



**A BETTER WAY TO FORMULATE**

# VERSASTIQUE™ SUNCARE

## MINERAL SUNSCREEN STUDY

The Versastique product line is a range of multi-functional materials that provides a better way to formulate through simplified creation of functional and aesthetic solid stick applications. With translucent and clear stick properties, Versastique is ideal for natural, mineral and synthetic ingredients in suncare products.

Versastique offers formulators excellent performance and stability benefits:

- Formulation Friendly – efficient delivery system, easy to use (simply melt and mix).
- Cost Effective – reduces amount of structural material required to make a stick application.
- Versatility – compatible with a wide variety of low polarity ingredients.
- Performance – excellent suspension properties and superior moisture delivery.
- Stability – stabilizes and protects active ingredients in a self-preserving formulation base.
- No harsh chemicals – milder to the skin and low toxicity.

**For more than 100 years, Penreco® has specialized in niche product blending to meet customer specific requirements.** If you are interested in finding out more about the many attributes of our gelled and solid stick technology, we can provide supporting clinical and in-vitro studies. Please contact your Penreco sales representative and our technical experts will be happy to find a solution that's right for you.

**Let us show you a better way to formulate.**

**penreco®**

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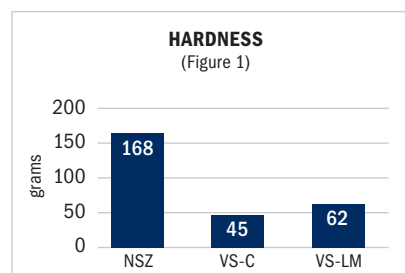
### WHY FORMULATE WITH VERSASTIQUE

Studies on the Versastique product line demonstrate that formulations utilizing the Penreco® Versastique Clear 5T (VS-C) and Low Melt products (VS-LM) provide an effective solution for creating high performing mineral sunscreen sticks. To illustrate the benefits of formulating with Versastique, mineral sunscreen prototypes were developed and tested against a market-leading commercial benchmark (NSZ).

The studies performed utilize a texture analyzer and third party In-vitro SPF water-resistance testing. The studies demonstrated the Versastique products offer comparable or improved hardness, friction, transfer rate and efficacy.

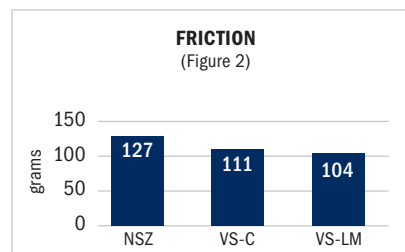
### HARDNESS

Versastique prototypes have lower hardness (grams) than the wax-structured benchmark while maintaining sufficient structure and integrity. Softer stick products are gentler to apply onto the skin. (Figure 1)



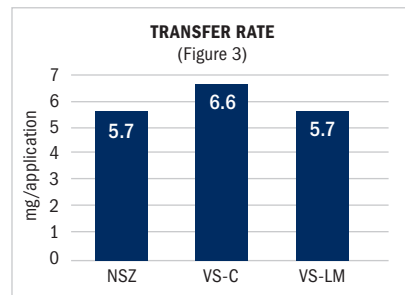
### FRICTION

Versastique prototypes have lower friction (grams) than the commercial benchmark. Thus, we can conclude that the Versastique prototypes take less force to spread product over the surface. (Figure 2)



### TRANSFER RATE

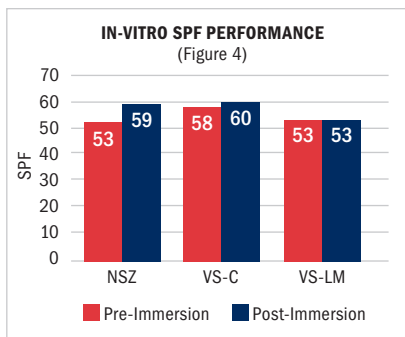
Versastique sunscreen prototypes have comparable or improved transfer rates (mg/application) compared to NSZ. Thus, we can conclude the amount of product being applied is equivalent or improved compared to the benchmark. This means Versastique sunscreens are gentler and easier to apply without applying excess product to the skin. (Figure 3)



