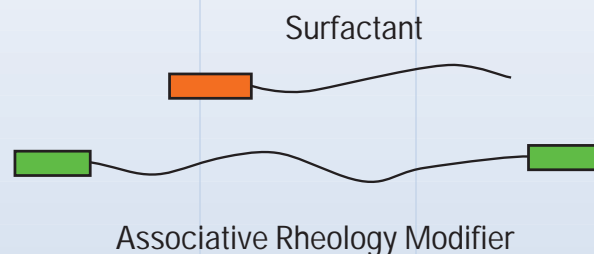
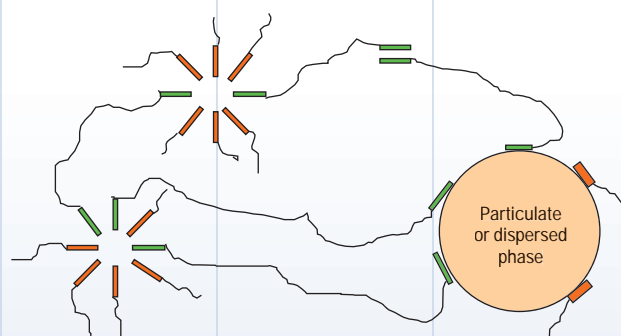


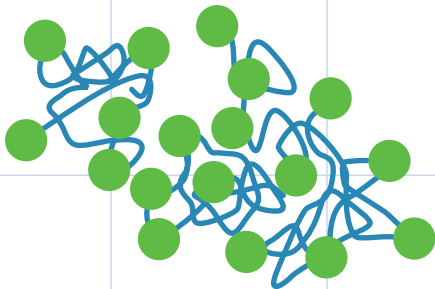
$R_1 = \text{H or R}$
 $R = \text{C (=O) stearate}$

Mechanism of Action

Aculyn 60 rheology modifier thickens via an associative mechanism. The hydrophobic parts of Aculyn 60 build up associations with other hydrophobes present in the formulation. However, because Aculyn 60 is nonionic in nature, no neutralization is needed, and Aculyn will 60 function equivalently in a pH range from 4 through 9.

The hydrophobic groups in Aculyn 60 are free to build associations with one another and with other hydrophobes available in the formulation, such as surfactants, particulates, emulsion droplets and dyes. This phenomenon creates a network structure that results in a significant viscosity build.





Features of HNP Rheology Modifiers

The chart opposite shows features indicative of the behavior of HNP rheology modifiers under different conditions. Please note that these behaviors may vary to some extent according to specific formulations.

HNP rheology modifiers are soluble in water, glycols and surfactants. At levels up to 3%, Aculyn 60 solutions yield clear gels in the presence of surfactants. Above 3%, Aculyn 60 solutions have a pleasant pearlescent effect. Aculyn 60 rheology modifier also has excellent compatibility with low pH and cationic systems and excellent salt tolerance.

Ease of formulation	Fair
Associative	Yes
Salt tolerance	
NaCl	Excellent
Di/trivalent ions	Excellent
Shear thinning behavior	Fair
Solvent compatibility	Good
Low pH compatibility	Excellent
Anionic compatibility	Excellent
Nonionic compatibility	Excellent
Cationic compatibility	Excellent
Peroxide stability	
1 part system	No
2 part system	No

Aculyn™ 60 Behavior Profile and Sample Formulations

Interactions with Surfactants

Aculyn 60 rheology modifier is compatible with a wide variety of common surfactants used in personal care applications. The table below shows the significant increases in viscosity that can be achieved by adding Aculyn 60 to solutions containing different surfactants.

Effect of Aculyn 60 on Viscosities of Surfactant Containing Solutions

Surfactant	% Active	% Aculyn 60	Viscosity in cPs ^a	
			6 rpm	60 rpm
SLES ^b	14%	5%	1,822	1,660
SLES	7%	5%	16,038	6,552
SLES	7%	4%	550	160
TEALS ^c	10%	5%	1,729	1,336
SLESS ^d	20%	5%	4,374	3,645
SLESS	10%	2.5%	100	100
AAB ^e	15%	5%	7,290	1,093
AAB	7.5%	5%	10,935	5,733
AI ^f	20%	2.5%	84,766	3,865
AI	10%	2.5%	1,993	1,620

^a Viscosities measured on a Haake Rheometer after 1 week of storage

^b SLES = Sodium lauryl ether sulfate;

^c TEALS = triethanolamine lauryl sulfate;

^d SLESS = Sodium lauryl ethoxy semisuccinate;

^e AAB = Alkylamidobetaine;

^f AI = Alkyl imidazoline

All of the SLES solutions were crystal clear. A greater viscosity increase was achieved at lower surfactant levels, and in dilute solutions of SLES, a jump in viscosity occurred between 4 to 5% Aculyn 60. The TEALS solution was also crystal clear, but the viscosity increase was not as pronounced as with SLES.

