

Non-Nano Zinc Oxide Sunscreen Technologies

Inorganic UV filters have been manufactured during the past forty years for use in sunscreen products. They are preferred over organic UV filters because of their physical and chemical stability, as well as their non-irritating properties. In order to optimize the protection against UV light, and to minimize the scattering of visible light, zinc oxide with particle sizes less than 100nm, or “nanoparticles,” have become increasingly popular. However, there are recent safety concerns surrounding “nanoparticles,” particularly skin penetration, risk of inhalation, eco-toxicity, and bioaccumulation in the human body.

In light of perceived health risks associated with “nanoparticles,” pigment producers have been challenged to develop grades with a mean particle size over 100nm, while maintaining adequate UV-protection and cosmetic acceptability.

Kobo offers a grade of Zinc Oxide, where the primary particle size is greater than 100nm when measured by image analysis. This non-nano ZnO is available coated with either organic or inorganic surface treatments, and

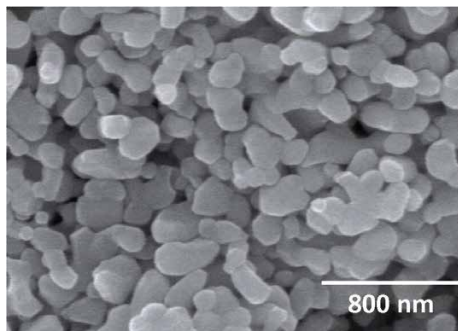
also dispersed in various vehicles for easier use in formulations. They will help formulators develop sunscreen products with broad spectrum protection without nanoparticles.

Kobo Non-Nano Patent Information:

Patent China # ZL 200980149776.7

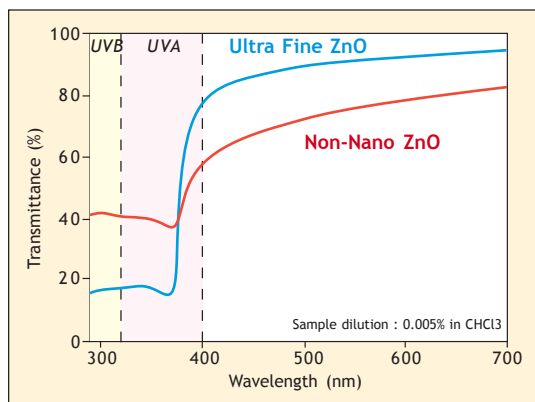
Patent Pending # WO 2010/068687

U.S. Patent Application No.: 12/331,593 for Zinc Oxide Aqueous and Non-Aqueous Dispersions including its making and use in sun care product.



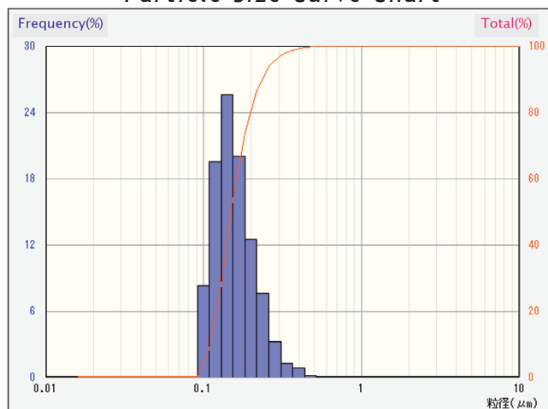
SEM image of treated ZnO-C (30 kX magnification, 15 kV accelerating voltage).

Note: These products are considered to be non-nano materials according to Cosmetics Europe's interpretation of the definition given in Regulation (EC) No. 1223/2009.



Comparison of the transmittance curves of Non-Nano ZnO, ZnO-C (red curve) and an ultra fine grade Zinc Oxide (blue curve) in dispersions.

Particle Size Curve Chart



In Vitro Test Results of Formulated Zinc Oxides

	ZnO-350 (attenuation grade)	ZnO-C
SPF	28.6	24.4
UVA Ratio	0.80	0.80

* Data from Sumitomo Osaka Cement

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Non-Nano ZnO

Powders

Product Name	Surface Treatment	Properties
ZnO-C+	None	Hydrophilic
ZnO-C-12	Isopropyl Titanium Triisostearate	Lipophilic
ZnO-C-NJE3+	Jojoba Esters	Hydrophobic
ZnO-C-DMC2	Hydrogen Dimethicone	Hydrophobic
ZnO-C-DS4	Dimethicone	Hydrophobic
ZnO-C-ASG3*	Stearoyl Glutamic Acid	Hydrophobic

Note: NJE Treatment
 Patent # US 8623386 B2
 Natural Ester, Wax or Oil Treated Pigment,
 Process for Production Thereof
 and Cosmetic Made Therewith

* Raw material approved by Ecocert in accordance with the Cosmos and Ecocert Standards (w/ petrochemical)



