

SILSOFT* Spread MAX Fluid

SPECIALTY FLUIDS - PERSONAL CARE



INCI Name: *Methoxy PEG-8 Dimethylsilylethyl Trimethylsilane (and) Trideceth-5 (and) Meroxapol 172.*

Silsoft Spread MAX fluid is a non-ionic organomodified carbosilane copolymer that can reduce the surface tension of personal care formulations providing the superspreading of actives and inorganic pigments on skin and hair. Silsoft Spread MAX fluid is typically stable in the aqueous phase from pH 2 - 12.

Key Features and Typical Benefits

- Lowers surface tension of aqueous formulas for improved spreading of actives and inorganic pigments
- Hydrolytically stable from pH 2 to 12 for increased formulation flexibility
- Quick to dry for reduced tack time
- Effective at low concentrations (0.1 - 1%)
- Will not accelerate the decomposition of peroxides

Potential Applications

- Hair coloring
- Depilatory
- Inorganic sunscreens
- Color cosmetics
- Facial cleansers
- Conditioners
- Anti-aging skin care
- Facial toners
- Shampoos
- Hair styling
- Anti-acne treatments
- Shaving preparations
- Hair relaxers/permanents

Typical Physical Properties

Appearance	Colorless liquid
Viscosity @ 25 °C, cps	70
Surface Tension (0.1%), mN/m	26.7
Pour Point, °C	2
Flash Point, PMCC, ⁽¹⁾ °C (°F)	165 (329)
Specific Gravity @ 25 °C, g/mL	1.00

Typical properties are average data and are not to be used as or to develop specifications.

(1) Pensky-Martens closed-cup

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Performance Data

Superspreading

The addition of Silsoft Spread MAX fluid to a formulation can increase the spreading area of an aqueous formula to form an even monolayer on skin and hair. Silsoft Spread MAX fluid can aid in wetting most substrates with a contact angle $<1^\circ$ due to its low surface tension.

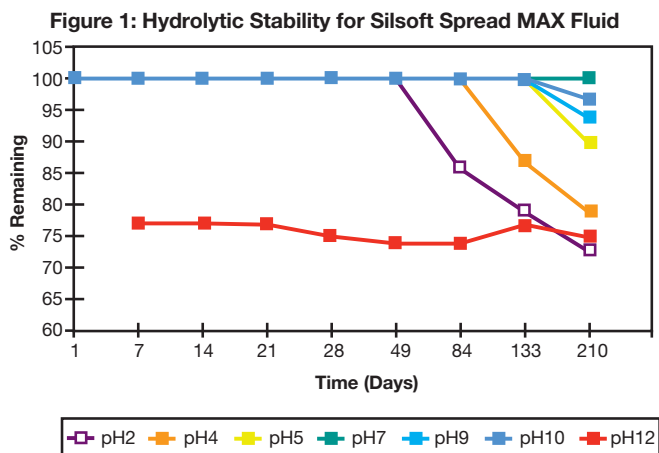
Surfactant	wt%	Surface Tension mN/m ⁽¹⁾
Sodium Lauryl Sulfate	0.1	40
Silsoft Spread MAX fluid	0.1	26.7

(1) Wilhelmy Plate Method at 25 °C

Hydrolytically Stable

Previously, applications for organomodified siloxane copolymer have been constrained due to pH limitations. The launch of this hydrolytically stable superspreader has increased formulation flexibility.

Using HPLC analysis, Silsoft Spread MAX fluid was tracked to determine stability over a pH range of 2 - 12.



Silsoft Spread MAX fluid typically remains hydrolytically stable from pH 2 to 12.

Peroxide Stability

The stability of hydrogen peroxide was tested in a formulation containing Silsoft Spread MAX fluid.

Formulation:

0.03% Silsoft Spread Max fluid

0.75% H₂O₂

QS – Water and pH buffer solution

Results:

- Silsoft Spread MAX fluid did not accelerate the decomposition of peroxides over a broad pH range.
- At pH 10, peroxide will degrade under these conditions even without Silsoft Spread MAX fluid present.

