The Formulator's Sun Care Solution Finder

SPECIALTY FLUIDS - PERSONAL CARE

Today's consumers are increasingly aware of the dangers of sun exposure and its harmful effects on skin. These damaging effects may manifest themselves as undesired premature aging and skin cancer. As a result of increasing consumer awareness, incorporating sun protection into daily use body, facial products and color cosmetics is now the norm and the demand for highly effective sun care formulations is even greater than in the past.

Key Features and Typical Benefits

The key challenges for sun care formulators include:

- creating differentiated formulations that provide the benefits of sun protection
- developing sun care products that have a natural appearance on skin
- formulating high SPF sunscreens that provide water resistance and comfortable long wear while minimizing the potential for irritation
- adding elegant aesthetics to sun formulations without significantly impacting cost

As a leader in specialty silicones, Momentive Performance Materials' diverse product portfolio offers solutions that are excellent candidates for sun care formulators to consider for overcoming these challenges.

Our innovative silicone technologies allow formulators the potential to develop effective sunscreen containing products that are water resistant, aesthetically elegant and cost effective.

Silicone resins, alkyl functionalized siloxanes, silicone microspheres, silicone emulsifiers and crosspolymer gel networks generally help to enhance overall sunscreen formulation performance. Our technologies have been shown to optimize film formation, water resistance, solubilize and disperse sunscreen actives while imparting superior skin feel unlike the waxy, greasy feel typically observed when other non-silicone raw materials are used in sun care preparations.

The following products may be considered for sun care formulation needs:

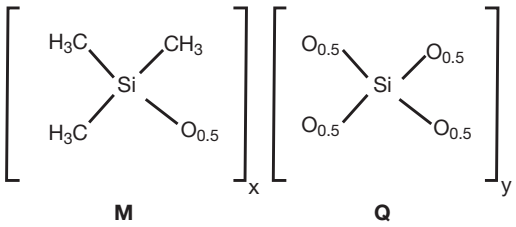
	Product	INCI Name	Emulsifier	Sensory Enhancement	Film Former	Water Resistance	Oil Resistance	Transfer Resistance	SPF Enhancement	Stabilizing Aid	Dispersing Aid
Silicone Resins											
	SR1000	Trimethylsiloxysilicate			X	X		X	X		
	SS4230	Cyclopentasiloxane (and) Trimethylsiloxysilicate			X	X		X	X		
	SS4267	Dimethicone (and) Trimethylsiloxysilicate			X	X		X	X		
	SilForm* flexible resin	Polymethylsilsesquioxane			X	X		X	X		
	SilForm FR-10 fluid	Trifluoropropyldimethylsiloxy/Trimethylsiloxy Silsesquioxane (and) Dimethicone			X	X	X		X		
	SilShine* 151 gloss additive	Phenylpropyldimethylsiloxysilicate		X	X	X			X	X	
Alkyl Functionalized Siloxanes											
	Silsoft 034 organosilicone fluid	Caprylyl Methicone		X					X	X	X
	Silsoft ETS trisiloxane	Ethyl Trisiloxane		X						X	X
Crosspolymer Gels											
	Silsoft* Silicone Gel	Cyclopentasiloxane (and) Cetearyl Dimethicone/Vinyl Dimethicone Crosspolymer		X							
	Velvesil* 034 organosilicone gel	Caprylyl Methicone (and) C30-45 Alkyl Cetearyl Dimethicone Crosspolymer		X					X		X
	Velvesil Plus gel	Cyclopentasiloxane (and) C30-45 Cetearyl Dimethicone Crosspolymer (and) PEG/PPG-20/23 Dimethicone		X					X		X
Silicone Microspheres											
	Tospearl* 145A microspheres	Polymethylsilsesquioxane		X							
	Tospearl 1110A microspheres	Polymethylsilsesquioxane		X							
	Tospearl 3000A microspheres	Polymethylsilsesquioxane		X							
Polyether Functionalized Siloxane											
	SF1540	Cyclopentasiloxane (and) PEG/PPG-20/15 Dimethicone	X								

Note: Test results. Actual results may vary.

Enhancing Film Properties

It is well recognized that silicone resins enhance the film formation properties and water resistance of sun care formulations. In comparison to alternative polymer technologies, silicone resins promote greater film uniformity, cost performance benefit, film flexibility, SPF enhancement, overall improved aesthetics and comfortable wear.

SR 1000 – Trimethylsiloxysilicate

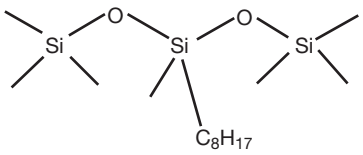


M **Q**

Property	Value
Actives	100%
Appearance	White powder
Particle Size, micron	20-100
Bulk Density, g/cm^3	0.3

MQ resins such as SR1000 in combination with an alkyl-modified siloxane, Silsoft* 034 organosilicone fluid, are excellent candidates to consider for a unique synergistic enhancement of SPF. Silsoft 034 organosilicone fluid lowers the surface tension of commonly used cosmetic oils and helps to maintain solid particles in a dispersed state. The addition of Silsoft 034 organosilicone fluid also provides a superior sensory product profile compared to the use of SR1000 alone.

Silsoft 034 organosilicone fluid - Caprylyl Methicone



Property	Value
Actives	100%
Appearance	Clear liquid
Viscosity @ 25°C, cSt	3
Pour Point, °C (°F)	-62 (-52)
Flash Point, °C (°F)	110 (43)
Refractive Index (nd 25)	1.413
Compatible with...	Silicones, oils, esters, organics

Note: Test results. Actual results may vary.

*Silsoft is a trademark of Momentive Performance Materials Inc.

