

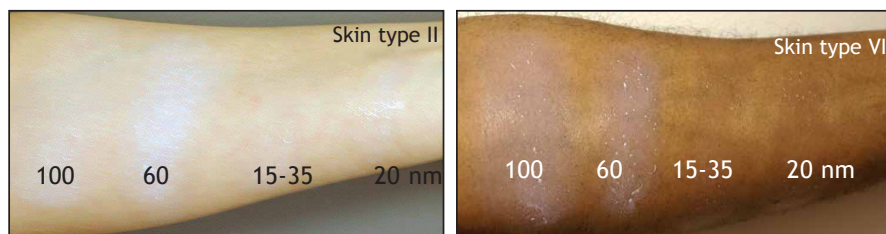
Attenuation Grade ZnO Dispersions



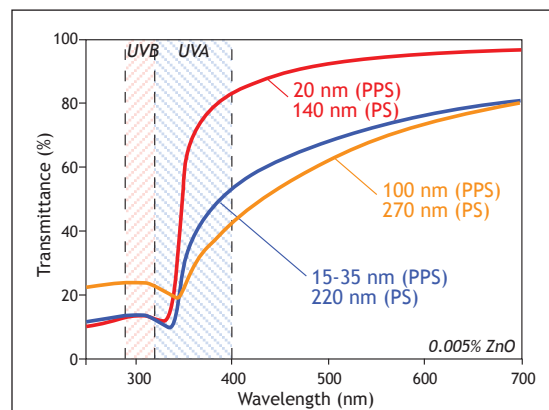
Zinc Oxide is used in cosmetics primarily as a skin protectant and for UV attenuation.

It is ideal for formulating mild or hypoallergenic sun care products for UVA/UVB protection for babies and people with sensitive skin. Zinc Oxide is available in a wide range of primary particle sizes and varying optical properties. Notwithstanding, zinc oxide is not supplied as individual grains, but as aggregates of primary particles. The degree of aggregation is a function of the primary particle size and manufacturing process, similar to the case with TiO₂. These large aggregates may reduce the protection of the formula against UV light, and likewise scatter visible light, increasing whitening when sun care products are applied on skin. Kobo specializes in the custom formulation and dispersion of zinc oxide. We offer a wide selection of ZnO dispersions that

include various particle sizes, surface treatments, and a wide range of carriers, including volatile solvent bases. Kobo can also provide formulation assistance based on our extensive experience formulating and testing sunscreen products containing inorganic UV filters.



The primary particle size available on the market ranges from 20 to 120 nm. Dispersions with various particle sizes can be made. These pictures compare the transparency of ZnO dispersions of various PPS when applied on two different skin types.



This figure shows transmittance curves. The curves indicate the relationship between particle size, transparency and UVA/B attenuation. As the particle size becomes very small, ZnO can be effective in UVB attenuation (up to 2 SPF / ZnO%) but it can lose some UVA protection. Like TiO₂, the particle size should be optimized when balanced protection of UVA and UVB light is required.



KSL-179C-CH

Elegant W/O Sunscreen featuring TNP50T7 & TNP65FZS



Part 1

• Deionized Water	28.40%
• Sodium Chloride - Morton Salt: Sodium Chloride	0.50%
• Aculyn™ 44 - Rohm & Haas: PEG-150/Decyl Alcohol/SMDI Copolymer	0.50%
• Allantoin - DSM Nutritional Products: Allantoin	0.20%

Part 2

• Butylene Glycol - Ruger Chemical Co., Inc.: Butylene Glycol	2.00%
• KELTROL® CG - CP Kelco: Xanthan Gum	0.10%

Part 3

• TNP50T7 - Kobo Products: C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Alumina (And) Polyhydroxystearic Acid (And) Methicone	32.00%
• TNP65FZS - Kobo Products: Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Triethoxycaprylylsilane (And) Polyhydroxystearic Acid	30.00%
• ABIL® EM 90 - Evonik: Cetyl PEG/PPG-10/1 Dimethicone	3.00%
• SF1214 - Momentive: Cyclopentasiloxane (And) Dimethicone	2.00%
• Tocopherol - BASF: Tocopherol	0.30%

• Methyl Paraben NF - International Sourcing: Methylparaben	0.15%
• Propyl Paraben NF - International Sourcing: Propylparaben	0.10%

Part 4

• MSS-500W - Kobo Products: Silica	0.75%
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Manufacturing Procedure

1. Combine Part 1 and heat to 70°C.
2. Add Part 2 to Part 1.
3. Combine Part 3 and heat to 70°C.
4. Combine Parts 1 and 2 to Part 3 while propeller mixing.
5. Add Part 4 while cooling.

