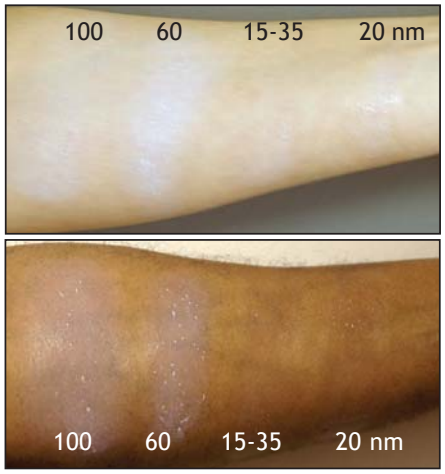
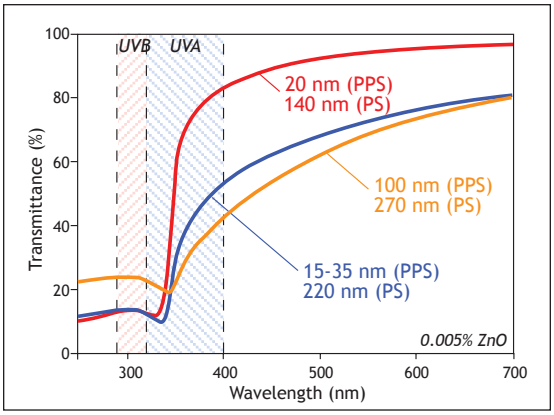
Attenuation Grade
ZnO Dispersions

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 protection for babies and people with sensitive skin. Although the primary particles can be very small, much larger aggregates are always formed. The degree of aggregation is a function of the primary particle size and manufacturing process, similar to the case with TiO_2. The large aggregates scatter visible light, causing undesired whitening when sun care products are applied on skin.

As a leader in dispersion technology, Kobo can help solve the above problems by offering pre-dispersions of ZnO. Kobo specializes in creating custom formulating and grinding dispersions of particulates.
Kobo has mastered the art of manipulating particle size for specific applications using state of the art grinding equipment and supporting analytical capability. We offer a wide selection of ZnO dispersions that include various particle sizes, surface treatments, and a wide range of solvent bases. Kobo can also provide effective formulation assistance based on our extensive experience in formulating with inorganic UV filters and in vivo testing data.



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 needs to be optimized if balanced protection in UVA and UVB is needed.

W/O High SPF Suncare Emulsion

SPF 25
PFA 4

Formula KSL-043

Part 1

- *Deionized Water* 40.00%
- Xanthan Gum - CP Kelco: *Xanthan Gum* 0.15%
- Magnesium Sulphate - Mallinckrodt: *Magnesium Sulfate* 2.00%
- Propylene Glycol - Rita Corp.: *Propylene Glycol* 3.00%

Part 2

- **TNP50ZSI** - Kobo Products: *C12-15 Alkyl Benzoate (And) Zinc Oxide (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane* 30.00%
- Ceraphyl® 375 - ISP: *Isostearyl Neopentanoate* 16.95%
- Emulsynt™ GDL - ISP: *Glyceryl Dilaurate* 1.00%
- Arlacel P135 - Croda: *PEG-30 Dipolyhydroxystearate* 3.00%

Part 3

- **CL-2080** - Kobo Products: *Polyethylene* 2.50%
- Liposatin PE-35 - Lipo Chemicals: *Polyethylene* 1.00%
- Liquid Germall® Plus - ISP: *Propylene Glycol (And) Diazolidinyl Urea (And) Iodopropynyl Butylcarbamate* 0.40%

Manufacturing Procedure

1. Mix Part 1 in the order listed until homogeneous and smooth and heat to 80°C.
2. Heat and stir Part 2 to 80°C.
3. Add Part 1 to Part 2 slowly with homogenization.
4. Cool to 40°C and add ingredients listed under Part 3, in the order listed. Mix well after each addition.

Description

This sunscreen is an elegant W/O emulsion with great SPF and transparency. Kobo's Zinc Oxide Dispersion, TNP50ZSI, spreads easily and is transparent. CL-2080 adds a creamy feel and a matte appearance on the skin.

Active Ingredients: Zinc Oxide = 14.10%

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ZnO Dispersions

Carrier / Solvent	Product Name	INCI Name	Primary Part. Size	Particle Size*	ZnO Content	Viscosity
Silicones	CM3K50XZ4	Zinc Oxide (And) Cyclopentasiloxane (And) PEG-10 Dimethicone (And) Methicone	20 nm	175 nm	48%	Pourable
Mixed Solvents	KES50ZSM	Zinc Oxide (And) Ethyl Trisiloxane (And) Cyclopentasiloxane (And) Methicone (And) Lauryl PEG-9 Polydimethylsiloxyethyl Dimethicone	25 nm	190 nm	48%	Pourable
Esters/Oils	TNP70MZ	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate	15-35 nm	200 nm	68%	Pourable
	INH73MZ	Zinc Oxide (And) Isononyl Isononanoate (And) Polyglyceryl-6 Polyricinoleate (And) Isopropyl Titanium Triisostearate	15-35 nm	200 nm	71%	Viscous
	GCP50ZSI	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20 nm	130 nm	47%	Pourable
	TNP50ZSI	C12-15 Alkyl Benzoate (And) Zinc Oxide (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20 nm	130 nm	47%	Pourable
	INP70ZSI	Zinc Oxide (And) Isononyl Isononanoate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20 nm	135 nm	68%	Pourable
	GCP45XZJ	Caprylic/Capric Triglyceride (And) Zinc Oxide (And) Polyhydroxystearic Acid (And) Jojoba Esters	20 nm	155 nm	43%	Pourable
	GCP50XZ4	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Polyhydroxystearic Acid (And) Methicone	20 nm	155 nm	48%	Pourable
	TNP65MZS	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	20 nm	221 nm	63%	Pourable
	TNP65FZS	Zinc Oxide (And) C12-15 Alkyl Benzoate Polyhydroxystearic Acid (And) Triethoxycaprylylsilane	60 nm	238 nm	62%	Viscous
Natural Esters/Oils	COP50MZ	Zinc Oxide (And) Ricinus Communis (Castor) Seed Oil (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate	15-35 nm	210 nm	49%	Pourable
	CO55MZJ	Zinc Oxide (And) Ricinus Communis (Castor) Seed Oil (And) Jojoba Esters	15-35 nm	292 nm	52%	Viscous
	SO60MZJ	Zinc Oxide (And) Helianthus Annuus (Sunflower) Seed Oil (And) Jojoba Esters	15-35 nm	371 nm	57%	Viscous
	JOSP55XZJ	Zinc Oxide (And) Simmondsia Chinensis (Jojoba) Seed Oil (And) Polyhydroxystearic Acid (And) Jojoba Esters	20 nm	200 nm	52%	Viscous
Hydrocarbons	PM9P60XZ4	Zinc Oxide (And) Isododecane (And) Polyhydroxystearic Acid (And) Methicone	20 nm	171 nm	58%	Pourable

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

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 subsitute for product specification sheets.
NA = Not available at the time of printing

Our dispersions are often divided into two general categories:

1. **High Solids® Dispersions**: These are usually in paste form and have a high active ZnO loading and efficacy.
2. **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 %

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