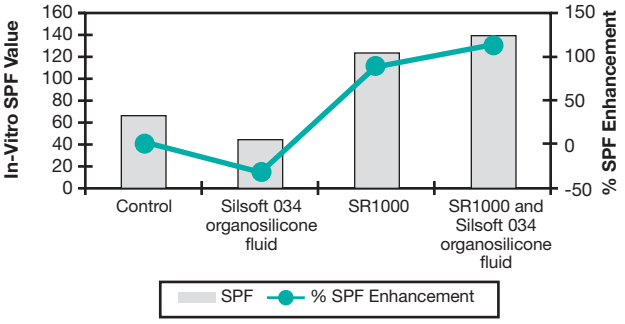
Table 1: O/W Formulation Containing SR1000 and Silsoft* 034 organosilicone fluid

SR1000 / Silsoft 034 Formulations	
Phase A	**wt %**
Stearic Acid	3.63
Cetyl Alcohol	0.57
Dimethicone 350cSt (SF96-350, Momentive Performance Materials)	10-(x+y)
Trimethylsiloxysilicate (SR1000, Momentive Performance Materials)	**x**
Caprylyl Methicone (Silsoft 034, Momentive Performance Materials)	**y**
C12-C15 Alkylbenzoate	5
Caprylic Capric Triglycerides	5
Octylmethoxycinnamate	7.5
Octylsalicylate	5
Oxybenzone	6
Avobenzone	3
Phase B	
Tetrasodium-EDTA	0.08
Carbomer	0.1
Triethanolamine	1.14
Water	52.97

Control: x = y = 0; SR1000 / Silsoft 034: x = y = 2.5;
SR1000: x = 2.5, y = 0; Silsoft 034: x = 0, y = 2.5

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.

Figure 1: SPF Enhancement O/W Formulation with SR1000 and Silsoft* 034 Organosilicone Fluid Synergistic Effects



As demonstrated in Figure 1, alone Silsoft 034 organosilicone fluid did not improve the SPF value of our O/W test formulation however the synergistic combination of SR1000 and Silsoft 034 organosilicone fluid significantly improved the in-vitro SPF performance of sun care products while also dramatically improving its sensory profile. These enhancements can be seen in many emulsion types including water in silicone sunscreen emulsions.

Note: Test results. Actual results may vary.

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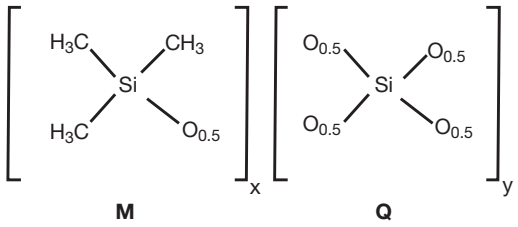
The high levels of organic and/or inorganic sunscreen actives required to formulate high SPF sun care products can be detrimental to formulation aesthetics and formulation cost. SS4267, a film forming MQ resin in 50 cSt dimethicone, is an excellent candidate to consider for cost performance advantages in sunscreen formulations.

SS4267 – Dimethicone (and) Trimethylsiloxysilicate; SS4230 Cyclopentasiloxane (and) Trimethylsiloxysilicate



Property	SS4267	SS4230
Silicone Resin	35%	45%
Silicone Fluid	Dimethicone	Cyclopentasiloxane
Appearance	Clear liquid	Clear liquid
Viscosity @ 25°C, cSt	300 - 700	70 - 200
Specific Gravity @ 25°C	1.04	1.05

Since the cost of SS4267 can be more favorable than sunscreen actives, its excellent film forming properties gives formulators an alternative for a reduced level of sunscreen actives necessary to achieve a desired SPF value, thus potentially improving formulation cost and aesthetics.

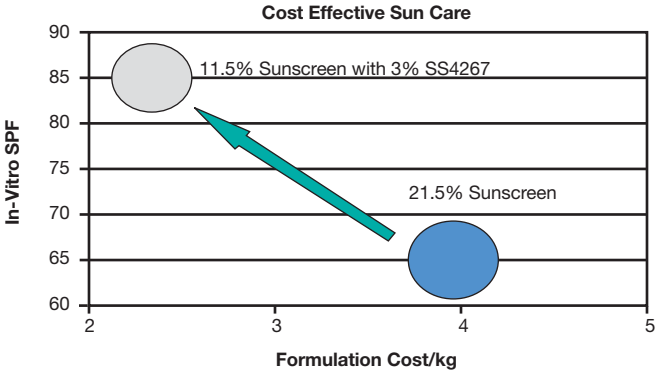
Table 2: SS4267 Oil-in –Water Sunscreen Formulation

SS4267 – Formulations	
Phase A	**wt %**
Stearic Acid	3.63
Cetyl Alcohol	0.57
Dimethicone 350cSt (SF96-350, Momentive Performance Materials)	10-x
Dimethicone (and) Trimethylsiloxysilicate (SS4267, Momentive Performance Materials)	**x**
C12-C15 Alkylbenzoate	5
Caprylic Capric Triglycerides	5
Octylmethoxycinnamate (OMC)	7.5 (6)
Octylsalicylate (OS)	5 (4)
Oxybenzone (OX)	6 (0)
Avobenzone (AV)	3 (1.55)
Phase B	
Tetrasodium-EDTA	0.08
Carbomer	0.1
Triethanolamine	1.14
Water Distilled	52.97 ± y

Control: x = 0, y = 0
Formulation with 6% SS4267: x = 6, y = 0
Formulation with 3% SS4267: x = 3, y = 0
Formulation with 3% SS4267 & reduced sunscreens: x = 3, y = +9.95

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.

Figure 2: Cost Benefit Analysis using 3% SS4267 in Sunscreen Formulation



In addition, the reduction in the level of sunscreen actives allowed for more formulation space within the oil phase for other ingredients such as moisturizers, vitamins and other skin care ingredients.

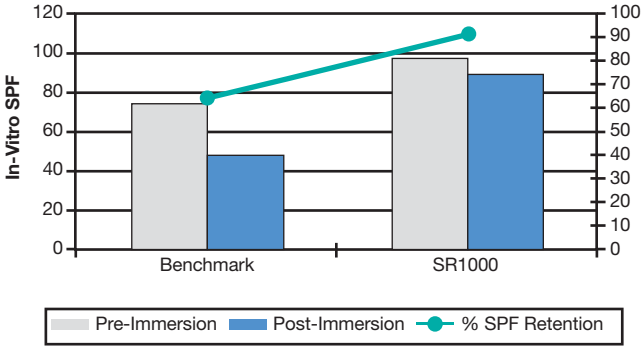
As an alternative to SS4267, Momentive Performance Materials offers a silicone resin in cyclopentasiloxane, SS4230. The latter resin exhibited a lighter sensory experience, but the functional benefits may be diminished.

