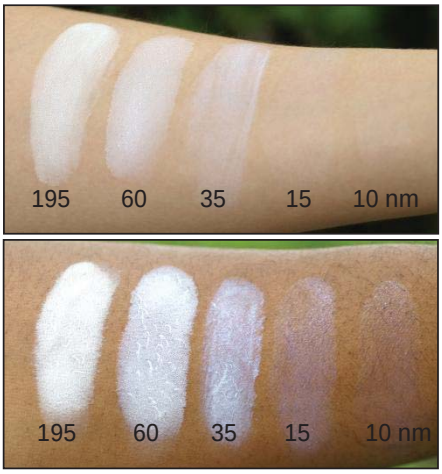
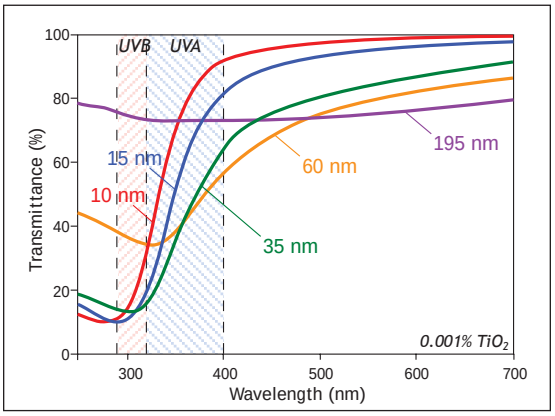
Attenuation Grade
TiO_2 Dispersions

Titanium dioxide (TiO_2) is an effective sunscreen agent. Its chemical and physiological inertness makes it ideal for formulating mild or hypoallergenic sun care products, especially for babies and people with sensitive skin. Although micronized TiO_2 has a very small primary particle size, the particles always form much larger aggregates, which often cause undesired whitening and sometimes create an ashy look when sun care products are applied on skin.



There is a wide range of TiO_2 available with different primary particle sizes (PPS). These pictures compare the transparency of TiO_2 dispersions of various PPS on two different skin types. Small primary particle sizes are necessary to produce dispersions transparent to visible light and efficient against UVB.

As a leader in dispersion technology, Kobo specializes in custom formulating and grinding of TiO_2 dispersions. Kobo is able to grind TiO_2 to an aggregate size of about 100 nm, which enables the TiO_2 to become extremely transparent on skin. Kobo has mastered the art of manipulating particle size and offers dispersions of TiO_2 with various particle sizes and surface treatments in 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.



This figure shows transmittance curves. The curves tell the relationship not only between particle size and transparency, but also between particle size and UVA/UVB balance. As the particle size becomes very small, UVB attenuation is strong but UVA attenuation is weak. The particle size must be in a medium range if balanced protection in both the UVA and UVB regions is needed.

Sunscreen Stick with HBTN65HP1 & HBTN55TIS

SPF 31.40
UVA PF 10.87

Formula KSL-171A

Part 1

- Unitolate 160K - Universal Preserv-A-Chem: *Caprylic/Capric Triglyceride* 29.84%
- **HBTN55TIS** - Kobo Products: *Butyloctyl Salicylate (And) Titanium Dioxide (And) Isostearic Acid (And) Aluminum Hydroxide (And) C12-15 Alkyl Benzoate* 13.64%
- Ozokerite Wax White SP 1020P - Strahl & Pitsch: *Ozokerite* 11.00%
- Jeechem ISIS - *Jeen International: Isostearyl Isostearate* 9.00%
- **HBTN65HP1** - Kobo Products: *Zinc Oxide (And) Butyloctyl Salicylate (And) C12-15 Alkyl Benzoate (And) Triethoxycaprylylsilane* 7.22%
- Lanolin Technical Grade - RITA Corp: *Lanolin* 6.00%
- Candelilla Wax - Frank B. Ross: *Euphorbia Cerifera (Candelilla) Wax* 5.50%
- Castor Oil - Alzo International: *Ricinus Communis (Castor) Seed Oil* 5.00%
- *Carnauba Wax* - Strahl & Pitsch: *Copernicia Cerifera (Carnauba) Wax* 4.50%
- Softisan® 100 - *Condea Chemie: Hydrogenated Coco-Glycerides* 4.00%
- Beeswax White SP 422P - Strahl & Pitsch: *Beeswax* 4.00%
- Vitamin E Acetate - BASF: *Tocopherol Acetate* 0.30%

Manufacturing Procedure

Add all ingredients together and heat to 70-80°C. Mix until all waxes are melted and pour into sticks at 78-80°C.

