



ACUDYNE™ 1000 Hair Styling Polymer

Novel conditioner for the hair care market

General

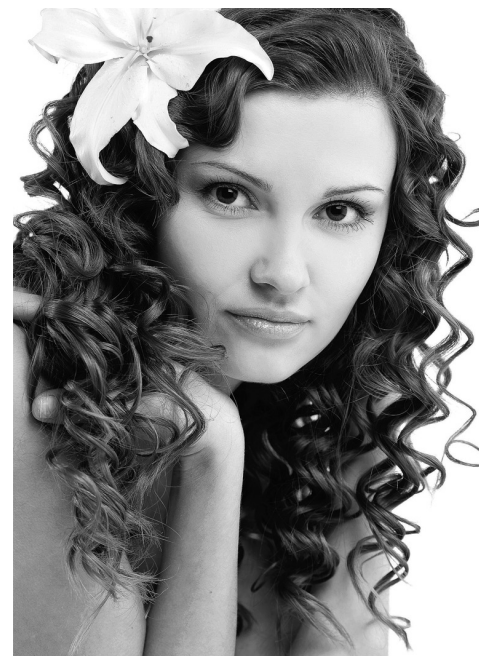
ACUDYNE™ 1000 Hair Styling Polymer allows hair product formulators to achieve long lasting style control with high levels of hold, excellent humidity resistance and no flaking.

Features

- Patented dual phase (soft and hard phase) polymer
- Ability to achieve different performance levels based on use levels
- Durable acrylic based polymer
- Provided as emulsion

Benefits

- Maximum hold and durability for hair styles that last
- Formulation flexibility and potential raw material savings
- Provides a smooth coating to the hair shaft, which tolerates high humidity, promotes hair shine and avoids flaking
- Allows for low energy processing, quick dissolution and eliminates dust handling issues



Delivering outstanding hold and durability

Formulating with ACUDYNE™ 1000 Hair Styling Polymer

- Low viscosity, water soluble emulsion is easy to handle and readily disperses in water
- Upon neutralization, ACUDYNE™ 1000 Hair Styling Polymer dissolves to form clear water or water/ethanol solutions
- Patented technology avoids corrosion in tin-plated cans

Recommended Applications

- Aerosol and pump sprays across range of VOC levels 0% VOC to 90% VOC –
Note: ACUDYNE™ 1000 Hair Styling Polymer is not compatible with hydrocarbon propellants such as propane or butane. A blend of Dimethyl Ether and hydrocarbons can be used
- Aerosol and non-aerosol mousse
- Styling gels including alcohol-containing gels
- Variety of styling aids, such as pomades, puttys, lotions and creams

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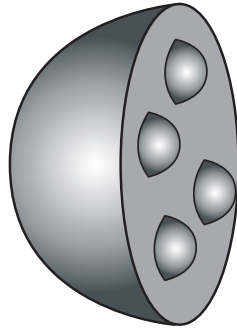
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ACUDYNE™ 1000 Hair Styling Polymer

Physical Properties

The following are typical properties of ACUDYNE™ 1000 Hair Styling Polymer; they are not to be considered product specifications.

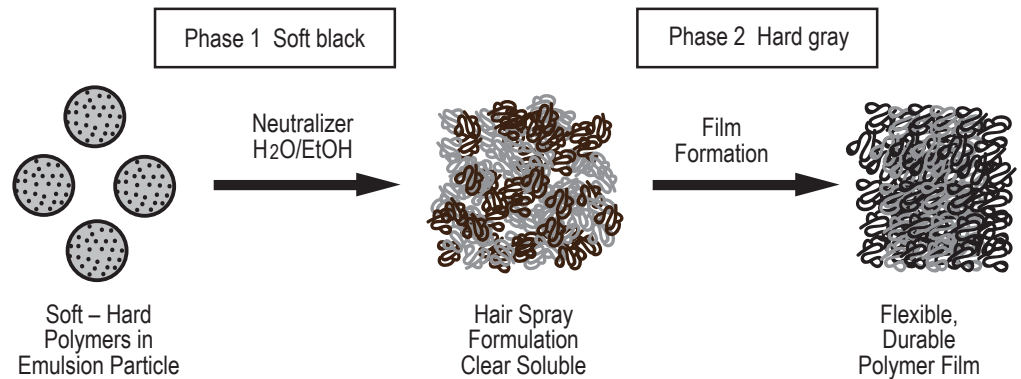
Trade Name : ACUDYNE™ 1000 Hair Styling Polymer
 INCI Name: Acrylates/Hydroxyesters Acrylates Copolymer
 Appearance: Milky with fluid
 Solids content: 44.00 to 46.00%
 pH: 3.30 to 4.30
 Acid Level (moles/gram active): 1.8 to 2.20
 Molecular weight: 140,000 to 150,000
 Viscosity, cps at 25° C As supplied,
 Brookfield LV, spindle #1, 60 rpm): 150 Maximum
 Preservative: 0.778% Benzoic Acid (Maximum)

