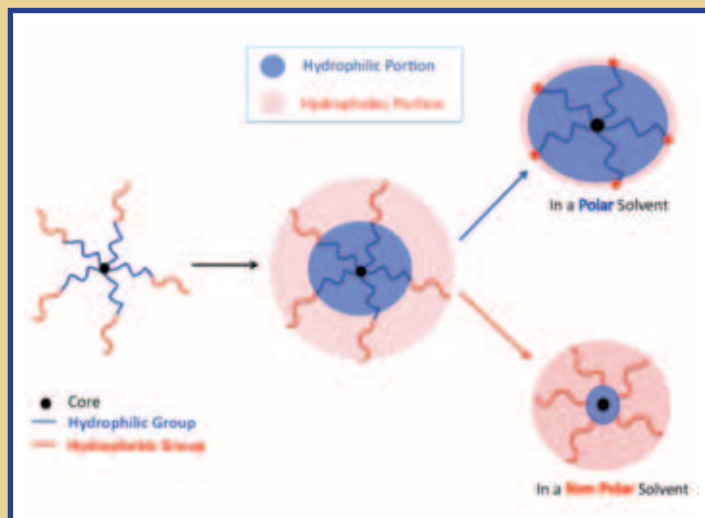




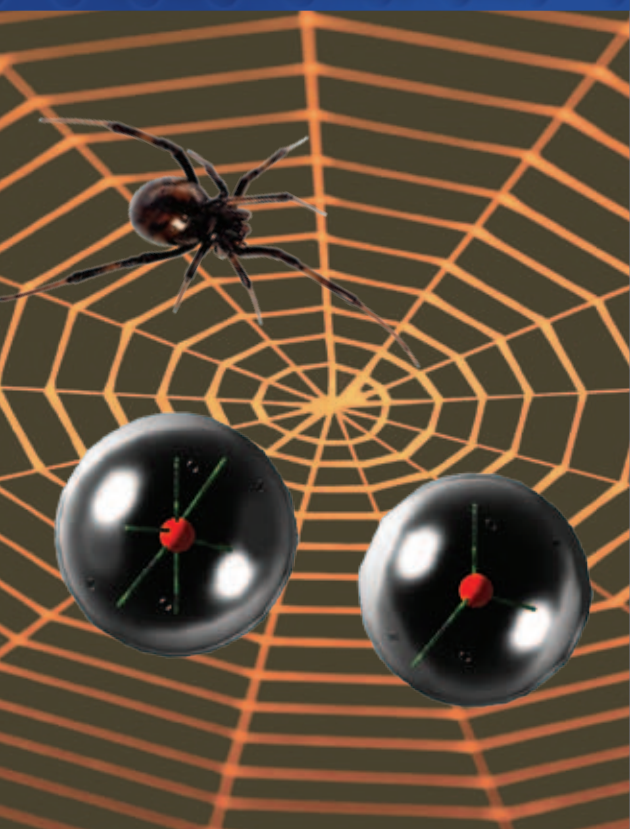
# SPIDER ESTERS®

Spider Esters® are a class of patented<sup>1-7</sup> materials that were specifically designed to have a hydrophilic core surrounded by a hydrophobic periphery. This produces an amphiphilic polymer. Amphiphilic polymers contain two distinct regions that have different polarities covalently bonded together. This amphiphilic nature makes spider esters very attractive because of their unique solubilities. Amphiphilic polymers are covalently bonded together and do not have the same inherent stability issues that are evident in emulsions. Oil in water emulsions have pockets of hydrophobic oil contained in the core of micelles surrounded by an aqueous environment. When hydrophobic organic sunscreens are added into the emulsion, they migrate into the hydrophobic micelle cores and remain suspended in a unified matrix. When the Spider Ester is introduced into a polar solvent, the hydrophobic periphery will collapse upon itself to minimize its contact with the solvent environment.



The dual polarities of Spider Esters® make them soluble and effective when added into polar oil based sun care formulations as well as non-polar oil based sunscreen formulations. The major benefit of these Spider Esters is that they are capable of “encapsulating” sunscreen filters in the core and “shielding” them from the surrounding environment. This allows the filters to be placed into a wide variety of solvents, also this “shielding” of the filters can drastically improve their performance. The hydrophilic core will respond to the polar solvent in the opposite manner, the solvent will cause the core to swell and maximize its contact with the polar solvent. This phenomenon is the basis for the “loading” or encapsulation of small molecules into the core of the Spider Ester. We have coined this phenomenon the “Spider Effect”.

## SPIDER STRUCTURE



## SPIDER ESTER SOLUBILITY

Spider Esters have solubility in a wide variety of solvents.