With respect to beach products, water resistance is a critical requirement for consumers. Consumers want confidence that their sun care products will remain active after swimming or outdoor activities. Momentive Performance Materials' MQ silicone resins SR1000 and SS4267 are excellent candidates to consider for enhancement of water resistance compared with conventional polymer technologies.

Some alternative polymers used in sun care for water resistance are HLB sensitive and thus difficult to use at effective concentrations, unlike the typical performance of our silicone resins.

Note: Test results. Actual results may vary.

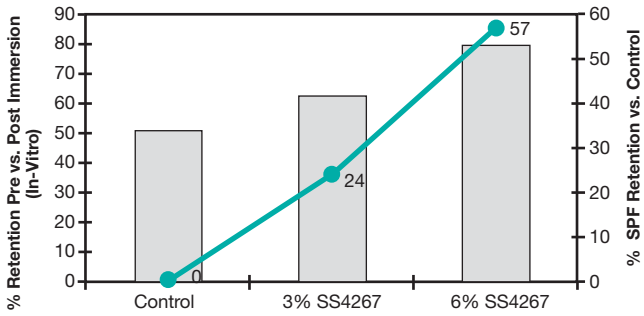
Figure 3: In-vitro Water Resistance of SR1000 vs. Organic Film Former



As shown in Figure 3, SR1000 showed significant improvement over organic film formers in providing water resistance.

We have previously shown in The Formulators Sun Care Solution Finder that MQ resin products such as SS4267 generally optimize SPF and improve formulation cost. Using the same formulation shown in Table 2, SS4267 was also evaluated for its potential to aid in water resistance.

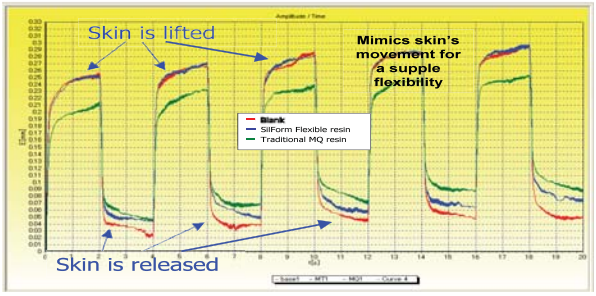
Figure 4: Water Resistance Evaluation with SS4267



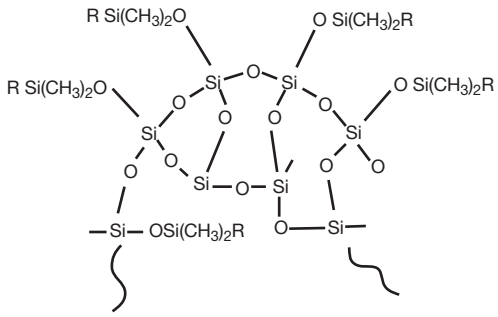
In summary, MQ resins are excellent candidates for formulators to consider for overcoming sun care challenges through a variety of methods. Incorporating MQ resins in sunscreen formulations potentially allow formulators to optimize SPF values of sun care products with less required sunscreen actives while offering better formulation cost. MQ resin products also increased resistance to wash-off.

Comfort and long lasting performance are typically crucial in the daily use sun care category that continues to grow. To address the need for enhanced film flexibility and comfort over conventional film forming polymers and resins (including MQ resins, which can be somewhat brittle) Momentive Performance Materials offers for consideration our MT or fluoro-modified MT resins known as SilForm* flexible resin and SilForm FR-10 fluid. These MT resin products have been shown to form highly flexible films that can mimic the skin's movement and impart comfort along with water and oil resistance, which may extend the wear of sunscreen containing formulations.

Figure 5: MT Resins Mimic Skin's Movement



SilForm Flexible Resin – Polymethylsilsesquioxane; SilForm FR-10 Fluid - Trifluoropropyldimethylsiloxy/ Trimethylsiloxy Silsesquioxane (and) Dimethicone



R = $-CH_3$

R' = $-CH_2CH_2CF_3$

Property	SilForm Flexible Resin	SilForm FR-10 Fluid
Silicone Resin	100%	50%
Silicone Fluid	N/A	10 cSt Dimethicone
Appearance	White solid	Translucent liquid
Viscosity	N/A	0.4 Pas
Softening Point °C	75-90	N/A

To further study the flexibility of films formed by MT resin products, dry silicone films were subjected to 110% lateral expansion on synthetic skin. See Figure 6 below. Both SilForm flexible resin and SilForm FR-10 fluid showed excellent film uniformity and flexibility when compared to the MQ resin. Enhanced film flexibility typically translates into improved wear and comfort for our consumers.

Figure 6: SilForm Flexible Resin and SilForm FR-10 Fluid film flexibility versus MQ resin

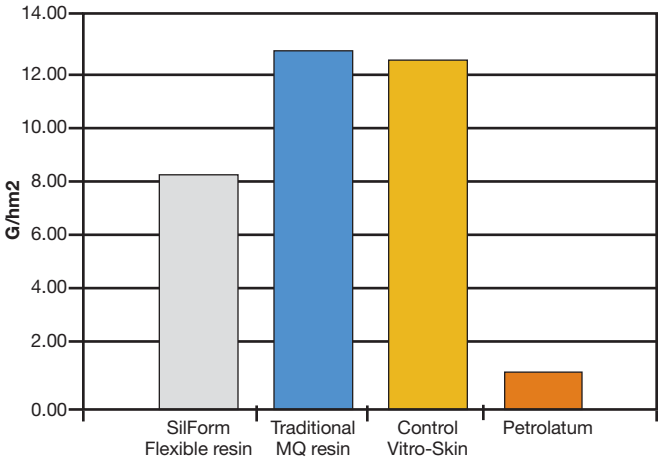
SilForm Flexible Resin | **SilForm FR-10 Fluid** | **MQ-Resin**

Note: Test results. Actual results may vary.

*SilForm is a trademark of Momentive Performance Materials Inc.