Patented Dual Polymer Phase Design



ACUDYNE™ 1000 Hair Styling Polymer

Chemistry - ACUDYNE 1000 Morphology:
 Optimization of dual Tg film gives flexible hold

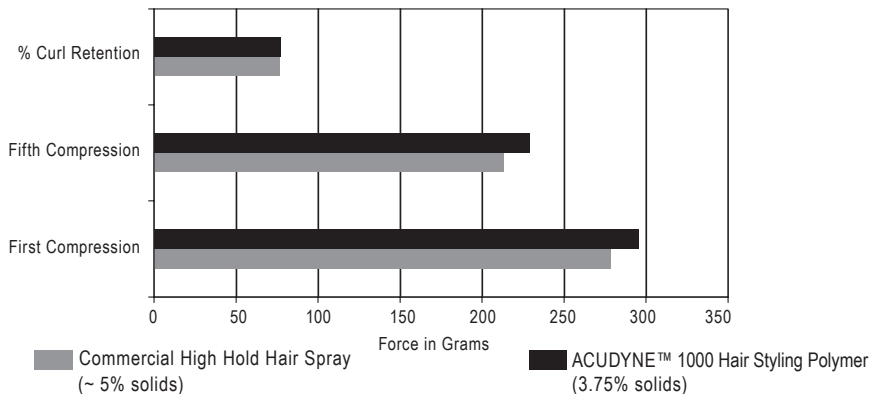


ACUDYNE™ 1000 Hair Styling Polymer Performance Data

As shown in Figure 1, ACUDYNE™ 1000 Hair Styling Polymer matches stiffness and curl retention when compared to commercial high hold hair spray.

Figure 1: 55% VOC Aerosol Evaluation Diastron Stiffness

At lower solids, ACUDYNE 1000 has similar stiffness and curl retention vs. commercial high hold hair spray.



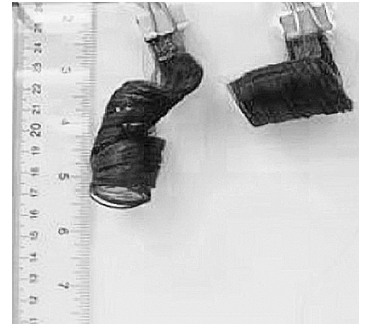
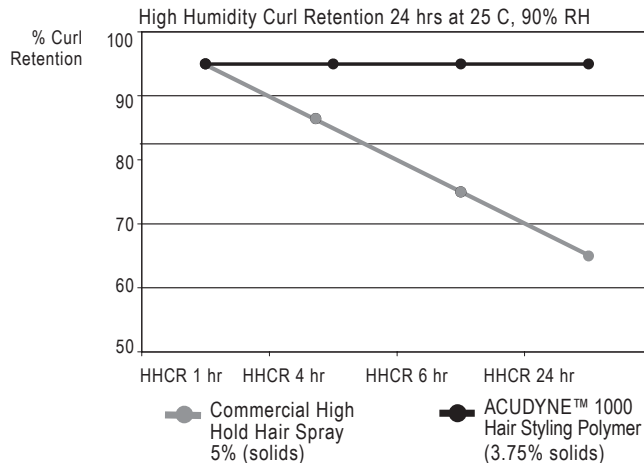
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 ACUDYNE™ 1000 Hair Styling Polymer

In Figure 2, the outstanding high humidity curl retention of ACUDYNE™ 1000 Hair Styling Polymer is demonstrated.

