S-Block™

Clinical-Grade Zinc Oxide Dispersion
Premium Sensory, Stability, Sun Protection

applechem
Create Possibilities

Sb S-Block™

Zinc Oxide Dispersions for Clinical Sun Care

Combining Clean Ingredients with Clinical SPF Protection

S-Block DZ 100 PDCC is a new zinc oxide dispersion designed to meet growing consumer demand for multi-functional sun care products that combine clinically-validated claims with cleaner ingredients. The intersection between clean beauty and clinical treatment has created new product design problems that traditional silicone-based dispersions weren't intended to solve. S-Block addresses these issues by giving formulators the ability to add consistent broad spectrum mineral SPF protection while moving freely between high performance silicone-based, hydrocarbon-based and clean beauty compliant emulsion and anhydrous systems. This makes S-Block a great fit for a wider range of sun care applications that need medical grade performance with brand-specific ingredient requirements. It features:

"Sensory"- Block Boost

Creates a unique, powdery smooth feeling during rub-in. Excellent sensorial enhancer, reducing dry-down, helps detackify formulations without requiring additional silicone powder.

Formulation Flexibility with Clean Ingredients

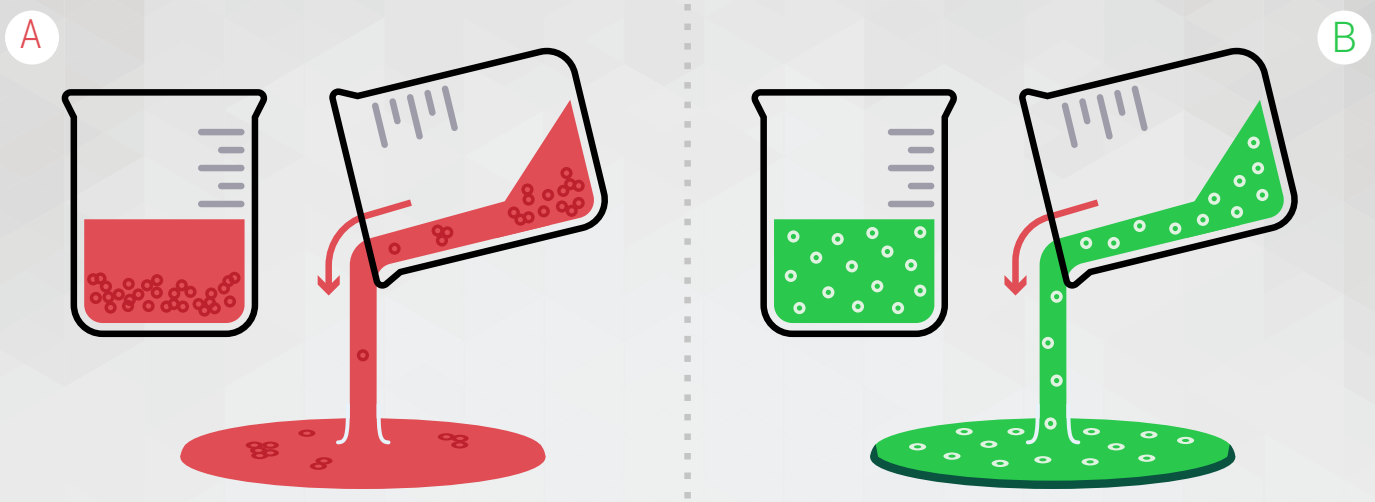
Compatible with all emulsion and anhydrous systems. Suitable for Clean at Sephora, Conscious Beauty at Ulta, and Credo Clean.

Clinical Grade Broad Spectrum Protection

Meets the FDA broad spectrum labeling requirements as well as EU COLIPA (UVAPF/SPF = 0.46) and Japanese PF standards (PA ++++).

Excellent Active Loading + Stress-Free Stability

High zinc oxide active concentration (78%) while still retaining an easy-to-disperse viscosity profile. No separation or settlement, resulting in consistent SPF and critical wavelength from batch to batch.



The Applechem Difference

A good dispersion is more than a simple mixture. Our expertise in polymer science and chemical engineering allow us to customize the architecture of natural polymeric dispersants and in-situ coating systems. This creates more control over the density and distribution of zinc oxide aggregates as well as the dispersion stability profile.

In other words, we can develop more concentrated, stable products that resolve traditional formulation issues linked to poor dispersions.

(A) Conventional Zinc Oxide Dispersion

The typical zinc oxide dispersion features low active content and poor stability, leading to formulators constantly battling settlement issues along with inconsistent SPF results. Lack of uniformity in aggregate size combined with uneven agglomerations leads to negative sensory, poor transparency, and difficulty remixing back into a homogenous state.

