

Non-Nano Zinc Oxide Sunscreen Technologies

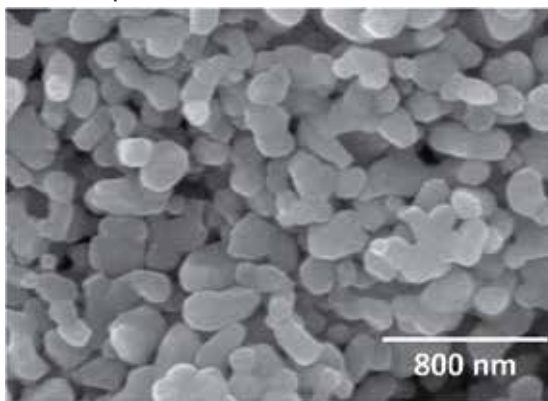
Inorganic UV filters have been manufactured during the past forty years for use in sunscreen products. They are preferred over organic UV filters because of their physical and chemical stability, as well as their non-irritating properties. In order to optimize the protection against UV light, and to 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

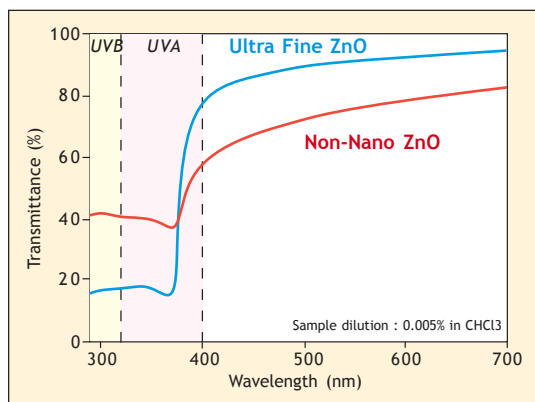
also dispersed in various vehicles for easier use in formulations. They will help formulators develop sunscreen products with broad spectrum protection without nanoparticles.

Kobo Non-Nano Patent Information:

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.

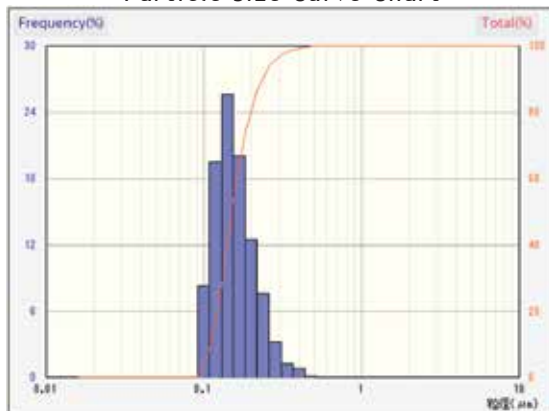


SEM image of treated ZnO-C (30 kX magnification, 15 kV accelerating voltage).



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-I2	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

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
	New GCP70MZCSG	Zinc Oxide (And) Caprylic/Capric Triglyceride (And) Stearoyl Glutamic Acid (And) Silica (And) Polyhydroxystearic Acid	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 Polycinoleate (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

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



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



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



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

in vivo SPF 37
CW 370

Sunscreen with Non-Nano Zinc Oxide

Formula KSL-200A

Part 1	
• Deionized Water - Water	53.90%
• Liposorb® L-20 - Lipo Chemicals: Polysorbate 20	1.00%
Part 2	
• Propylene Glycol - Symrise: Propylene Glycol	1.50%
• KELTROL® CG - CP Kelco: Xanthan Gum	0.30%
Part 3	
• HALLBRITE® BHB - Hallstar: Butyloctyl Salicylate	7.50%
• Neo Heliopan® AV - Symrise: Ethylhexyl Methoxycinnamate	7.50%
• ZNO-C-DMC2 - Kobo Products: Zinc Oxide (And) Hydrogen Dimethicone	7.50%
• Ceraphyl® 368 - ISP: Ethylhexyl Palmitate	7.00%
• Lipo® GMS-450 - Lipo Chemicals: Glyceryl Stearate	3.00%
• Neo Heliopan® BB - Symrise: Benzophenone-3	3.00%
• Finsolv® TN - Finetex: C12-15 Alkyl Benzoate	2.50%
• Lipomulse® 165 - Lipo Chemicals: Glyceryl Stearate (And) PEG-100 Stearate	2.00%
• Covi-ox® T-50 - Cognis Corp.: Tocopherol	0.50%
• Lipowax® D - Lipo Chemicals: Cetearyl Alcohol (And) Ceteareth-20	0.50%
• Liposorb® TS - Lipo Chemicals: Sorbitol Tristearate	0.30%
Part 4	
• Botanistat PF-64 - DD Chemco: Phenoxyethanol (and) Caprylyl Glycol (and) Ethylhexylglycerin (and) Hexylene Glycol	1.00%

Part 5

- Aculyn™ 44 - Rohm & Hass: PEG-150/Decyl Alcohol/SMDI Copolymer 1.00%

Manufacturing Procedure

1. In main kettle, combine Part 1 ingredients and heat to 78-80°C.
2. Combine Part 2 ingredients and heat to 80°C. Mix until uniform using propeller mixer.
3. Add Part 2 to Part 1 and mix until uniform.
4. Combine Part 3 ingredients. Heat to 80°C and add to batch with propeller mixing.
5. Add Part 4 while cooling.
6. Homogenize for approximately 2 minutes at 4000 rpm.
7. Add Part 5 to batch.
8. Homogenize for approximately 1 minute at 4000 rpm.
9. Cool batch to 30°C.

Description

This sunscreen contains Kobo's Non-Nano Zinc Oxide Powder ZnO-C-DMC2. This sunscreen also contains organic sunscreens for broad spectrum.

Active Ingredient(s)	
Zinc Oxide	7.35%
Benzophenone-3	3.00%
Ethylhexyl Methoxycinnamate	7.50%

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

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