Figure 2: 55% VOC Aerosol Evaluation High Humidity Curl Retention

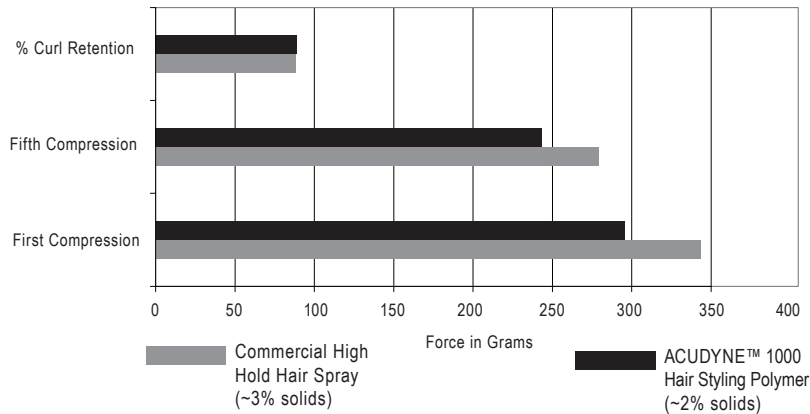
ACUDYNE 1000 delivers significantly better high humidity curl retention v. commercial high hold hair spray.



As Figure 3 illustrates, ACUDYNE™ 1000 Hair Styling Polymer formulated into a hair gel provides higher stiffness and similar curl retention to a commercial extra hold hair gel.

Figure 3: Hair Gel Evaluation Diastron Stiffness

ACUDYNE 1000 has higher stiffness and similar curl retention vs. commercial high hold hair gel.

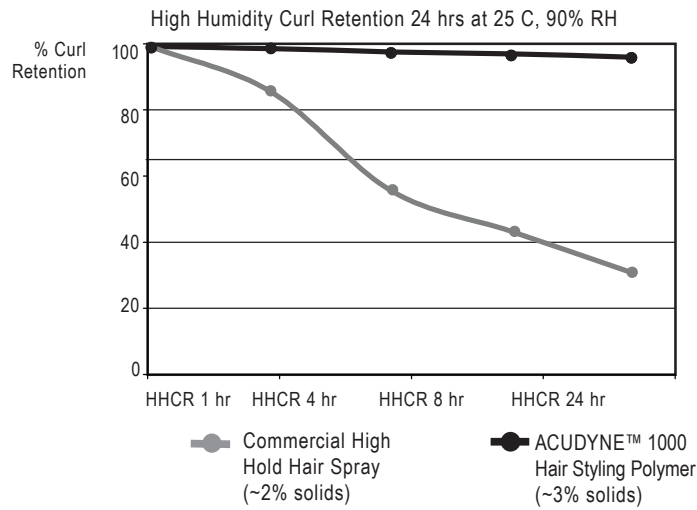


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Figure 4 shows the outstanding high humidity curl retention offered by ACUDYNE™ 1000 Hair Styling Polymer.

Figure 4: Hair Gel Evaluation High Humidity Curl Retention
ACUDYNE 1000 maintains better high humidity curl retention vs. commercial high hold hair gel.



Global Applications for ACUDYNE™ 1000 Hair Styling Polymer

Hair Styling Applications Options

Application	80%+ VOC*	55% VOC	35% VOC	16% VOC	6% VOC	0% VOC
Aerosol sprays	✓	✓	✓			
Pump sprays	✓	✓	✓			✓
Mousse				✓	✓	
Spray gel				✓	✓	✓
Gel				✓	✓	✓
Lotion						✓
Pomade/other						✓

* Use only in Dimethyl Ether (DME) formulations, not compatible with Hydrocarbons such as propane or butane unless used in combination with DME.

ACUDYNE™ 1000 Hair Styling Polymer Formulation Guidelines

Effect of Neutralization Level on Hair Spray Performance

For high hold hair sprays with excellent humidity resistance, we recommend neutralization levels between 60 – 80%

Neutralization Level	Durability (% Curl Retention)		Dia-Stron		Shampoo removability
	High humidity	Bouncing	Stiffness	Stiffness modulus	
60%	90	91	307	11	Good
70%	85	93	249	10	Good
80%	84	93	269	10	Good
90%	79	95	288	10	Good
100%	75	84	278	9	Good

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ACUDYNE™ 1000 Hair Styling Polymer

Neutralization level	Compatibility		
	55VOC (DME)	55VOC (HFC 152a)	80+VOC (DME)
60%	Good	Good	Good
70%	Good	Good	Good
80%	Good	Good	Good
90%	Good	Good	Good
100%	Good	Good	Good

