SILSOFT* A-843
organosilicone copolymer

SPECIALTY FLUIDS - PERSONAL CARE

Silsoft A-843 organosilicone is a proprietary(1) copolymer that represents a class of aminosilicone polyalkyleneoxide copolymers for hair conditioning. Conventional organomodified polysiloxanes have pendant organic groups on a silicone backbone, while Silsoft A-843 organosilicone is a block copolymer, having an $(AB)_n$ structure, with repeating silicone and organic segments. The new molecular architecture of Silsoft A-843 copolymer helps result in excellent adsorption on surfaces, unique tactile properties, and uniform surface coverage. Each component of Silsoft A-843 organosilicone copolymer has a distinct function.

(1) US 5,807,956; US 5,981,681

Key Features and Typical Benefits

The aminosilicone portion may help provide...

- substantivity
- conditioning
- excellent feel
- fly-away control
- lubricity

The polyalkyleneoxide portion may help provide...prevention of build-up

- water solubility
- hair color overdyeability
- moisture retention

Potential Applications

- exceptional hair conditioning without build-up in products such as shampoos, conditioners and styling products
- clear shampoos and styling product formulations where silicone emulsions would cloud the formulation
- hair care products that require superior wet combability
- treated hair that has been damaged by color treatment, permanent wave, sun or blow drying
- improved hair conditioning in hair color products

Typical Physical Properties	
Appearance	Translucent liquid
Viscosity at 25°C, mPa•s	5000
Refractive Index, 25°C	1.4335
Solids Content, %	30
Flash Point, °C (°F)	67 (152)
Solubility (10%) in	
Water	Dispersible
Isopropanol	Soluble
White Mineral Oil	Insoluble
Cyclomethicone	Insoluble
Propylene Glycol	Soluble
Isopropyl Myristate	Soluble

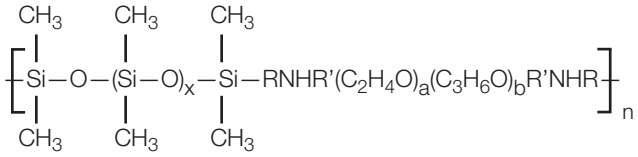
The INCI name for Silsoft A-843 organosilicone copolymer is *Bisamino PEG/PPG-41/3 Aminoethyl PG-Propyl Dimethicone.*

Performance

Silsoft A-843 organosilicone copolymer generally offers the following properties to enhance the performance of hair care products:

- silky softness
- wet/dry combability
- fly-away control
- sheen/Gloss
- moisture control

Chemical Structure



Performance Data

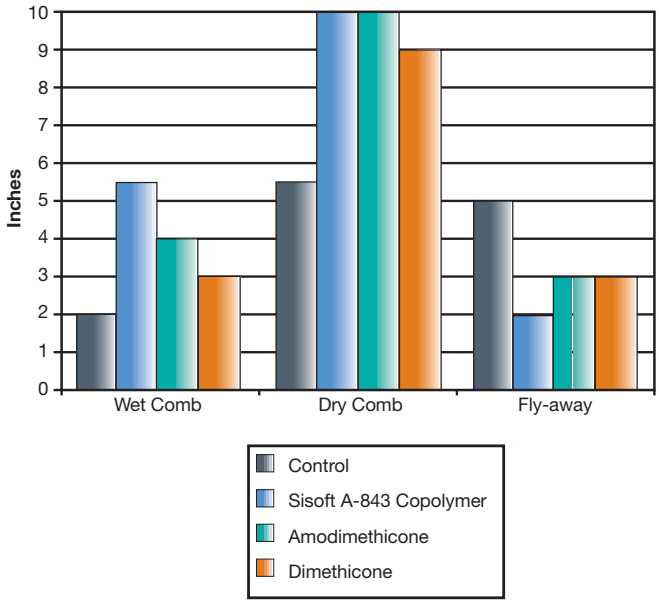
Hair Testing Procedure

The following performance data demonstrates that Silsoft A-843 organosilicone copolymer typically offers excellent performance in wet and dry combability, as well as in fly-away control. Also, Silsoft A-843 organosilicone has been rated higher than amodimethicone and dimethicone in softening properties as determined by an in-house hand panel evaluation. Below is a description of the performance tests:

- wet and dry combability are measured as the number of inches a comb travels when a 10-inch long hair tress, placed on a calibrated chart, is combed from top to bottom
- fly-away is reported as the difference between the total width of the entire tress and the width of the hair bundle after the tress is combed quickly 10 times
- graphs on the following pages show a side by side comparison of Silsoft A-843 organosilicone copolymer, amodimethicone and dimethicone applied to different types of hair from a shampoo containing 1% silicone actives