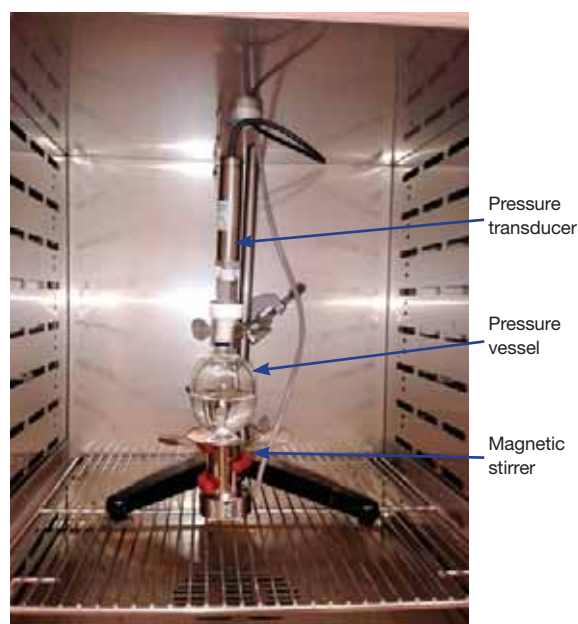
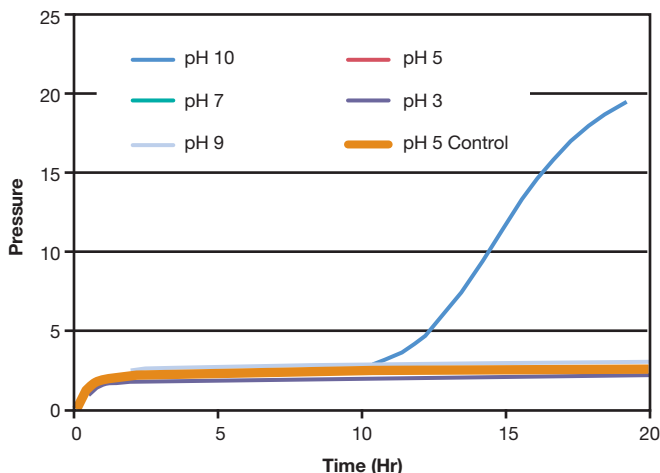


Figure 2: Stability of a Hydrogen Peroxide Formulation with Silsoft Spread MAX at 50 °C



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Note: Test data. Actual results may vary.

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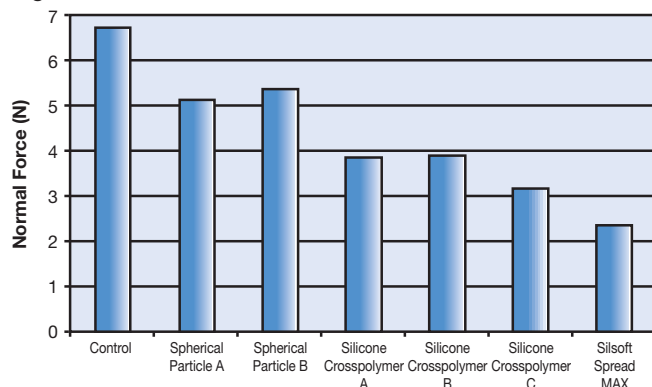
Performance Data (continued)

Tack Reduction

The increasing use of natural ingredients can pose a significant challenge for a formulator. Most natural products tend to be perceived as being rather tacky or oily on skin, and often their spreading behavior on skin is far less than optimal.

The addition of Silsoft Spread MAX fluid has shown to be a sensory and performance enhancer for natural ingredients. In the chart below, we are presenting the ability of Silsoft Spread MAX fluid to reduce the normal force [FN] measurements of Safflower Oleosomes as compared with other sensory enhancing compounds.

Figure 3



Results:

All tested materials were very efficient in reducing the FN of Safflower Oleosomes at a concentration of one percent; however, the Silsoft Spread MAX fluid outperformed these ingredients, making it an efficient sensory enhancer.

Hair Dye Study

This study was designed to test the ability of Silsoft Spread MAX fluid to enhance the overall performance of a hair dye formulation.

Silsoft Spread MAX fluid was added to the color phase of a commercially-available rich auburn oxidative hair dye system and evaluated for its ability to enhance color development, as witnessed by a lower ΔE . Silsoft Spread MAX fluid was added to the shimmering color phase as shown in figure 4. The hair tresses were treated and rinsed per the manufacturer's directions (25 minutes residence time, two-minute rinse with 42 °C tap water, ± 2 °C). Hair tresses were then conditioned with the supplied conditioner and again given a two-minute rinse with 42 °C tap water, ± 2 °C). Tresses were allowed to dry overnight at room temperature, and were then brushed. L*a*b* readings were measured via a Hunter Lab Color Quest XE Spectrophotometer and recorded.

Results:

There was an obvious visual difference between the control vs. other tresses at all concentration levels. The hair tress treated with Silsoft Spread MAX fluid showed much darker color than the control as exhibit by the ΔE value.