**ACUDYNE™ 1000
Hair Styling Polymer
Formulation
Guidelines For Hair
Sprays***

- Recommended use level of ACUDYNE™ 1000 Hair Styling Polymer is 3 to 5% solids for pump or aerosol hair spray
- Recommended neutralization level for ACUDYNE 1000 is 60 to 80% for optimum film tensile strength and high humidity curl retention
- Formulation viscosity changes may require aerosol valve, actuator and propellant optimization to achieve desired spray properties
- Recommended order of addition:
 - ACUDYNE 1000 well-dispersed in alcohol first
 - Neutralizer (i.e. AMP™–ULTRA PC 2000)
 - Remaining ingredients

* Note: ACUDYNE 1000 is not compatible with hydrocarbon propellants such as propane and butane; however, blends of Dimethyl Ether and hydrocarbons or HFC 152a for anhydrous sprays are possible.

**ACUDYNE™ 1000
Hair Styling Polymer
55% VOC Aerosol
Formulation**

Ingredients	INCI Name	%
Ethanol	Alcohol	20.0
Panthenol	Panthenol	0.1
AMP™ Neutralizing Amine	Aminomethyl Propanol	1.4
ACUDYNE™ 1000 Hair Styling Polymer	Acrylates Hydroxyesters Acrylates Copolymer	8.15
AQUA™ PRO WP	Hydrolyzed Wheat Protein	0.1
Fragrance	Fragrance	0.1
Water	Water	35.15
DYMEL™ A	Dimethyl Ether	35.0

Valve System: VX-81, Stem 0.016 inches (0.41 mm), spring 0.018 inches (0.46 mm), body .013 inches (0.33 mm), vapor tap 0.010 inches (0.25 mm), 0.122 inches (3.1mm) tubing
Actuator: Style VX/XL 200 Misty, Orifice Size: 0.023 inches (0.58 mm) Misty

**ACUDYNE™ 1000
Hair Styling Polymer
80% VOC Aerosol
Formulation**

Ingredients	INCI Name	%
Ethanol	Alcohol	45.0
Panthenol	Panthenol	0.1
AMP™ Neutralizing Amine	Aminomethyl Propanol	1.1
ACUDYNE™ 1000 Hair Styling Polymer	Acrylates Hydroxyesters Acrylates Copolymer	6.5
AQUA™ PRO WP	Hydrolyzed Wheat Protein	0.1
Fragrance	Fragrance	0.1
Water	Water	12.1
DYMEL™ A	Dimethyl Ether	35.0

Valve System: VX-81, Stem 0.016 inches (0.41 mm), spring 0.018 inches (0.46 mm), body .013 inches (0.33 mm), vapor tap 0.010 inches (0.25 mm), 0.122 inches (3.1mm) tubing
Actuator: Style VX/XL 200 Misty, Orifice Size: 0.023 inches (0.58 mm) Misty

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**ACUDYNE™ 1000
Hair Styling Polymer
55% VOC Pump
Formulation**

Ingredients	INCI Name	%
Ethanol	Alcohol	55.0
Panthenol	Panthenol	0.1
AMP™ PC 2000 Neutralizing Amine	Aminomethyl Propanol	1.4
ACUDYNE™ 1000 Hair Styling Polymer	Acrylates Hydroxyesters Acrylates Copolymer	8.15
AQUA™ PRO WP	Hydrolyzed Wheat Protein	0.1
Fragrance	Fragrance	0.1
Water	Water	35.15

Represents typical 55% VOC pump formulation
Seaquist Perfect Optima, (160 µL). 0.014" x 0.010" inches deep (0.36 x 0.25 mm). 0.060 inches (1.5 mm) tubing i.d.