To impart suppleness and comfort, films formed on skin must be flexible and impart moisturization. MT resins such as SilForm* flexible resin have been shown to deliver flexible films on skin while reducing Transepidermal Water Loss (TEWL). Measuring TEWL is a good indication of the moisture retention potential of a film.

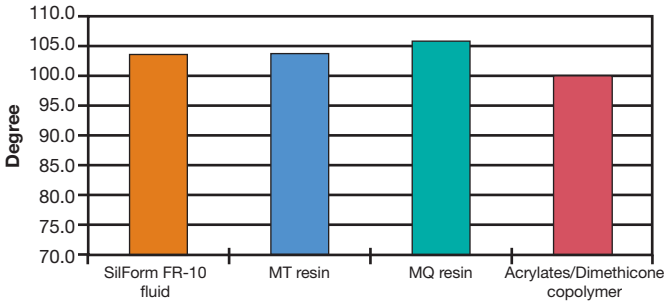
Figure 7: TEWL Results SilForm Flexible Resin



Hydrated in-vitro skin was coated with resins in a 1:1 mixture with cyclopentasiloxane, dried overnight and subjected to TEWL analysis. As shown in Figure 7, the film formed by SilForm flexible resin was clearly more occlusive that the control or the MQ resin. Incorporating SilForm flexible resin into a sun care formulation provided skin with a more supple and moisturized feel.

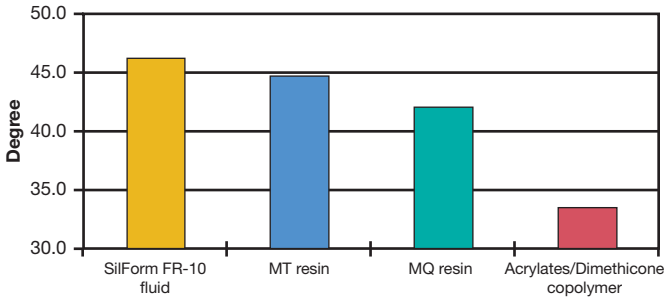
Water repellency may be improved, compared to other film formers, when incorporating the MT resin, SilForm flexible resin and the fluoro-modified MT, SilForm FR-10 fluid, into formulations. Water contact angle of 30% resin solutions in cyclopentasiloxane were measured.

Figure 8: Water Contact Angle Measurements



For color cosmetic formulations with SPF, oil resistance for improved long wear is necessary. To measure oil repellency, squalene contact angle of the same resin solutions in cyclopentasiloxane was measured.

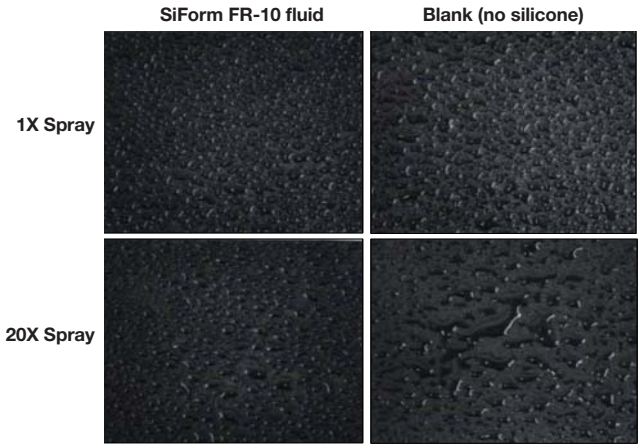
Figure 9: Squalene Contact Angle Measurements



In comparison to the acrylate based film former, SilForm flexible resin and SilForm FR-10 fluid provided an improved combination of water and oil repellency. They also provided greater oil resistance than a traditional MQ resin.

Film durability in the presence of water was studied with SilForm FR-10 fluid. To test the durability of SilForm FR-10 fluid, model sunscreen formulations containing silicone film formers were prepared and applied onto synthetic skin and allowed to dry. The substrate was insulted with a water spray followed by towel drying, to simulate swim and exercise conditions. The procedure was repeated 20 times.

Figure 10. Wash Off Durability with SilForm FR-10 Fluid



As shown by the beading of droplets on the film surface in Figure 10, SilForm FR-10 fluid delivered improved wash and rub resistance, which potentially lend to extended wear benefits in products designed for exercise and outdoor activities.

In conclusion, MT resin products can impart film flexibility, comfort and moisturization, long wear, oil and water resistance and durability to sunscreen formulations. All of these benefits are essential whether formulating beach or daily use products and color cosmetics with SPF.

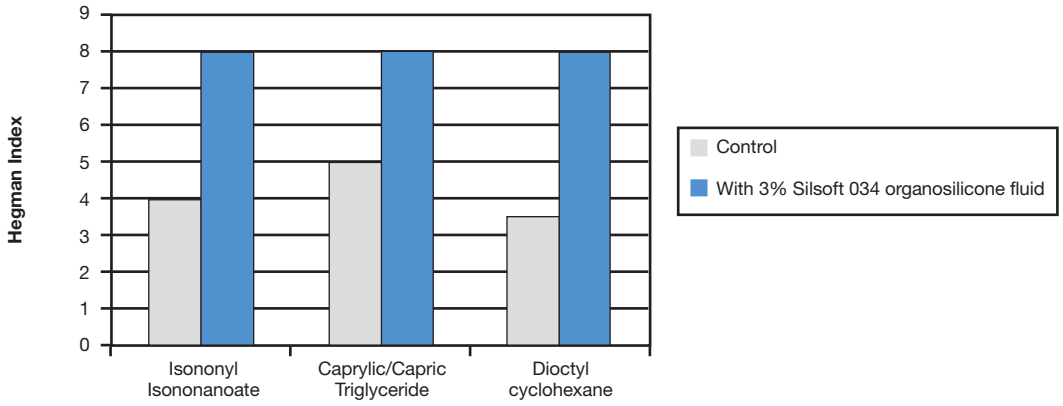
Note: Test results. Actual results may vary.

*Silsoft and SilForm are trademarks of Momentive Performance Materials Inc.