(B) S-Block DZ 100 PDCC

S-Block dispersions are engineered to be extremely stable compounds, with no separation or synerisis developing over time. Zinc oxide aggregates are more uniform and evenly distributed, improving sensory, transparency, and SPF consistency.

More Actives, More Stability, More Benefits

Multi-Functional Premium Suncare

- **Unique powdery smooth sensory**
- Excellent transparency
- High ZnO content with low, pourable viscosity creates better control over texture and sensory
- Highest UVA protection (PA ++++) for clinical grade broad spectrum claims
- Inherent water resistance - reduces film former usage which improves product sensory
- Strong skin conditioning benefits for healthier skin

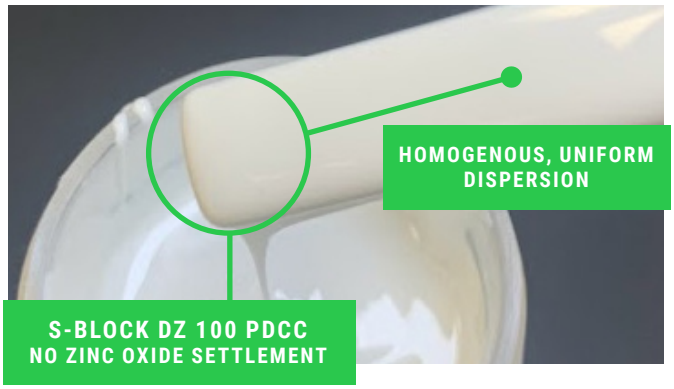
Unmatched Versatility

- **Compatible with silicone, hydrocarbon, or natural systems (anhydrous + all emulsion-types)**
- Unique sensory profile and formulation versatility reduces dependency on silicone or siloxane-based dispersions
- Easily formulate for clean, clean clinical, or premium performance clinical products

Faster Speed to Market

- **Better stability means easier and faster scale-up from lab to pilot to manufacturing**
- No remixing required - consistent active concentration means reproducible SPF and broad spectrum performance from batch to batch
- Improved shelf stability - reduces pH drift and in-package rising viscosity issues associated with zinc oxide

S-Block verses Conventional Coated Dispersions



Particle Settlement Test

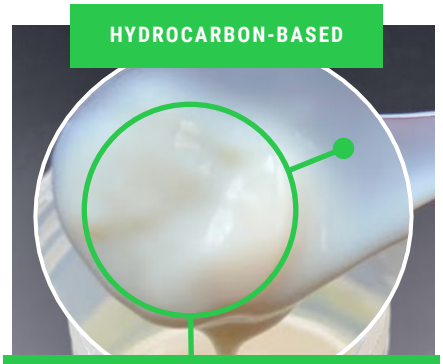
The goal of this test was to determine the overall suspension power and stability profile of S-Block verses a panel of traditional silane-coated dispersions. Samples were subjected to a long-term stability test for 30 days at 50 Celsius. A spatula was then inserted to scrape the bottom for potential settlement residue. **S-Block was the only dispersion that did not exhibit zinc oxide particulate settlement issues.** The other dispersions were only stable for one week, and exhibited settlement behavior even at room temperature storage.

SILICONE-BASED

AGGLOMERATED ZnO RESIDUE

ZINC OXIDE (AND) CYCLOPENTASILOXANE (AND) POLYGLYCERYL-3 POLYDIMETHYLSILOXYETHYL DIMETHICONE (AND) TRIETHOXYSILYLETHYL POLYDIMETHYLSILOXYTHEYL HEXYL DIMETHICONE

HYDROCARBON-BASED



HEAVY AGGLOMERATED ZnO RESIDUE

ZINC OXIDE (AND) COCONUT ALKANES (AND) TRIETHOXYCAPRYLYLSILANE (AND) POLYHYDROXYSTEARIC ACID (AND) COCO-CAPRYLATE/CAPRATE