BLONDE BLEACHED HAIR

Figure 1: Performance of Silsoft A-843 Copolymer vs Other Types of Silicones

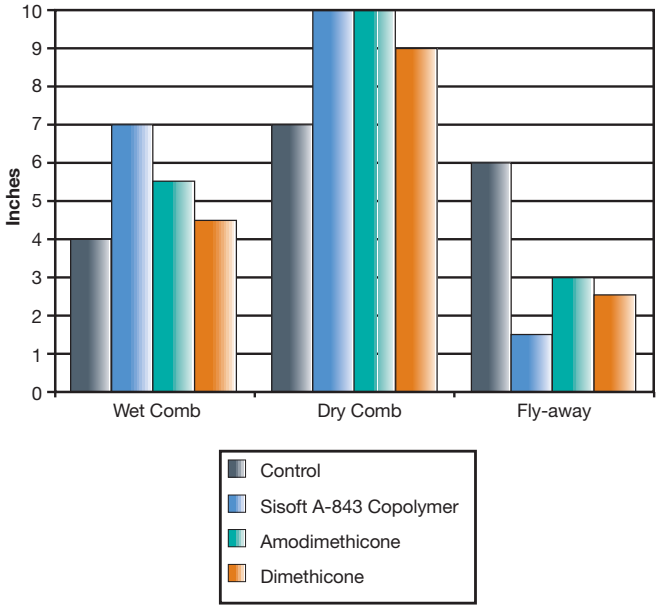


*Silsoft is a trademark of Momentive Performance Materials Inc.

Performance Data (continued)

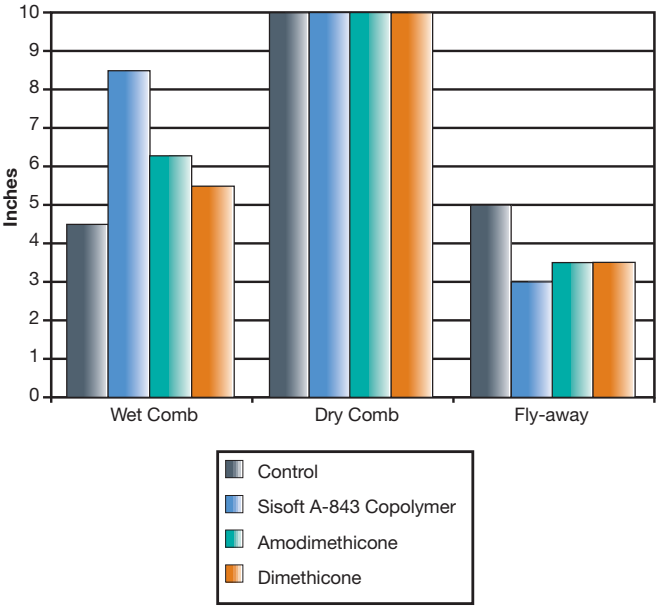
BROWN CAUCASIAN HAIR

Figure 2: Performance of Silsoft A-843 Copolymer vs Other Types of Silicones



ASIAN HAIR

Figure 3: Performance of Silsoft A-843 Copolymer vs Other Types of Silicones



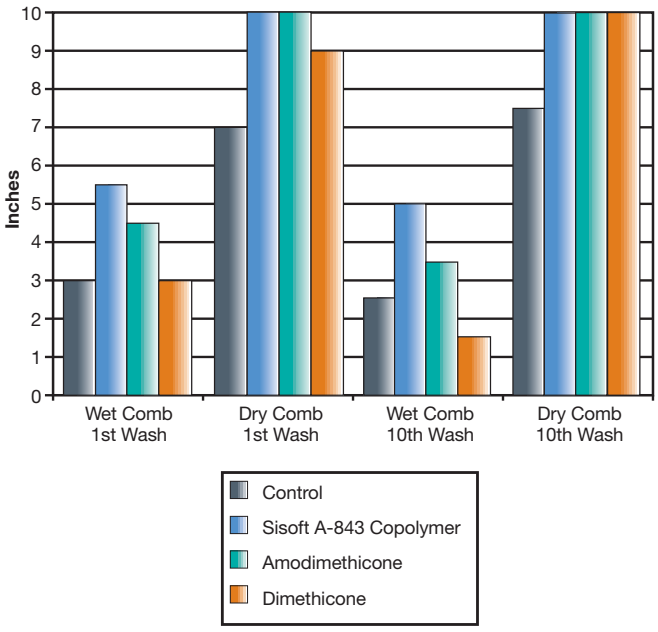
Build Up

The following four shampoo variations were evaluated for build up:

1) control shampoo
2) control shampoo with a 1% active level of Silsoft A-843 organosilicone copolymer
3) control shampoo with a 1% active level of amodimethicone and
4) control shampoo with a 1% active level of dimethicone.

Two hair tresses were used to generate data for each shampoo variation. Build up was noted as the change in the wet and dry combability after 1 wash and 10 washes. Figure 4 shows that after 10 consecutive washes with the shampoo variations, only the hair washed with the Silsoft A-843 copolymer shampoo formulation retains consistent wet and dry combability; amodimethicone shows a measurable decrease in wet combability; and dimethicone shows a noticeable loss in wet combability, becoming worse than the control shampoo. After the tenth wash, in a sensory evaluation, hair shampooed with the dimethicone variation was characterized as draggy and dirty, while other samples felt soft and smooth. These results suggest that dimethicone builds up on hair after repeated applications, amodimethicone may present a problem after extended use and Silsoft A-843 copolymer has virtually no build up tendency.