Enhancing Dispersibility of Inorganic Sunscreen Actives

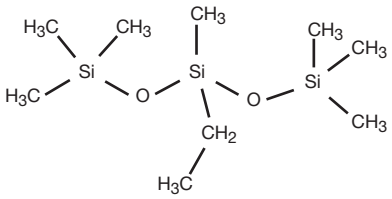
Momentive Performance Materials' alkyl functionalized trisiloxanes such as Silsoft* 034 organosilicone fluid are spreading agents for both oils and pigments such as titanium dioxide and zinc oxide. Trisiloxanes in particular are effective dispersants for TiO2, which has a tendency to agglomerate over time, potentially leading to formulation instability and excessive whitening on skin. Trisiloxanes aid in reducing agglomeration size with minimal energy requirement.

Figure 11: Titanium Dioxide Dispersibility in Various Carriers



Dispersions were prepared by incorporating 10% dry titanium dioxide into media containing 3% Silsoft 034 organosilicone fluid. Particle size distributions were evaluated using GRIND GAUGE and reported in Hegman Index (1-coarse, 8-very fine). Silsoft 034 organosilicone fluid, as a spreading and wetting agent, improved the dispersibility of TiO2 versus other commonly used dispersing aids, resulting in finer dispersion that will potentially lead to reduced whitening on skin during application of the sun care formulation and enhanced efficacy of the inorganic sunscreen active.

Silsoft ETS Ethyl Trisiloxane:



Property	Value
Actives	>98%
Appearance	Clear colorless liquid
Viscosity	~1.1 mPas @20°C
Boiling Point, °C	172
Flash Point, °C	45
Melting Point °C	< -60
Density g/cm^3	~0.83
Compatible with…	Silicones, oils, esters, organics, alcohols, etc…

Momentive Performance Materials also offers an ethyl-modified trisiloxane: Silsoft ETS trisiloxane. Similar to Silsoft 034 fluid, Silsoft ETS trisiloxane aided in dispersibility and spreadability, however Silsoft ETS trisiloxane has a higher volatility profile than Silsoft 034 organosilicone fluid. It evaporates rapidly and provides a quick rub-in, with a light dry after feel.

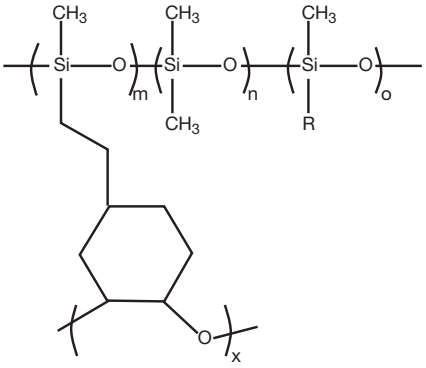
Note: Test results. Actual results may vary.

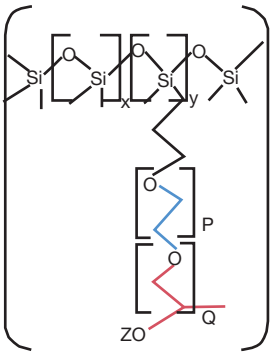
Enhancing Sensorial Effects of Sun Care Formulations

Momentive Performance Materials' Velvesil* crosspolymer gel networks and Tospearl* spherical powders generally are excellent sensory modifiers, which may also offer visual effects such as soft focus effects and enhanced spreadability and dispersion of UV actives for enhanced SPF.

Two of our most recently introduced Velvesil crosspolymer gels typically can be used in a wide range of sun care formats to deliver compelling new textures and sensory properties.

Velvesil 034 organosilicone gel organosilicone gel– Caprylyl Methicone (and) C30-45 Alkyl Cetearyl Dimethicone Crosspolymer; Velvesil Plus gel gel – Cyclopentasiloxane (and) C30-45 Cetearyl Dimethicone Crosspolymer (and) PEG/PPG – 20/23 Dimethicone





Silicone Polyether Velvesil Plus gel

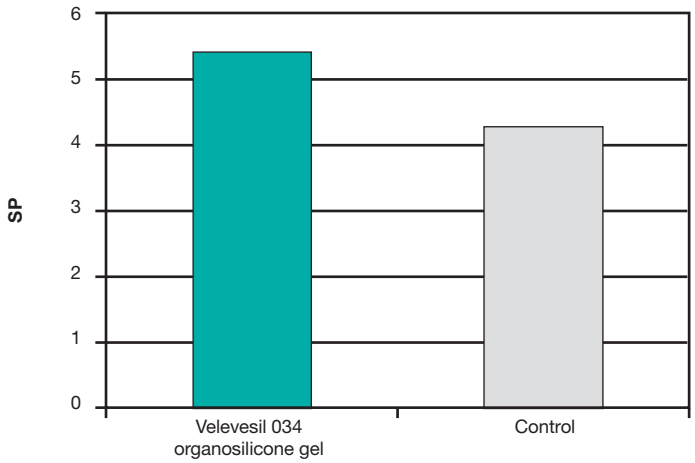
Property	Velvesil 034 organosilicone gel	Velvesil Plus gel
Solids	15 - 17	18.5 – 21.5
Appearance	Clear translucent gel	White gel
Viscosity	>80, 000 cPs	150,000 – 300,000 cPs

Velvesil 034 organosilicone gel organosilicone gel generally delivers a delightful sensory to personal care formulations. With Silsoft* 034 organosilicone fluid spreading and wetting aid as the crosspolymer carrier, Velvesil 034 organosilicone gel is an excellent candidate to consider for dispersing and spreading active and pigment containing formulations. It is a typically outstanding detackifier that can help provide more uniform coverage in daily sunscreens. Velvesil 034 organosilicone gel organosilicone gel generally has excellent compatibility with many commonly used cosmetic organic materials.

Note: Test results. Actual results may vary.

To evaluate the performance of Velvesil* 034 organosilicone gel in sunscreen formulations, the SPF of an O/W formulation containing organic sunscreen actives were conducted via the in-vitro method versus the control. The test formulation contained 3% Velvesil 034 organosilicone gel with 7% SS4267 whereas the control formulation contained 3% Element14* PDMS 5 and 7% SS4267.