Description

Elegant W/O sunscreen that uses Kobo's Titanium Dispersion, TNP50T7, and Kobo's Zinc Oxide Dispersion, TNP65FZS. MSS-500W Spherical Silica gives slip during application and reduces shine on the skin.

Active Ingredient(s):

Titanium Dioxide	12.32%
Zinc Oxide	18.72%

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Carrier / Solvent	Product Name	INCI Name	Primary Part. Size (nm)	Particle Size** (nm)	Active %	Viscosity
Silicones	CMF650ZSI*	Zinc Oxide (And) Cyclopentasiloxane (And) Polyglyceryl-3 Polydimethylsiloxyethyl Dimethicone (And) Triethoxycaprylylsilane	20	157	48	Pourable
	CM3K65FZS*	Zinc Oxide (And) Cyclopentasiloxane (And) PEG-10 Dimethicone (And) Triethoxycaprylylsilane	60	228	60	Paste
Mixed Solvents	KES50ZSM	Zinc Oxide (And) Ethyl Trisiloxane (And) Cyclopentasiloxane (And) Methicone (And) Lauryl PEG-9 Polydimethylsiloxyethyl Dimethicone	25	190	48	Pourable
Esters/Oils	TNP70MZ	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate	15 - 35	200	68	Pourable
	INH73MZ	Zinc Oxide (And) Isononyl Isononanoate (And) Polyglyceryl-6 Polyricinoleate (And) Isopropyl Titanium Triisostearate	15 - 35	200	71	Paste
	TNP65MZS*	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	15 - 35	221	63	Pourable
	HBTNP60ZSI*	Zinc Oxide (And) Triethoxycaprylylsilane (And) Butyloctyl Salicylate (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid	20	128	58	Pourable
	TNP70ZSI*	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20	130	68	Pourable
	OPP60ZSI*	Zinc Oxide (And) Ethylhexyl Palmitate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20	173	58	Pourable
	TNSS60MZSI*	Zinc Oxide (And) Ethylhexyl Methoxycrylene (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	35	171	58	Paste
	TNHLP70FZS*	Zinc Oxide (And) Hydrogenated Polyisobutene (And) C12-15 Alkyl Benzoate (And) Triethoxycaprylylsilane (And) Polyhydroxystearic Acid	60	207	67	Pourable
	HBQP75FZS*	Zinc Oxide (And) Butyloctyl Salicylate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	60	212	72	Pourable
	TNP65FZS*	Zinc Oxide (And) C12-15 Alkyl Benzoate Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	60	238	62	Paste
Natural Esters/Oils	COP50MZ	Zinc Oxide (And) Ricinus Communis (Castor) Seed Oil (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate	15 - 35	210	49	Pourable
	CO55MZJ*	Zinc Oxide (And) Ricinus Communis (Castor) Seed Oil (And) Jojoba Esters	15 - 35	292	52	Paste
	SO60MZJ*	Zinc Oxide (And) Helianthus Annuus (Sunflower) Seed Oil (And) Jojoba Esters	15 - 35	371	57	Paste
	JOSP55XZJ*	Zinc Oxide (And) Simmondsia Chinensis (Jojoba) Seed Oil (And) Polyhydroxystearic Acid (And) Jojoba Esters	20	200	52	Paste
	GCP50ZSI*	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20	130	47	Pourable
	GCP45XZJ*	Caprylic/Capric Triglyceride (And) Zinc Oxide (And) Polyhydroxystearic Acid (And) Jojoba Esters	20	155	43	Pourable
	GCP50XZ4	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Polyhydroxystearic Acid (And) Methicone	20	155	48	Pourable
	GCP55MZ8SG*	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Polyhydroxystearic Acid (And) Stearoyl Glutamic Acid	35	180	52	Pourable

This table was prepared to assist in formulating with Zinc Oxide Dispersions. The information contained herein is believed to be accurate at the time of printing and represent typical values, but should not be used as a substitute for product specification sheets.

* These ZnO products comply with the conditions for Zinc Oxide (nano) as set forth in the Annex VI to Regulation (EC) No 1223/2009.

** Size in dispersion: intensity-weighted mean size measured on Dynamic Light Scattering particles sizer

Kobo also offers Dispersions in Volatile Non-D5 Carriers. Please see separate flyer.

Our dispersions are often divided into two general categories:

- High Solids® Dispersions:** These are usually in paste form and have a high active ZnO loading and efficacy.
- High Speed™ Dispersions:** These are usually pourable and easy to incorporate into a formulation. They are highly transparent.

Formulation guidelines

Estimation of use level for SPF

- | | |
|----------------------------------|-----------------------|
| 1. PPS : 20 - 30 nm, PS < 150 nm | 1.0 - 2.0 SPF / ZnO % |
| 2. PPS : > 60 nm, PS > 200 nm | 0.5 - 1.0 SPF / ZnO % |