Figure 4: Silicone Build-Up on Bleached Hair



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Model Formulations

Clear[a] Conditioning Shampoo

Description: Conditioning shampoo for daily use. Silsoft A-843 organosilicone copolymer conditions and helps retain moisture on the hair.

Formula:

Ingredients	Wt Percent
Ammonium Lauryl Sulfate, 28%[b]	35.7
Cocamide DEA	3.0
PEG-120 Methyl Glucose Dioleate	2.0
Silsoft A-843 organosilicone copolymer[c]	3.3
Citric Acid, Anhydrous	0.4
Cocamidopropyl Betaine, 35%	10.0
Deionized Water	qs
Preservative	qs

Mixing Instructions: With propeller agitation, mix deionized water and ammonium lauryl sulfate: add remaining ingredients in the order listed, waiting for each ingredient to dissolve before adding the next. Silsoft A-843 organosilicone copolymer is a combustible liquid. Use caution while heating mixture. Use non-sparking tools and equipment.

If the viscosity of the shampoo needs to be adjusted, we recommend the following thickeners (see Table on page 5 for details):

PEG-150 Distearate, PEG-120-Methyl Glucose Dioleate and Sodium Chloride

(a) Opaque shampoos can be also formulated by incorporating common pearlescent agents in the formula

(b) In systems with other primary surfactants, formulation may not be completely clear: clarity can be improved by pre-blending Silsoft A-843 with isolaureth-6 or trideceth-6 at 1:1 ratio.

(c) If Silsoft A-843 copolymer is post added, temporary haze may result.

Model Formulations (continued)

Thickeners for Commercial Shampoos with Silsoft A-843 Copolymer

It is a well known phenomenon that the addition of water soluble or water dispersible silicones to shampoo causes a reduction in viscosity. The following chart demonstrates this effect on four commercial shampoos that do not contain silicone additives. When Silsoft A-843 copolymer is post added to these shampoos, the viscosity drops dramatically (see line 2). Lines 3 through 6 show the various thickening systems that can be used to adjust the shampoos back to their original starting viscosity.

	(Commercial Shampoo I)	(Commercial Shampoo II)	(Commercial Shampoo III)	(Commercial Shampoo IV)
1. Viscosity(1) as received	14,700	3,860	16,300	4,400
2. Viscosity of the shampoo containing 3.3 parts Silsoft A-843 copolymer	300	600	750	500
3. Viscosity of the shampoo containing 3.3 parts Silsoft A-843 copolymer + 3 parts PEG-150 Distearate	36,000	3,900	7,300	35,000
4. Viscosity of the shampoo containing 3.3 parts Silsoft A-843 copolymer + 3 parts PEG-120 Methyl Glucose Dioleate	26,700	4,100	4,900	71,000
5. Viscosity of the shampoo containing 3.3 parts Silsoft A-843 copolymer + 1 part NaCl	2,100	1,260	1,680	2,500

(1) cps, DV-I, #4, 10RPM

Model Formulations (continued)

Hair Conditioner

Description: Unique formulation exhibiting excellent wet-and-dry combability plus minimal fly-away.

Ingredients	Weight
Silsoft A-843 organosilicone copolymer	6.0
Cetearyl Alcohol	2.0
Dicetyldimonium Chloride	2.5
Stearamidopropyl Dimethylamine	0.5
Panthenol	0.2
Citric Acid	0.05
Deionized Water	qs
Preservative	qs

Procedure: While agitating the water, add 0.05 g of citric acid, cetearyl alcohol, dicetyldimonium chloride, and stearamidopropyl dimethylamine. With mixing, heat to 75-80°C and add remaining ingredients except preservative. Silsoft A-843 organosilicone copolymer is a combustible liquid. Use caution while heating mixture. Use non-sparking tools and equipment. Cool to room temperature with mixing. Adjust to pH 4.5-5 with citric acid if necessary. Add preservative.

Leave-In Conditioner

Description: Clear gel providing conditioning, soft feel, good wet and dry combability and gloss.

Ingredients	Wt Percent
Phase A	
Deionized Water	40.0
Carbomer	0.5
Phase B	
Triethanolamine (50%)	1.0
Phase C	
Propylene Glycol	50.0
Methylgluceth-20	5.0
Phase D	
Silsoft 148 Silicone	2.0
Silsoft A-843 Copolymer	1.5

Procedure: Combine ingredients of Phase A and mix until uniform. Add Phase B. Combine components of Phase C and add slowly with mixing. Add phase D in the order listed. Silsoft A-843 organosilicone copolymer is a combustible liquid. Use caution while heating mixture. Use non-sparking tools and equipment.

Patent Status

Nothing contained herein shall be construed to imply the nonexistence of any relevant patents or to constitute the permission, inducement or recommendation to practice any invention covered by any patent, without authority from the owner of the patent.

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Customers must evaluate Momentive Performance Materials products and make their own determination as to fitness of use in their particular applications.

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