Figure 4: ΔE vs. Concentration

Concentration	ΔE
0.05%	1.59
0.10%	1.05
0.25%	2.14
0.50%	2.26
1.00%	6.25

Figure 5: 1.00 percent Silsoft Spread MAX fluid vs control



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Sunless-Tanning Application Study

This study was designed to test the advantage of formulating sunless-tanning applications with Silsoft Spread MAX fluid.

Study Design:

- For this study, two dihydroxyacetone-based sunless-tanning formulations were prepared. The test formulation contained 0.5% Silsoft Spread MAX fluid and the control formulation did not.
- A 0.1-gram sample of each product was applied to a 1.5-inch area on the forearm.
- Test sites were analyzed three hours and 24 hours post application.

Results:

- After the three-hour analysis, the test formulation showed non-enzymatic “tanning” of the skin much faster than the control formulation.
- The 24-hour analysis of the test sites showed a more prominent color distribution with the test formulation, as opposed to the control formulation, which exhibited inconsistent color development.

Conclusions:

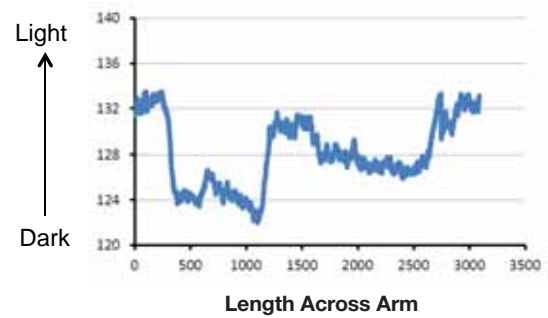
- The accelerated development of the artificial tan with the test formulation showed that Silsoft Spread MAX fluid effectively carried the dihydroxyacetone for reaction with the skin’s amino acids more efficiently than the control formulation.
- The ability of the Silsoft Spread MAX fluid to help lower the surface tension of this formulation resulted in a more even application of the product.
- Silsoft Spread MAX fluid may be a good choice to consider for carrying or delivering ingredients to the skin with greater efficiency and uniformity.

Figure 6

Three Hours Post Application



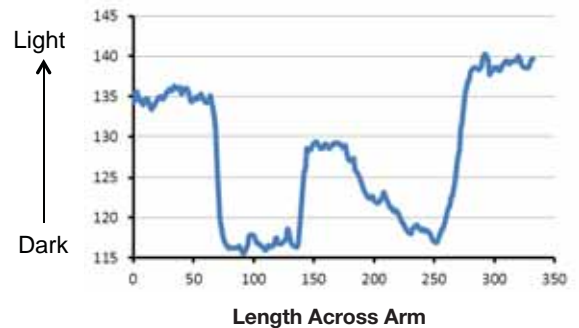
Left - 0.5% Silsoft Spread MAX fluid
Color Development Observed Right-Control
Color Not Yet Developed



24 Hours Post Application



Left - 0.5% Silsoft Spread MAX fluid
Color Development Very Uniform Right-Control
Color Development Uneven



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Note: Test results. Actual results may vary.

SILSOFT* Spread MAX Fluid

Sample Formulation Information

- Silsoft Spread MAX fluid is dispersed within the aqueous phase of a formulation
- Recommended use levels 0.1 - 1.0%
- Cold processable easy to use liquid, can be post-added

Effortlessly Smoothing Moisturizing Lotion

Commercial Name	INCI	% wt/wt
Part A		
Water	Water	q.s. to 100%
Edeta† BD ⁽¹⁾	Disodium EDTA	0.05
Carbopol® Ultrez 10 ⁽²⁾	Carbomer	0.20
Part B		
Momentive Softouch* CC6058 (BN) Powder ⁽³⁾	Boron Nitride	1.00
Butylene Glycol	Butylene Glycol	2.50
Part C		
Schercemol™ CO ⁽²⁾	Cetyl Octanoate	5.00
Arlacel® 60 ⁽⁴⁾	Sorbitan Stearate	1.50
Protasorb S-20 ⁽⁵⁾	Polysorbate 60	1.00
Procol CS-20-D ⁽⁵⁾	Cetearyl Alcohol (and) Ceteareth-20	1.00
SF1214 ⁽³⁾	Cyclopentasiloxane (and) Dimethicone	1.50
Part D		
Water	Water	2.00
AMP-95 ⁽⁶⁾	Aminomethyl Propanol	0.20
Part E		
Sepiplus 400 ⁽⁷⁾	Polyacrylate 13 (and) Polyisobutene (and) Polysorbate 20	1.00
Part F		
Preservative	(TBD)	Per manufacturer's recommendation
Post Add		
Silsoft Spread MAX fluid ⁽³⁾	Methoxy PEG-8 Dimethylsilylethyl Trimethylsilane (and) Trideceth-5 (and) Merxapol 172	0.25