### EFFICACY

#### In-Vitro SPF Performance (static vs. post-immersion)

Versastique sunscreen prototypes have comparable SPF performance to the benchmark. The water-resistant properties of Versastique enable equivalent or higher **SPF post-immersion** vs. the **static or pre-immersion** values. The mildness, high efficiency, and water resistance properties of Versastique makes it an attractive base for high-performance mineral sunscreens. Due to the performance/formulation dynamics of mineral UV filters, it is important to optimize mineral sunscreen formulation. The incorporation or removal of one ingredient can significantly change overall product performance. (Figure 4)



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In-vitro sunscreen evaluation sample numbers: 20-088 to 20-093.

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## MINERAL SUNSCREEN STUDY

Versastique offers a simplified solution and formula optimization requiring less ingredients to create high-performance, water-resistant stick products. The prototypes achieved comparable performance to a market-leading benchmark with a more efficient formulation (10 ingredients vs. 15) while also providing superior texture. Additionally, the co-polymer system in Versastique provides a higher melt point than traditional wax bases so the sunstick doesn't melt when exposed to the sun or higher temperatures.\* Formulation strategy included optimized ingredients such as SPF booster, dispersants, waterproofing agents, structurants and a skin feel enhancer.

The VersaSun stick formulation combines Versastique and mineral sunscreen agents for an even and protective application that goes on smoothly.



## FORMULATION

### VersaSun LM (VS-LM)

PHASE	TRADE/COMMON NAME	WT%	FUNCTION
A	<b>Versastique Low Melt ME 5T</b>	52.9%	Base
A	Sunflower Wax Granules	10.0%	Structurant
B	Dispersun OL-100	2.5%	Dispersant
C	Z-Cote HP1*	21.6%	Sunscreen agent
D	Hallbrite® BHB	5.0%	SPF Booster + Dispersant
D	SunSpheres™ Powder	2.0%	SPF Booster
D	Cosmedia® DC	2.0%	Water-proofing agent
D	Vitamin E	1.0%	Antioxidant
D	LexFeel™ Natural	2.0%	Skin-feel modifier
D	Valvance® Touch	1.0%	Skin-feel modifier

### VersaSun C (VS-C)

PHASE	TRADE/COMMON NAME	WT%	FUNCTION
A	<b>Versastique Clear ME 5T</b>	50.4%	Base
A	Sunflower Wax pellets	10.0%	Structurant
B	Myritol® 331	5.0%	Dispersant
C	Z-Cote HP1*	21.6%	Sunscreen agent
D	Hallbrite® BHB	5.0%	SPF Booster + Dispersant
D	SunSpheres™ Powder	2.0%	SPF Booster
D	Cosmedia® DC	2.0%	Water-proofing agent
D	Vitamin E	1.0%	Antioxidant
D	LexFeel™ Natural	2.0%	Skin-feel modifier
D	Valvance® Touch	1.0%	Skin-feel modifier

## MIXING INSTRUCTIONS

- Melt Phase A components at approximately 220°F
- Add Phase B to Melted Phase A and mix at 220°F for 15 minutes.
- Add Phase C to the blend and mix at 220°F for 30 minutes.
- Add Phase D components to blend and mix at 220°F for 2 hours.
- Pour blend into sample containers and allow to cool.

\*Products in **bold** are supplied by Calumet Specialty Products Partners, L.P.

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\*VersaSun LM melt point = 190.6 °F  
VersaSun C melt point = 203.8 °F  
NSZ melt point = 167.0 °F

The Benchmark product ingredients include:

*Active ingredients:* Zinc Oxide (21.6%)

*Inactive ingredients:* Octyldodecyl, Neopentanoate, C12-15 Alkyl Benzoate, Polyethylene, Paraffin, Silica, Neopentyl Glycol Diethylhexanoate, Ozokerite, Isopropyl Myristate, Adipic Acid/Diglycol Crosspolymer, Triethoxycaprylsilane, Neopentyl Glycol Diisostearate, Caprylyl Glycol, Tocopheryl Acetate

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