**ACUDYNE™ 1000
Hair Styling Polymer
Formulation
Guidelines for
Hair Gels**

- Recommended use level for ACUDYNE™ 1000 Hair Styling Polymer is 1 to 2% solids for hair gel
- Recommended ACUDYNE 1000 neutralization level is 90 to 100% for optimum film tensile strength and high humidity curl retention
- Amount of neutralizer needs to be pre-calculated based on sum of all formulation ingredients.
- Recommended Order of Addition:
 - Add water, rheology modifier and ACUDYNE 1000
 - Add remaining ingredients
 - Add neutralizer to achieve desired pH level

**ACUDYNE™ 1000
Hair Styling Polymer
Neutralization Chart**

% Neutralization Chart using AMP™ ULTRA PC 2000 (95% solids as supplied)

Neutralization	50% Ntr	60% Ntr	70% Ntr	80% Ntr	90% Ntr	100% Ntr
1 gram polymer solids	0.10	0.12	0.14	0.16	0.18	0.20
3 gram polymer solids	0.29	0.35	0.41	0.47	0.53	0.58
5 gram polymer solids	0.49	0.59	0.69	0.79	0.89	0.98
6 gram polymer solids	0.59	0.71	0.83	0.95	1.07	1.18

$$X = \frac{A * B * C * D}{E * 1000}$$

X = Grams of neutralizing agent required
A = millimoles acid/gram resin SOLIDS; 2.09 meq/gram solids
B = grams of polymer (solids) in the formulation
C = molecular weight of the neutralizing agent
D = % neutralization desired
E = % solids of neutralization agent used

**Hair Gel Formulation
with Bubble
Suspension
Featuring
ACUDYNE™ 1000
Hair Styling Polymer**

Ingredients	INCI Name	%
Deionized Water	Water	78.8
LAPONITE™ XLG 2%	Magnesium Silicate	10.0
AMP™ ULTRA Neutralizing Amine	Aminomethyl Propanol	0.8
ACUDYNE™ 1000	Acrylates Hydroxyesters	4.3
Hair Styling Polymer	Acrylates Copolymer	
BRIJ™ 98/Fragrance (7:1)	Oleth-20	0.5
ACULYN™ 88 Rheology Modifier	Acrylates Steareth-20 Methacrylate Crosspolymer	5.0
NEOLONE™ PE Preservative	Phenoxyethanol and Methylisothiazolinone	0.6

**Mousse Formulation
Featuring
ACUDYNE™ 1000
Hair Styling Polymer**

Ingredients	INCI Name	%
Deionized Water	Water	92.01
ACUDYNE™ 1000	Acrylates Hydroxyesters	4.00
Hair Styling Polymer	Acrylates Copolymer	
AMP™ ULTRA PC 2000	Aminomethyl Propanol	0.42
RITAPAN DL	DL Panthenol	0.05
ACULYN™ 88 Rheology Modifier	Acrylates Steareth-20 Methacrylate Crosspolymer	2.0
Propylene Glycol	Propylene Glycol	0.20
Ritasil SQ2020	Quaternium -17 and PropyleneGlycol	0.05
Taga CH40	PEG-40 hydrogenated castor oil	0.10
BRIJ™ 30	Laureth-4	0.10
Mackam 35	Cocamidopropyl Betaine	0.5
Tocopheryl Acetate	Vitamin E Acetate USP	0.01
Robert EX XN-73	Fragrance	0.11
NEOLONE™ PE Preservative	Phenoxyethanol and Methylisothiazolinone	0.45
Aeron A -46	Isobutane butane	6.0
Seaquist VX-81, 0.112 ID tubing		

**Hair Serum Featuring
ACUDYNE™ 1000
Hair Styling Polymer**

Ingredients	INCI Name	%
Water		77.7
ACUDYNE™ 38 Rheology Modifier	Acrylates/Vinyl Neodecanoate Crosspolymer	9.0
AMP™ ULTRA PC 2000	Aminomethyl Propanol	0.8
Dow Corning 245	Cyclopentasiloxane	9.0
Dow Corning 200	Dimethicone	0.5
Dow Corning 190	PEG/PPG-18/18 Dimethicone	0.5
ACUDYNE™ 1000 Hair Styling Polymer	Acrylates/Hydroxyesters Acrylates Copolymer	2.0
NEOLONE™ PE Preservative	Phenoxyethanol and Methylisothiazolinone	0.50
Total		100

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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.

Storage

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

Disposal Considerations

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

Product Stewardship

Dow has a fundamental concern for all who make, distribute, and use its products, and for the environment in which we live. This concern is the basis for our product stewardship philosophy by which we assess the safety, health, and environmental information on our products and then take appropriate steps to protect employee and public health and our environment. The success of our product stewardship program rests with each and every individual involved with Dow products – from the initial concept and research, to manufacture, use, sale, disposal, and recycle of each product.

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