Procedure:

- Build Part A at 80 °C. stir at 400rpm for 30 minutes.
- Build Part B at 80 °C.
- Add Part B to Part A at 80 °C and continue stirring.
- Build Part C at 80 °C and stir at 200rpm.
- Slowly add Part C to the water phase. Remove heat; cool to 60 °C.
- Build Part D and warm to 60 °C.
- Add Part D to the previous build.
- Add pre-mixed Sepiplus 400 to water phase.
- Add Silsoft Spread MAX fluid; stir for 15 minutes.

Suppliers:

- Edeta is a trademark of BASF Aktiengesellschaft.
- Carbopol and Schercemol are trademarks of Lubrizol Advanced Materials, Inc.
- Available from Momentive Performance Materials Inc.
- Arlacel is a registered trademark of Croda Americas LLC.
- Available from Protameen Chemicals Inc.
- AMP-95 is a registered trademark of the Dow Chemical Company.
- Available from Air Liquide Group.

Product formulations are included as illustrative examples only. Momentive makes no representation or warranty of any kind with respect to any such formulations, including, without limitation, concerning the efficacy or safety of any product manufactured using such formulations.

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Sample Formulation Information (continued)

Shave Lotion with Silsoft Spread MAX

Phase	Ingredient	INCI Name	Wt %
A	Deionized Water	Water	q.s. to 100%
	Trisodium EDTA	Trisodium EDTA	0.10
	Glycerin	Glycerin	4.00
	Carbopol Ultrez 21 ⁽²⁾	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20
B	Silsoft Spread MAX fluid⁽¹⁾	Methoxy PEG-8 Dimethylsilylethyl Trimethylsilane (and) Trideceth-5 (and) Meroxapal 172	1.00
	SilForm* 60A⁽¹⁾	PEG/PPG-20/15 Dimethicone (and) Diisopropyl Adipate	1.00
	Silsoft A+⁽¹⁾	PEG-40/PPG-8 Methylaminopropyl/Hydroxypropyl Dimethicone Copolymer	1.50
	Element14* PDMS 100⁽¹⁾	Dimethicone	2.00
	Stearic Acid	Stearic Acid	3.00
	Mineral Oil	Mineral Oil	5.00
C	Cetyl Alcohol	Cetyl Alcohol	1.75
	Glyceryl Stearate	Glyceryl Stearate	0.50
	Tris Amino ⁽³⁾	Tromethamine	0.20
	Deionized Water	Water	2.00
D	Preservative	(TBD)	Per manufacturer's recommendation
	Fragrance	Fragrance	Per manufacturer's recommendation

Procedure:

- In the main vessel, add EDTA mix until dissolved. Disperse Carbopol Ultrez 21 under high-speed mixing until the mixture is uniform. Add remaining phase A ingredients. Heat to 70-75 °C.
- In a separate vessel, combine phase B ingredients. Heat to 70-75 °C.
- Emulsify phase B into phase A with high-speed mixing. Homogenize if necessary.
- Pre-mix phase C ingredients until tromethamine is dissolved. Add to main vessel. Batch will thicken; begin cooling.
- Cool batch to 35 °C. Add fragrance and preservative; mix until homogenous.

Suppliers:

- Available from Momentive Performance Materials, Inc.
- Carbopol is a trade name of Lubrizol Advanced Materials, Inc.
- Tris Amino is a registered trademark of Angus Chemical Company

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Acne Cream with Silsoft Spread MAX

Phase	Ingredient	INCI Name	Wt %
A	Deionized Water	Water	q.s. to 100%
	Propylene Glycol	Propylene Glycol	2.00
	Trisodium EDTA	Trisodium EDTA	0.15
	Carbopol 981 ⁽²⁾	Carbomer	0.30
B	Element14* PDMS 5⁽¹⁾	Dimethicone	1.00
	Brij S721-SO-(AP) ⁽³⁾	Steareth-21	1.40
	Brij S2-SO-(AP) ⁽³⁾	Steareth-2	1.60
	Dermol 99 ⁽⁴⁾	Isononyl Isonononate	6.00
	Cetyl Alcohol	Cetyl Alcohol	3.50
C	Deionized Water	Water	2.00
	Tris Amino ⁽⁵⁾	Tromethamine	0.40
D	Silsoft Spread MAX fluid⁽¹⁾	Methoxy PEG-8 Dimethylsilylethyl Trimethylsilane (and) Trideceth-5 (and) Meroxapal 172	1.00
	Momentive Softouch* CC6004 (BN) Powder⁽¹⁾	Boron Nitride	3.00
E	Deionized Water	Water	1.00
	Preservative	(TBD)	Per manufacturer's recommendation
F	Curoxyl 42 ⁽⁶⁾	Benzoyl Peroxide	24.00