Dispersions

Carrier/Solvent	Product Name	INCI Name	Active %	Viscosity
Esters/Oils	GC70MZCJ-G+	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Jojoba Esters (And) Glyceryl Behenate/Eicosadioate	67	Paste
	New GC70MZCSG++	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Stearoyl Glutamic Acid (And) Glyceryl Behenate/Eicosadioate	68	Paste
	HBP75MZCM	Zinc Oxide (And) Butyloctyl Salicylate (And) Polyhydroxystearic Acid (And) Hydrogen Dimethicone (And) Glyceryl Behenate/Eicosadioate	73	Paste
	TNPB80MZCM-G	Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Isopropyl Myristate (And) Polyhydroxystearic Acid (And) Stearalkonium Hectorite (And) Hydrogen Dimethicone (And) Glyceryl Behenate/Eicosadioate (And) Propylene Carbonate	79	Paste
	New TNSS75MZCM	Zinc Oxide (And) Ethylhexyl Methoxycrylene (And) C12-15 Alkyl Benzoate (And) Polyhydroxystearic Acid (And) Hydrogen Dimethicone	72	Paste
Natural Esters/Oils	JOP80MZCJ+	Zinc Oxide (And) Simmondsia Chinensis (Jojoba) Seed Oil (And) Polyhydroxystearic Acid (And) Jojoba Esters	78	Paste
Silicones	CMX80MZCM	Zinc Oxide (And) Cyclopentasiloxane (And) Dimethicone (And) PEG/PPG-18/18 Dimethicone (And) Hydrogen Dimethicone	78	Paste
Volatile Non-D5	DIM2FH75MZCM	Zinc Oxide (And) Dimethicone (And) Isononyl Isononanoate (And) Polyglyceryl-6 Polyricinoleate (And) PEG-10 Dimethicone (And) Hydrogen Dimethicone	74	Pourable
	DM2X80MZCM	Zinc Oxide (And) Trisiloxane (And) Dimethicone (And) PEG/PPG-18/18 Dimethicone (And) Hydrogen Dimethicone	78	Paste
	MTMX80MZCM	Zinc Oxide (And) Methyl Trimethicone (And) Dimethicone (And) PEG/PPG-18/18 Dimethicone (And) Hydrogen Dimethicone	78	Paste
Water/Glycols	GLW70MZC	Zinc Oxide (And) Water (And) Glycerin (And) Sodium Polyacrylate (And) Cellulose Gum	70	Paste

+ Raw material approved by Ecocert in accordance with the Cosmos and Ecocert Standards



++ Raw material approved by Ecocert in accordance with the Cosmos Standard



The method of measurement used to classify these products as Non-Nano is the Image Analysis method.

O/W Sunscreen with TNP50ZSI & TNPB80MZCM-G



Formula KSL-349

Part 1

- Deionized Water - Water 51.10%
- Trisodium EDTA - Protameen: Trisodium EDTA 0.10%

Part 2

- Glycerin U.S.P. Natural 96% - Univar USA Inc.: Glycerin 5.30%
- Keltrol® CG - CP Kelco: Xanthan Gum 0.20%

Part 3

- TNP50ZSI** - Kobo Products: C12-15 Alkyl Benzoate (And) Zinc Oxide (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane 18.20%
- TNPB80MZCM-G** - Kobo Products: Zinc Oxide (And) C12-15 Alkyl Benzoate (And) Isopropyl Myristate (And) Polyhydroxystearic Acid (And) Stearalkonium Hectorite (And) Hydrogen Dimethicone (And) Glyceryl Behenate/Eicosadioate (And) Propylene Carbonate 13.80%
- SunBoost ATB™** - Kobo Products: Argania Spinosa Kernel Oil (And) Tocopheryl Acetate (And) Bisabolol 5.00%
- Cegesoft® C 24 - BASF: Ethylhexyl Palmitate 0.85%
- Abil® WAX 9801 - Evonik: Cetyl Dimethicone 0.75%
- Myritol® 331 - BASF: Cocoglycerides 0.75%
- Arlacel™ P135 - Emulsion Engineering Inc.: PEG-30 Dipolyhydroxystearate 0.65%
- CPF-3300@10cSt - Avantor/Kobo Products: Phenyl Trimethicone 0.45%
- Lipopeg® 100-S - Vantage: PEG-100 Stearate 0.30%
- Eumulgin® SG - BASF: Sodium Stearoyl Glutamate 0.20%
- Pemulen™ TR-2 - Lubrizol Corporation: Acrylates/C10-C30 Alkyl Acrylate Crosspolymer 0.10%

Part 4

- PHENOXTOL - Clariant: Phenoxyethanol 0.25%

Part 5

- MSS-500 - Kobo Products: Silica 1.00%

Part 6

- Simulgel™ EG - Seppic: Sodium Acrylate/Sodium Acryloyldimethyl Taurate Copolymer (And) Isohexadecane (And) Polysorbate 80 1.00%

Manufacturing Procedure

- Begin Prop mixing Part 1 then add Slurry Part 2.
- Combine Part 3 and heat to 70°C under homogenizer.
- Slowly add Part 3 to Parts 1 and 2 while homogenizing at 70°C.
- Begin cool down to 40°C then add Part 4.
- Cool to 30°C then add Part 5 while homogenizing.
- Add Part 6 to batch while homogenizing.

Description

This elegant Zinc-only O/W Sunscreen uses two different particle sized Zinc Oxide Dispersions, TNP50ZSI and TNPB80MZCM-G to provide broad spectrum protection from the Sun's harmful UV rays. The combination of Non-nano Zinc with nano provides overall better coverage for improved SPF/PFA results. Kobo's SunBoost ATB™ is a booster to help increase the SPF/PFA values. CPF-3300@10cSt is a silicone fluid that can improve the spreadability and, due to its high refractive index, can also disguise wrinkles and fine lines. Kobo's spherical silica Microsphere, MSS-500, gives slip during application and reduces shine on the skin.

Active Ingredient

Zinc Oxide 19.38%

Testing

SPF: in vivo in 3 subjects

Broad Spectrum Protection

Formulation Guidelines

Estimation of Use Level for SPF/UVA-PF
 SPF Units: 0.8 SPF / % ZnO
 SPF/UVA-PF < 3
 Critical Wavelength > 370nm