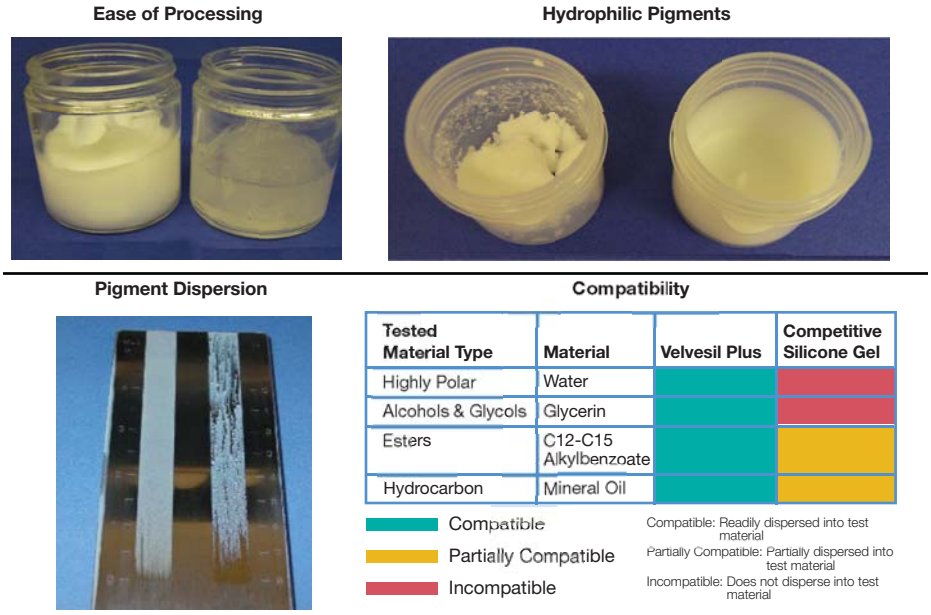
Figure 12: In-Vitro SPF O/W Formulation 3% Velvesil 034 organosilicone gel versus Control



The use of Velvesil 034 organosilicone gel and SS4267 led to a 25% increase in SPF, when compared to the same control formulation containing Element14 PDMS and SS4267. Therefore, Velvesil 034 organosilicone gel is important to consider in sun care formulation as an outstanding sensory modifier. Due to the enhanced spreading of the sunscreen-containing formulation and compatibility, it potentially aids in boosting SPF.

Velvesil Plus gel is also an excellent candidate to consider for dispersion of hydrophilic, or uncoated, physical sunscreens and pigments and boosting SPF.

Figure 13: Velvesil Plus gel Performance Benefits



Velvesil Plus gel is compatible with polar sunscreen oils and can be used to formulate stable, low viscosity, pumpable, sunscreen-containing formulations with outstanding sensory properties.

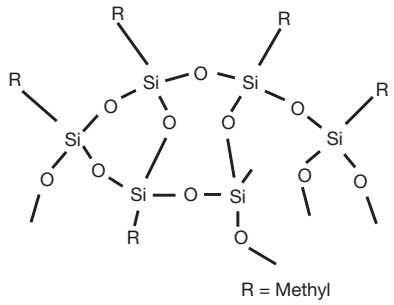
Note: Test results. Actual results may vary.

*Velvesil and Element14 are trademarks of Momentive Performance Materials Inc.Inc.

Tospearl* microspheres are a series of mono-dispersed, micro-fine spherical crosslinked siloxane particles. All of these T-resins generally provide exceptional feel to skin when incorporated into a variety of cosmetic formulations. Each grade has a specific particle size that typically results in excellent performance benefits.

Tospearl microspheres typical performance benefits include:

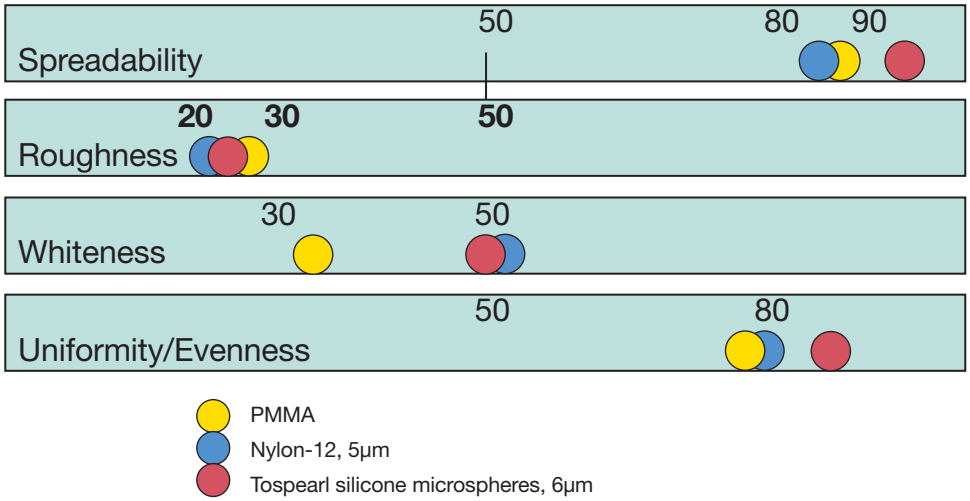
- soft, smooth, dry feel
- excellent lubrication
- prevents powder agglomeration
- soft focus effect
- sebum absorption



Property	Tospearl 145A microspheres	Tospearl 3000A microspheres	Tospearl 1110A microspheres
Appearance	White Powder	White Powder	White Powder
Average Particle Size	4.5	4 – 7	11
Specific Surface Area m2/g	20	20- 30	18
Line Seed Oil Absorption Rate ml/100 g	60	60	56
Typical Benefit	Sensory; Soft Focus Effects	Cost Effective Performance of Key Benefits	Excellent Lubricity

In comparison to organic powders, Tospearl microspheres generally impart the best overall sensory experience to sensory panelists.

Figure 14: Tospearl Microspheres Sensory Comparison with Organic Powders



Tospearl microspheres are an excellent candidate to consider for daily wear formulations with SPF and beach sunscreens in which a natural look, enhanced lubricity and cost effectiveness are important features to consider.

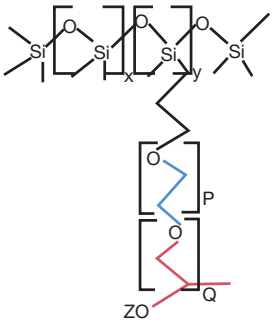
Note: Test results. Actual results may vary.