NATURAL-BASED

SETTLEMENT, OIL SYNERISIS

ZINC OXIDE (AND) SQUALANE (AND) LECITHIN (AND) SILICA

Oil Phase Compatibility Test

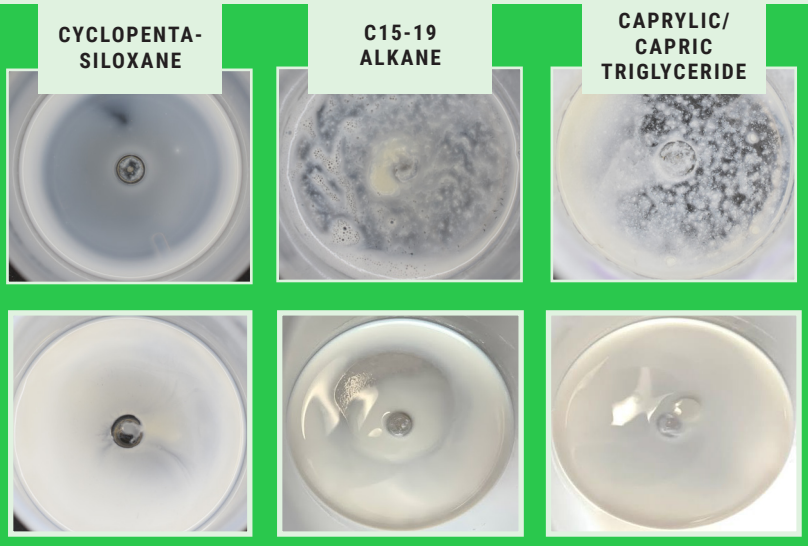
This test was conducted to determine the general compatibility of S-Block with the three main oil classes (silicone/hydrocarbon/natural esters) in comparison to the above conventional silicone-based coated zinc oxide dispersion. Samples of the dispersions were mixed with the carrier oil and then poured out to examine residue for synerisis.

Popular Conventional Silicone Dispersion

No synerisis when dispersed into volatile silicone, but displays clear evidence of incompatibility in hydrocarbon and natural esters.

S-Block DZ 100 PDCC

No evidence of synerisis when mixed in either silicone, hydrocarbon, or natural ester.



Product INCI

TRADE NAME	INCI
S-Block DZ 100 PDCC Solid - 80%/ Active - 78%	Zinc Oxide (and) Propanediol Dicaprylate/Caprate (and) Polyhydroxystearic Acid (and) Polyglyceryl-3 Polyricinoleate (and) Triethoxycaprylylsilane (and) Lecithin

Product Applications

PRIMARY APPLICATION	SECONDARY APPLICATION	RETAIL INGREDIENT COMPLIANCY
• Clinical Skincare with SPF, Sunscreens • Clean Clinical Skincare with SPF, Sunscreens • Luxury Skincare with SPF, Sunscreens	• Color Cosmetics with SPF • Clean Beauty Sun Care	• Clean at Sephora • Conscious Beauty at Ulta • Credo Clean • Target Clean • Grove Beauty

Formulation Usage Guidelines

SPF PER 1% ACTIVE	BROAD SPECTRUM PARAMETERS	NANOPARTICLE STATUS
• 1.5 - 1.7	• FDA Protocol - Critical Wavelength - 371 - 373 nm • ISO 24442:2011 - In-Vivo UVAPF - 16.9 • JCIA - PA ++++ • ISO 24443:2012 - In-Vitro UVAPF - 15.67 • ISO 24443:2012 - In Vitro UVA/SPF - 0.461	• Not a nanoparticle according to EU Cosmetic Regulation EC 1223/2009 Nanoparticle definition

Processing Instructions

Mix with oil at the beginning of the oil phase. Depending on the oil type:

- Hydrocarbon/Ester Oil Phase only - mix using dispersion blade, homogenizer is not necessary
- Silicone-containing Oil Phase - blending with a homogenizer is highly recommended
- Blended Silicone/Hydrocarbon/Ester Oil Phase - Mix S-Block with hydrocarbons and ester oils first, then add silicone and homogenize
- Can be used in cold processing

Clean Sourcing, Clinical Power

Applechem is happy to provide all origin information to help satisfy your clean ingredient standard requirements. S-Block DZ 100 PDCC has an ISO Natural Index of 0.984, and will not contain ethoxylated ingredients, preservatives, pthalates, GMO's, sulfates, or synthetic fragrances. S-Block has not been tested on animals, does not contain any ingredients sourced from major allergen groups, and is dermatologist-approved for sensitive skin.

Applechem Formulary - Clinical Grade Sunscreens

Slip Shield Liquid Powder Sunscreen SPF 50 (SU-WSI 001)

This innovative water-in-silicone sunscreen features an amazing transforming texture, starting with a rich, creamy sensory that melts into the skin with a smooth, powdery finish. Additionally, it pairs maximum UVA/UVB mineral SPF protection (PF++++) with robust formulation stability, creating a premium sunscreen platform for clinical and luxury sun care product lines.

Claims: Broad Spectrum, Vegan, Cruelty-Free, Non-Comodegenic, Oil-Free

G-GEL Silkane is an organoclay gel designed for clean beauty applications. It greatly boosts suspension and sensory of mineral pigments, making it a crucial ingredient in stabilizing mineral sunscreens. It also shows an excellent thermal stability and suspension power.