SLESS solutions cannot be thickened with salts, however as seen in the table, addition of 4 to 5% of Aculyn 60 resulted in a significant increase in viscosity. These solutions were also clear, as were solutions of Aculyn 60 and the amphoteric AAB surfactant, where a significant increase in viscosity was observed with addition of 5% of Aculyn 60.

AI surfactants are finding increasing use in non-irritating shampoos. High viscosities were achieved with 15% surface active ingredient and 2.5% of Aculyn 60.



Behavior Profile and Sample Formulations [Continued]

Sample Formulations

Concentrated Pearlescent Bath or Shower Gel

Formula #1

Component	% Product by weight	% Active
Water	22.55	-
Sodium lauryl ether(2) sulfate (25%)	64.80	16.20
Coconut diethanolamine (90%)	6.00	5.40
Ethylene glycol stearate (100%)	2.00	2.00
Aculyn 60 (100%)	2.00	2.00
Citric acid (100%)	2.50	2.50
Perfume	0.10	-
Kathon CG (1.5%)	0.05	7.5 ppm
Viscosity, cPs (50 rpm)	5,340	

Heat the water to 60°C and add the sodium lauryl ether sulfate, coconut diethanolamine, ethylene glycol stearate and Aculyn 60. Cool to 40°C and add citric acid to adjust the pH to the desired level, add the perfume and Kathon CG.

The use of Aculyn 60 with sodium chloride shows a synergistic effect on viscosity as the combination leads to higher viscosities than either component alone. This concept of using Aculyn 60 with sodium chloride can show advantages.

Transparent Shampoos

Formula #2 Formula #3 Formula #4

Component	% Product by water	% Product by weight	% Product by weight
Water	62.85	57.85	59.85
Lauryl ether semi-sulfosuccinate, sodium salt (40%)		10.00	10.00
Triethanolamine lauryl sulfate (40%)	25.00	20.00	20.00
Alkylamido betaine (30%)	5.00	5.00	5.00
Coconut diethanolamine (90%)	2.00	2.00	2.00
Aculyn 60 (100%)	3.00	3.00	5.00
Sodium chloride (100%)	2.00	2.00	
Perfume	0.10	0.10	0.10
Kathon CG (1.5%)	0.05	0.05	0.05
Viscosity, cPs (50 rpm)	1,215	6,075	5,260

Comparison of Formula #3 with a 3% level of Aculyn 60 and 2% sodium chloride to Formula #5 with no sodium chloride and 5% of Aculyn 60 indicates that a synergistic viscosity increase can be obtained by using sodium chloride with Aculyn 60.

Behavior Profile and Sample Formulations [Continued]

Other Applications

In addition to clear shampoos, Aculyn 60 also has utility in very mild products such as baby shampoos that are based on mild surfactants such as imidazolines.

Aculyn 60 is similar to a lipid and acts as such, reducing the degreasing effect of surfactant. The following formulation gives good conditioning leaving the hair soft and manageable.

Mild Transparent Shampoos

Formula #5

Component	% Product by weight	% Active
Water	48.85	-
Alkylamido Betaine (30%)	35.00	10.50
Coconut Imidazoline (30%)	10.00	3.00
Coconut diethanolamine (90%)	2.00	1.80
Aculyn 60 (100%)	4.00	4.00
Perfume	0.10	-
Kathon CG (1.5%)	0.05	7.5 ppm



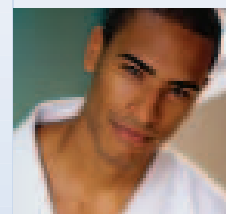
Conditioner with Quaternary Ammonium Compound