Solvent (10 wt %)	Spider Ester® ESO	Spider Ester® GEC
Water	Milky	Milky
Propylene Glycol	Translucent	Translucent
Isopropanol	Soluble	Soluble
Sorbitol	Translucent	Soluble
Cyclomethicone	Translucent	Translucent
Sunflower Oil	Soluble	Soluble
Isododecane	Soluble	Soluble

Spider Esters solubilize a variety of actives including:

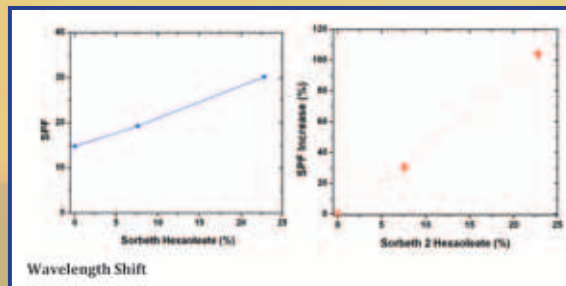
- Sunscreen actives
- Enzymes
- Benzoyl Peroxide (BPO)
- DHA
- Drugs
- Antioxidants
- Salicylic Acid
- Vitamins
- Peptides

# SPF BOOST WITH SPIDER ESTERS

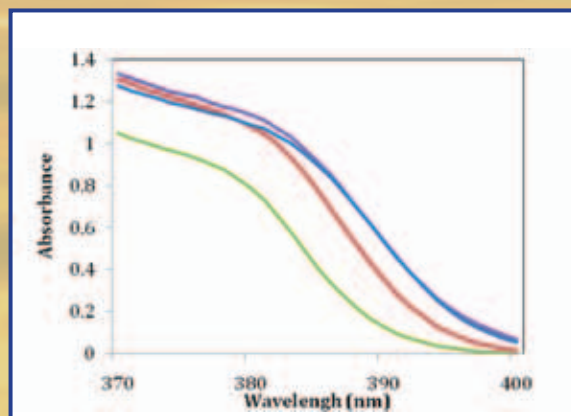
Spider Esters have been the subject of multiple studies in sunscreen formulations and articles. The use of Spider Esters in improving the SPF of sunscreen formulations is focused on making the sunscreen formulations more efficient. Until recently, there have been three major types of sunscreen formulations: water in oil emulsions, oil in water emulsions, and alcohol-based formulations. Spider Esters used with these major types of sunscreens can drastically improve the SPF.

Formula	% ESO	% Oil*	SPF	Formula Type
1	0.0	-	19	OW Emulsion
2	5.0	-	32	OW Emulsion
3	0.0	100	14.8	Oil
4	7.6	92.4	19.3	Oil
5	22.8	77.2	30.2	Oil

\*Oil is  $C_8C_{10}$  Triglyceride



Material	Formula (% wt / wt)			
	6	7	8	9
Mineral Oil	89	-	-	-
Spider Ester ESO	-	89	-	-
Spider Ester AB-1	-	-	89	-
Spider Ester ABN	-	-	-	89
Octocrylene	3	3	3	3
Octisalate	5	5	5	5
Avobenzone	3	3	3	3



Formula	Critical Wavelength ( $\lambda$ )	UV-A / UV-B	Increase in $\lambda_{370-400}$ (%)
6	373.4	0.86	-
7	377.3	1.00	47.12
8	379.5	1.09	60.82
9	377.2	1.06	66.93

“The ability to formulate polar actives into oil phases for release to the hair and skin offers the formulator significant opportunities to make new products.”



# FORMULATIONS

## SPIDER ESTER ESO

### LIP BALM WITH SPF & VITAMINS

Material	wt %
Petrolatum	63.65
Spider Ester ESO	10.00
Ascorbic Acid Vitamin C	0.10
Octyl Methoxycinnamate	7.50
Octocrylene	7.00
Oxybenzone	6.00
Octyl Salicylate	5.00
Tocopherol Vitamin E	0.25
Grapefruit Fragrance	0.50

#### Procedure:

1. Disperse the Vitamin C in the Spider Ester.
2. Melt Petrolatum and add sunscreens and Spider Ester/Vitamin C mixture.
3. When product is clear add Vitamin E and Fragrance.
4. Cool and Fill.