Specifications

- SPF 52.8 (in-vivo, FDA protocol, one subject)
- *Viscosity @ 1 rpm: 72,000 cP*
- *Viscosity @ 10 rpm: 11,240 cP*
- *50°C oven: 1 month stable*
- *Freeze-Thaw: Passed 3 Cycles*

PHASE	INCI NAME (TRADE NAME)	USAGE (WT%)
A_1	S-Block DZ 100 PDCC	31.50
	Caprylyl Methicone	5.00
	G-Gel Silkane	3.0
A_2	Dimethicone (2 cSt)	5.00
	Dimethicone (5 cSt)	6.00
	Dimethicone (and) Polysilicone-11 (Gransil DMG-3)	5.00
B	Cetyl PEG/PPG-10/1 Dimethicone (Shin-Etsu KF 6048)	1.00
	PEG-10 Dimethicone (Shin-Etsu KF 6017)	2.00
C	Water	37.00
	Propanediol	3.00
	Sodium Chloride	1.00
	Preservative	0.50

Processing Method

1. Stir Phase A_1 with dispersion mixer (600-750 rpm) at room temperature until G-Gel Silkane is fully dispersed. Add Phase A_2 and continue dispersing for 5-10 minutes.
2. Add Phase B into Phase A and homogenize 4000-4500 rpm for 10 minutes at room temperature.
3. Slowly add premixed Phase C (once sodium chloride is completely dissolved) into Phase A-B while homogenizing. Continue mixing for 10 minutes at room temperature.

Applechem Formulary - Clean Clinical Sunscreens

SkinSafeMD Smoothing Sunscreen SPF 35 with Triple Action Hydration (SU OW 019)

This non-comedogenic, clinical grade sunscreen pairs pure mineral SPF protection with a silicone-like powdery smooth sensory. Its unique Triple Action Hydration locks in moisture by turning sugar-based humectants into a powerful water retaining complex. This sunscreen is completely stable, providing a formulation platform that can easily incorporate multiple hero actives without destabilizing.

Claims: Broad Spectrum, Vegan, Cruelty-Free, Paraben-Free, Oil-Free, Non-Comedegenic, Siloxane-Free

Sensogel NOVUS is a very powerful polyol thickener which is used to great effect in this formula. Not only does it help achieve stability, but also boosts the viscosity of polyols like glycerin from a soft liquid into a structured gel, and tamps down on the traditional stickiness associated with these types of ingredients.

Specifications

- SPF 37.05 (in-vivo, FDA protocol, two subjects)
- *Viscosity @ 1 rpm: 30,500 cP*
- *Viscosity @ 10 rpm: 8,300 cP*
- *50°C oven: 1 month stable*
- *Freeze-Thaw: Passed 3 Cycles*

PHASE	INCI NAME (TRADE NAME)	USAGE (WT%)
A	S-Block DZ 100 PDCC	27.0
	Isohexadecane	10.0
	Sensogel NOVUS	3.00
	Glyceryl Behenate (Compritol 888 CG ATO)	0.50
	Polyglyceryl-10 Mono/Dioleate (Caprol PGE 860)	3.00
B	Water	49.0
	Glycerin	1.00
	Erythritol (Erylite)	3.00
	Sorbitol	3.00
	Preservative	0.50

Processing Method

1. Stir Phase A with dispersion mixer (500-800 rpm) at 80°C for 10 minutes. Homogenize for 5-10 minutes (4000 rpm) while maintaining temperature at 80°C.
2. Mix Phase B with propeller mixer until homogenenous and heat to 80°C.
3. Slowly add Phase B to Phase A while dispersing at high shear (1500-2000 rpm). Stir for 5 minutes, then homogenize for another 5 minutes (4000 rpm, 80°C).

Sb Create Possibilities

Ap Gb Gg Pc Sbx Sg Ac Of

applechem

Applechem was founded in 2003 by Dr. Samuel Lin in a tiny laboratory within a tech incubation center in northern New Jersey. Yet even after transitioning from a one-man startup to a stable, global supplier, we've never forgotten our roots as a small, spirited business with big ideas.

We recognize that every personal connection should be valued and validated with responsive customer service coupled with strong technical aptitude. Moreover, we promise to continue expanding the range of possibilities in the formulation space, creating functionality where none existed before and putting an improved spin on traditional ingredient technologies.

Get in touch with us.

ADDRESS	2 Cranberry Road, Unit A4 Parsippany, New Jersey 07054
OFFICE	862.210.8344
FAX	862.210.8336
EMAIL	sales@applechem.com
ONLINE	applechem.com