*Tospearl is a trademark of Momentive Performance Materials Inc.Inc.

Enhancing Emulsification (W/S Emulsion)

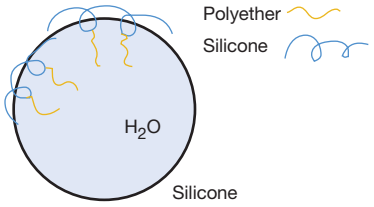
Momentive Performance Materials offers a concentrated formulation vehicle, SF1540, which typically can provide pleasant skin feel for water-in-silicone and water-in-oil emulsions. SF1540 is a 40% actives emulsifier concentrate, generally optimized to help deliver formulation latitude in sunscreens. It lends more formulation space in the oil phase, and it is an excellent candidate to consider for high SPF products. The emulsifier structure is generally optimized for high internal phase emulsion stabilization at low use levels as well as ambient processing.

SF1540 – Cyclopentasiloxane (and) PEG/PPG 20/15 Dimethicone:



Property	Value
Actives	40%
Appearance	Opaque liquid
Viscosity @ 25°C	10,000 – 50,000 cSt
Flash Point, °C	63
Pour Point °C	< -40

The molecular structure of SF1540 has been shown to allow for optimal orientation at the interface between water and oil. SF1540 lowered interfacial tension between these phases and formed a boundary barrier to enhance overall formulation stability.



Our diverse product portfolio of specialty silicones is an excellent candidate to consider for transformation of sunscreen containing formulations into cost effective, high performing, aesthetically elegant products.

Note: Test results. Actual results may vary.

Sample Formulations:

Cost Effective High SPF Water Resistant Oil-in-Water Sunscreen with SR1000

This is an example of an otherwise readily washed-off formulation rendered water resistant through the addition of a small amount of a single ingredient, silicone resin SR1000. Both water resistance and SPF are noticeably enhanced compared to the control formulation without silicone resin. This highly effective sunscreen formula is an excellent candidate to consider for beach and daily use sun care products.

Ingredients	w/w%
Part A	
Stearic Acid	3.63
Cetyl Alcohol	0.57
Dimethicone (Element14* PDMS 350)(1)	8.00
Trimethylsiloxysilicate (SR1000)(1)	2.00
Octinoxate	7.50
Octisalate	5.00
Oxybenzone	6.00
Avobenzone	3.00
C12-C15 Alkyl Benzoate	5.00
Caprylic/Capric Triglyceride	5.00
Part B	
Water	52.97
Tetrasodium EDTA	0.08
Carbomer 934	0.10
Part C	
Triethanolamine	1.14
Preservative	q.s.
Fragrance	q.s.

Procedure:

1. Combined ingredients in Part A at room temperature, heat to 75°C.
2. Combined ingredients in Part B, heat to 75°C and stir for 45 minutes.
3. Slowly added B to A, carefully monitoring the temperature.
4. Added Part C and increase agitation as the product thickens.
5. Cooled to 30°C with moderate mixing and added preservative and fragrance.

Suppliers:

(1) Momentive Performance Materials Inc.

All Day Comfort Sun Care Lotion with SilForm* Flexible Resin

This cost effective sun care base formulation containing SilForm flexible resin is an excellent candidate to consider for all day comfort. SilForm flexible resin enhanced the sensory properties as well as water and oil repellency of this daily use lotion.

Ingredients	w/w%
Stearic Acid	3.63
Cetyl Alcohol	0.57
Dimethicone (Element14 PDMS 5)(1)	7.50
Polymethylsilsesquioxane (SilForm Flexible Resin)(1)	2.50
Octinoxate	7.50
Octisalate	5.00
Oxybenzone	6.00
Avobenzone	3.00
C12-C15 Alkyl Benzoate	5.00
Caprylic/Capric Triglyceride	5.00
Tetrasodium EDTA	0.08
Carbomer	0.10
DI Water	52.98
Triethanolamine	1.14
Preservative and Fragrance	q.s.

Procedure:

1. Added oil phase ingredients in order listed (stearic acid through caprylic/capric triglyceride).
2. Heated oil phase to 75°C while mixing.
3. Combined water phase ingredients (EDTA through water) in a separate beaker.
4. Heated the water phase to 75°C and allowed carbomer to swell for 45 minutes, slowly added water phase to the oil phase.
5. Cooled and added triethanolamine while stirring. Added fragrance and preservative at room temperature.

Suppliers:

(1) Momentive Performance Materials Inc.

Note: Test results. Actual results may vary.

*Element14 and SilForm are trademarks of Momentive Performance Materials Inc.Inc.

Vitamin Enriched Facial Lotion with Sun Protection, incorporating Velvesil* Plus gel

Velvesil Plus gel adds cushion and silkiness to this facial formulation with sun protection. With Silsoft* 034 organosilicone fluid to aid in formulation spreading and SS4230 to enhance the SPF value, this formulation potentially provides a dry, powdery, prestige, moisturizing feel in addition to effective sun protection.

Ingredients	w/w%
Part A	
Cyclopentasiloxane (and) C30-45 Cetearyl Dimethicone Crosspolymer (and) PEG/PPG – 20/23 Dimethicone (Velvesil Plus gel)(1)	5.00
PEG-100 Stearate	2.80
Steareth-2	0.70
Cyclopentasiloxane (SF1202)(1)	3.00
Stearic Acid	1.00
Caprylyl Methicone (Silsoft 034)(1)	3.00
Cyclopentasiloxane (and) Trimethylsiloxysilicate (SS4230)(1)	0.50
C12-C15 Alkyl Benzoate	0.60
Oxybenzone	2.00
Octinoxate	4.00
Avobenzone	1.50
Part B	
Di Water	q.s. to 100%
Glycerin	5.00
Niacinamide	2.00
Panthenol	1.00
Tetrasodium EDTA	0.08
Tocopherol Acetate	0.30
Carbomer	0.16
Part C	
Triethanolamine	0.46
Part D	
Sodium Ascorbyl Phosphate	0.04
Preservative and Fragrance	q.s.