© 2005 SurfaTech Corporation

## SPIDER ESTER ESO

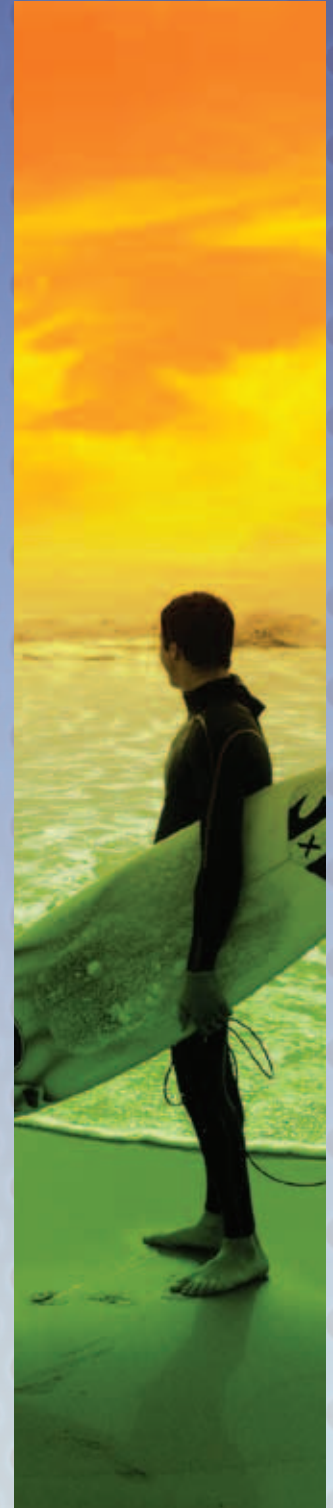
### SUNSCREEN CREAM

Component	With ESO (wt %)	Without ESO (wt %)
Water	49.5	49.5
Polysurf 67 CF	0.5	0.5
Propylene Glycol	2.0	2.0
Tetrasodium EDTA Versene 100	0.4	0.4
Octocrylene	7.5	7.5
Oxybenzone	3.0	3.0
Avobenzone	2.0	2.0
Silube J-208-612	4.0	4.0
Spider Ester ESO	10.0	0.0
Isopropyl Palmitate	10.0	15.0
Octyldodecyl Neopentanoate	10.0	15.0
Propylparaben	0.2	0.2
Methylparaben	0.4	0.4
Fragrance Fruity Fresh 146887	0.5	0.5
<b>Viscosity</b>	<b>30,000</b>	<b>31,500</b>

#### Procedure:

1. Heat water to 75-80°C and dissolve the Polysurf.
2. Mix until completely dissolved.
3. Cool to 50°C
4. Add Propylene Glycol and Versene to water.
5. Mix sunscreens, Silsurf, Spider Ester and Parabens and heat to 55°C until all solids completely dissolve.
6. Add sunscreen mixture to water phase with high speed mixer.
7. Mix until uniform.
8. Cool to 35°C add Fragrance.
9. Fill.

“Once entrapped in the spider molecule the material contained therein is released based upon partition coefficient. The active establishes an equilibrium with the oils on the skin.”





A dramatic difference is observed when the above formulations are sprayed upon wet skin.



The inclusion of Spider Ester ESO in the formulation allows for deposition of a uniform film of sunscreen, while if it is absent in the formulation, a white emulsion like film forms.

SurfaTech Corporation  
 1625 Lakes Parkway  
 Suite N  
 Lawrenceville, GA 30043  
 (770) 876-6983  
 (770) 876-6984 Fax  
 www.surfatech.com

## SPIDER ESTER ESO TREATMENT BUTTER WITH BETA HYDROXY ACID & VITAMIN E

Material	wt %
Shea Butter	69.0
Spider Ester ESO	20.0
Beeswax	5.0
Salicylic Acid	1.0
Tocopherol Vitamin E	1.0
Silica Cab-O-Sil M-5	4.0

Procedure:

1. Heat Shea Butter, Spider Ester and Beeswax to 55°C until Beeswax is completely melted.
2. Add Salicylic Acid, Tocopherol Vitamin E and Silica Cab-0-Sil M-5 and cool.
3. Fill.

### REFERENCES:

1. U.S. 7, 858,075 entitled Spider esters in personal care applications issued to O'Lenick et al assigned to SurfaTech Corporation.
2. U.S. 7, 723,456 entitled Spider esters in personal care applications issued to O'Lenick et al assigned to SurfaTech Corporation
3. U.S. 7, 723,456 entitled Crosslinked silicone polymers based upon Spider esters issued to O'Lenick et al assigned to SurfaTech Corporation
4. U.S. 7, 569,607 entitled Spider esters in personal care applications issued to O'Lenick et al assigned to SurfaTech Corporation
5. U.S. 7, 473,707 entitled Spider esters in personal care applications issued to O'Lenick et al assigned to SurfaTech Corporation
6. U.S. 7, 462,729 entitled Spider esters in personal care applications issued to O'Lenick et al assigned to SurfaTech Corporation
7. U.S. Patent Application 20090253812 entitled Spider Esters as delivery systems issued to O'Lenick et al assigned to SurfaTech Corporation

Visit our website [www.surfatech.com](http://www.surfatech.com) or [www.sunquencher.com](http://www.sunquencher.com)

### DISCLAIMER

We believe that the information in this technical data sheet is an accurate description of the typical uses of the product. However, we disclaim any liability for incidental or consequential damages, which may result from the use of the product that are beyond its control. Therefore, it is the user's responsibility to thoroughly test the product in their particular application to determine its performance, efficacy and safety. Nothing contained herein is to be considered as permission or a recommendation to infringe any patent or any other intellectual property right.