Formula #6

Component	INCI Name	Supplier	% Product by weight
Water	Water		87.85
Lanette 16	Cetyl alcohol	Cognis	2.50
Solulan 98	Polysorbate 80 & cetyl acetate & acetylated lanolin alcohol	Amerchol	1.00
Dehyquart A	Cetrimonium chloride	Cognis	1.00
Nesatol	C10-18 triglycerides	Vevey	1.00
Dow Corning 200 Fluid	dimethicone	Dow Corning	0.50
Propylene glycol	propylene glycol		1.00
Glucam P10	PPG-10 methyl glucose ether	Amerchol	1.00
Aculyn 60 (100%)	PEG-150 distearate	Rohm and Haas	3.00
Citric acid (100%)			1.00
Perfume			0.10
Kathon CG (1.5%)	methyl chloro isothiazolinone methyl isothiazolinone	Rohm and Haas	0.05

Heat the water to 60°C and add the Lanette 16, Solulan 98, Dehyquart A, Nesatol, Silicone, propylene glycol, Glucam P10 and Aculyn 60. Cool to 40°C and add citric acid to adjust the pH to the desired level, add the perfume and Kathon CG.

Additionally, Aculyn 60 can be used in hand soaps, bath foams, intimate cleaners, alcoholic and other hydrophilic solvent gels and oil-in-water emulsions, making possible applications almost limitless.



Formulation and Use Guidelines

Aclyn 60 rheology modifier is compatible with cationic surfactants, acids and electrolytes as well as other ingredients commonly found in cosmetic and toiletry products.

To ensure optimum performance, Aclyn 60 rheology modifier, which is shipped as a solid, should be solubilized at 70 to 80°C and incorporated in the surfactant formulation at 1 to 3%. Within this range of concentrations the formulations, if already clear, are not made hazy or opaque. At higher concentrations, a pleasant pearlescent effect may be obtained.



Environmental, Health and Safety Record

Toxicology

Acute Toxicity Profile

Test/Species	Results
Oral LD ₅₀ – rat	>5 g/kg non-toxic
Dermal LD ₅₀ – rabbit	>5 g/kg non-toxic
Eye irritation – rabbit	Moderately irritating (US) Irritant (EEC)
Skin irritation – rabbit	Non-irritating (US) Not irritant (EEC)
Inhalation LC ₅₀ – rat	> 3.36 mg/L non toxic

US – United States classification

EEC – European Economic Community classification

Sensitization Toxicity profile

Test/Species	Results
Sensitization, Guinea pig	Non sensitizer

Genetic Toxicity Profile

Test/Species	Results
Ames Test	Non mutagenic with and without metabolic activation

Human Toxicity Profile

Test/Species	Results
HRIPT	Non-sensitizing, non irritating

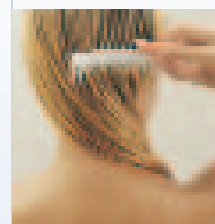
Ecotoxicity Profile

Test/Species	Results
Algae EC ₅₀ – 72 hr	229 mg/L – non toxic
Daphnia magna LC ₅₀ – 48 hr	229 mg/L – non toxic
Rainbow Trout LC ₅₀ – 96 hr	750 mg/L – non toxic

Overall Evaluation

Aculyn 60 is considered non-toxic by single oral, dermal and inhalation exposure, non-irritating to the skin, irritating to the eyes, a non-sensitizer, non-mutagenic in the Ames assay, and non-toxic to aquatic organisms. This material is safe and appropriate for use in a broad range of rinse-off and leave-on personal care applications.

Aculyn 60 rheology modifier is cleared under the major chemical inventories such as CTFA, MITI, EINECS, TSCA, AICS and Canada.



Storage and Handling

Storage

Aculyn 60 rheology modifier is supplied as a solid.

Avoid temperature extremes during storage;
ambient temperature preferred.

Keep container tightly closed when not in use.

Material Safety Data Sheets

Rohm and Haas 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), Rohm and Haas Company sends the appropriate MSDS to the recipient. If you do not have access to one of these MSDS, please contact your local Rohm and Haas 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.

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



To obtain samples, technical assistance, a Material Safety Data Sheet (MSDS) or to have a technical representative call for an appointment, contact the nearest Rohm and Haas Personal Care Technical Sales office or www.rhpersonalcare.com.

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Material Safety Data Sheets outlining known health and safety hazards and handling methods for our products are available on request.

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