Procedure:

1. Mixed and heated Part A to 78°C.
2. Mixed and heated Part B to 78°C.
3. Added Part B to Part A slowly.
4. Added Part C and mix while cooling.
5. Added Part D at room temperature or as per manufacturers instructions.

Suppliers:

(1) Momentive Performance Materials Inc.

Smooth, Soft Inorganic Sunscreen Mousse with Velvesil 034 organosilicone gel

Velvesil 034 organosilicone gel aided in the dispersion of titanium dioxide in this smooth, uniform mousse and provided the unique powdery, smooth sensory of this sunscreen mousse formulation. The use of Silsoft 034 organosilicone fluid and SR1000 has been shown to aid in enhancing the SPF values of sunscreen formulations. The combination of these specialty materials in this sun care formulation imparted enhanced sensory, improved SPF as well as an interesting product texture.

Ingredients	w/w%
Caprylyl Methicone (and) C30-45 Alkyl Cetearyl Dimethicone Crosspolymer (Velvesil 034 organosilicone gel(1)	51.00
Caprylyl Methicone (Silsoft 034)(1)	3.00
Dimethicone (Element 14 PDMS 5)(1)	7.00
Trimethylsiloxysilicate (SR1000)(1)	2.00
Titanium Dioxide	15.00

Procedure:

1. Combined ingredients and mix at room temperature with moderate agitation.

Suppliers:

(1) Momentive Performance Materials Inc.

After Sun Tanning Lotion with SilForm* Flexible Resin, Softouch* CCS402 and SF1540 Boron Nitride (BN)

After sun exposure, consumers prefer to maintain their radiant glow. Softouch CCS402 imparted radiance to this simple water-in-silicone emulsion containing SF1540 and SilForm flexible resin for potentially enhanced film formation.

Ingredients	w/w%
Part A	
Boron Nitride (Softouch CCS402)(1)	6.00
Polymethylsilsesquioxane (SilForm flexible resin)(1)	0.50
Cyclopentasiloxane (and) PEG/PPG 20/15 Dimethicone (SF1540)(1)	5.00
Cyclopentasiloxane (SF1202)(1)	18.50
Part B	
Glycerin	3.00
Sodium Chloride	1.00
Di Water	q.s. to 100

Procedure:

1. Dissolved SilForm flexible resin in SF1202.
2. Added all other ingredients in Part A and mixed until uniform.
3. Mixed all ingredients of Part B.
4. lowly added Part B to Part A while stirring and cool to room temperature.

Suppliers:

(1) Momentive Performance Materials Inc.

Note: Test results. Actual results may vary.

Transparent Cream Gel with Aloe Vera with SF1540 and Silsoft* Silicone Gel

This formulation demonstrated the option to produce a clear formulation with SF1540 as a water-in-silicone emulsifier and Silsoft silicone gel as a sensory enhancer. The methodology used in this formulation is "Refractive Index Matching" which resulted in a clear product in which the refractive indices of the oil phase and water phase are matched exactly.

Ingredients	w/w%
Part A	
Cyclopentasiloxane (and) PEG/PPG 20/15 Dimethicone (SF1540)(1)	3.40
Cyclopentasiloxane (and) Dimethicone (SF1214)(1)	0.82
Cyclopentasiloxane (and) Cyclohexasiloxane (SF1528)(1)	18.20
Cyclopentasiloxane (and) Cetearyl Dimethicone/Vinyl Dimethicone Crosspolymer (Silsoft Silicone Gel)(1)	4.00
Part B	
Water (and) Aloe Barbadensis Leaf Juice (Aloe Vera Gel Concentrate 10:1)(2)	2.80
Di Water	30.78
Propylene Glycol	25.60
Phenoxyethanol (and) Octoxyglcerine (Euxyl PE 9010)(3)	0.50
Sodium Chloride	1.00
Glycerin	12.90

Procedure:

1. Combined all ingredients in Part A and mixed until homogenous.
2. Measured the refractive index (RI) of Part A.
3. Combined all ingredients in Part B and mixed until homogenous.
4. Measured the RI of Part B and adjusted RI if necessary with either water or glycerin to match the RI of Part A exactly.
5. Slowly added Part B to Part A while stirring.
6. Avoided air entrapment for maximum clarity.
7. Added fragrance if needed (if turbidity occurs add fragrance to either the oil or water phase in the beginning to be sure that RI change is measured and taken into account).

Suppliers:

(1) Momentive Performance Materials

(2) Symrise

(3) Schuelke

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.

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.

Limitations

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

Product Safety, Handling and Storage

Customers should review the latest Material Safety Data Sheet (MSDS) and label for product safety information, safe handling instructions, personal protective equipment if necessary, and any special storage conditions required for safety. MSDS are available at www.momentive.com or, upon request, from any Momentive Performance Materials (MPM) representative. For product storage and handling procedures to maintain the product quality within our stated specifications, please review Certificates of Analysis, which are available in the Order Center. Use of other materials in conjunction with MPM products (for example, primers) may require additional precautions. Please review and follow the safety information provided by the manufacturer of such other materials.

Emergency Service

Momentive Performance Materials maintains an around-the-clock emergency service for its products.

Location	Emergency Service Provider	Emergency Contact Number
Mainland U.S., Puerto Rico	CHEMTREC	1-800-424-9300
Alaska, Hawaii	CHEMTREC	1-800-424-9300
Canada	CHEMTREC	1-800-424-9300
Europe, Israel	NCEC	+44 (0) 1235239670
Middle East	NCEC	+44 (0) 1235239671
Asia Pacific (except China)	NCEC	+44 (0) 1235239670
China	NCEC	+86-10-5100-3039
Latin America (except Brazil)	NCEC	+44 (0) 1235239670
Brazil	SOS Cotec	08000111767 or 08007071767
All other locations world wide	NCEC	+44 (0) 1235239670
At sea	Radio U.S. Coast Guard in U.S. waters NCEC in International waters	 +44 (0) 1235239670

For Health related calls, contact Momentive Performance Materials at +1-518-233-2500 (English only).

DO NOT WAIT. Phone if in doubt. You will be referred to a specialist for advice,

Note: Test results. Actual results may vary.

*Silsoft is a trademark of Momentive Performance Materials Inc.Inc.

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