Procedure:

- In the main vessel, add Propylene Glycol and EDTA, mix until dissolved. Disperse Carbomer powder under high-speed mixing until uniform. Heat to 70-75 °C.
- In a separate vessel, combine phase B ingredients. Heat to 70-75 °C.
- Emulsify phase B into phase A with high-speed mixing. Homogenize if necessary.
- Pre-mix phase C ingredients until tromethamine is dissolved. Add to main vessel. Batch will thicken.
- Begin cooling to 40 °C. Add Silsoft Spread Max fluid and Softouch 6004 boron nitride powder while mixing.
- Pre-mix phase E until powder is dissolved. Add to batch at 40 °C.
- Add Curoxyl 42 and mix until homogenous.

Suppliers:

- Available from Momentive Performance Materials, Inc.
- Carbopol is a trademark of Lubrizol Advanced Materials, Inc.
- Croda, Inc.
- Alzo International, Inc.
- Tris Amino is a registered trademark of Angus Chemical Company
- Curoxyl is a trademark of Essential Ingredients, Inc.

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Sample Formulation Information (continued)

Anti-Aging Serum with Silsoft Spread MAX

Phase	Ingredient	INCI Name	Wt %
A	Deionized Water	Water	q.s. to 100%
	Disodium EDTA	Disodium EDTA	0.15
	Pemulen TR-2 Polymer ⁽²⁾	Acrylates/C10-30 Alkyl Acrylate Crosspolymer	0.20
	Hydrolite-6 ⁽³⁾	1,2-Hexanediol	2.00
B	Glyceryl Stearate ⁽⁴⁾	Glyceryl Stearate	0.50
	Jeemate 6000 DS ⁽⁵⁾	PEG-150 Distearate	0.70
	Dermol 99 ⁽⁴⁾	Isononyl Isononanoate	4.00
	Element14* PDMS 50⁽¹⁾	Dimethicone	3.00
	Velvetil* 034⁽¹⁾	Caprylyl Methicone (and) C30-45 Alkyl Cetearyl Dimethicone Crosspolymer	5.00
C	Deionized Water	Water	1.00
	Tris Amino ⁽⁶⁾	Tromethamine	0.22
D	Silsoft Spread MAX fluid⁽¹⁾	Methoxy PEG-8 Dimethylsilylethyl Trimethylsilane (and) Trideceth-5 (and) Meroxapol 172	1.00
	Momentive Softouch* CC6004 (BN) Powder⁽¹⁾	Boron Nitride	5.00
E	Deionized Water	Water	1.00
	Preservative	(TBD)	Per manufacturer's recommendation
F	Syn-TC ⁽⁷⁾	Tetradecyl Aminobutyroylvalylaminobutyric Urea Trifluoroacetate (and) Palmitoyl Tripeptide-5 (and) Palmitoyl Dipeptide-5 Diaminobutyroyl Hydroxybutyrate (and) Glycerin (and) Water (and) Magnesium Chloride	2.50
	Fragrance	Fragrance	Per manufacturer's recommendation

Procedure:

- In the main vessel, add EDTA, mix until dissolved. Disperse Pemulen powder under high-speed mixing until uniform. Add remaining phase A ingredients, heat to 75 °C.
- In a separate vessel, combine phase B ingredients; heat to 75 °C.
- Emulsify phase B into phase A with high-speed mixing; homogenize.
- Pre-mix phase C ingredients until tromethamine is dissolved. Add to main vessel; batch will thicken.
- Begin cooling to 40 °C. Add phase D while mixing.
- Premix phase E until powder is dissolved. Add to batch at 40 °C.
- Cool batch to 35 °C. Add remaining ingredients and mix until homogeneous.

Suppliers:

- Available from Momentive Performance Materials, Inc.
- Pemulen is a trademark of Lubrizol Advanced Materials, Inc.
- Symrise AG
- Alzo International, Inc.
- Jeemate is a trademark of Jeen International, Inc.
- Tris Amino is a registered trademark of Angus Chemical Company
- DSM Nutritional Products

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