Description

This stick applies smoothly and is convenient to use. This sunscreen uses Kobo's Zinc Oxide Dispersion, HBTN65HP1 and Titanium Dioxide Dispersion, HBTN55TIS, for UVA/UVB protection. The Butyloctyl Salicylate is a booster to help increase the SPF value.

Active Ingredients:

Zinc Oxide = 4.60%
Titanium Dioxide = 6.00%

SPF testing: in vivo on 3 subjects

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TiO_2 Dispersions

Carrier / Solvent	Product Name	INCI Name	Primary Part. Size	Particle Size*	TiO_2 Content	Viscosity
Silicones	CM3KG25VM-AL	Cyclopentasiloxane (And) Titanium Dioxide (And) Alumina (And) PEG-10 Dimethicone (And) Lauryl Polyglyceryl-3 Polydimethylsiloxyethyl Dimethicone (And) Methicone	10 nm	110 nm	20%	pourable
	CM3KG40T7	Cyclopentasiloxane (And) Titanium Dioxide (And) Alumina (And) PEG-10 Dimethicone (And) Lauryl Polyglyceryl-3 Polydimethylsiloxyethyl Dimethicone (And) Methicone	15 nm	128 nm	32%	pourable
Mixed Solvents	KFS40VBAS-C	Titanium Dioxide (And) Caprylyl Methicone (And) Cyclopentasiloxane (And) C12-15 Alkyl Benzoate (And) Alumina (And) Polyhydroxystearic Acid (And) Triethoxysilylethyl Polydimethylsiloxyethyl Hexyl Dimethicone (And) Lauryl PEG-9 Polydimethylsiloxyethyl Dimethicone	10 nm	130 nm	31%	pourable
	KFS40VM-AL	Caprylyl Methicone (And) Titanium Dioxide (And) Cyclopentasiloxane (And) C12-15 Alkyl Benzoate (And) Alumina (And) Polyhydroxystearic Acid (And) Methicone (And) PEG-9 Polydimethylsiloxyethyl Dimethicone	10 nm	125 nm	31%	pourable
	KFS40M170	Caprylyl Methicone (And) Titanium Dioxide (And) Cyclopentasiloxane (And) C12-15 Alkyl Benzoate (And) Alumina (And) Polyhydroxystearic Acid (And) Methicone (And) PEG-9 Polydimethylsiloxyethyl Dimethicone	14 nm	150 nm	32%	pourable
	HBTN55TIS	Butyloctyl Salicylate (And) Titanium Dioxide (And) Isostearic Acid (And) Aluminum Hydroxide (And) C12-15 Alkyl Benzoate	15 nm	110-150 nm	44%	paste
Esters/Oils	TNP40VTTS	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Alumina (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate (And) Triethoxycaprylylsilane	10 nm	100 nm	32%	pourable
	TNP40VM-AL	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Alumina (And) Polyhydroxystearic Acid (And) Methicone	10 nm	105 nm	32%	pourable
	GCP50VTTS	Caprylic/Capric Triglyceride (And) Titanium Dioxide (And) Alumina (And) Polyhydroxystearic Acid (And) Isopropyl Titanium Triisostearate (And) Triethoxycaprylylsilane	10 nm	110 nm	40%	pourable
	New TNP50T7-ATB	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Argania Spinosa Kernel Oil (And) Alumina (And) Methicone (And) Tocopheryl Acetate (And) Polyhydroxystearic Acid (And) Bisabolol	15 nm	118 nm	38%	pourable
	TNP50T7	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Alumina (And) Polyhydroxystearic Acid (And) Methicone	15 nm	120 nm	40%	pourable
	INP60T7	Titanium Dioxide (And) Isononyl Isononanoate (And) Alumina (And) Methicone (And) Polyhydroxystearic Acid	15 nm	126 nm	48%	pourable
	IN60S4	Isononyl Isononanoate (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide	15 nm	130 nm	49%	paste
	TN40S4	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide	15 nm	140 nm	33%	paste
	TNQP55T5S	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid	30 nm	168 nm	45%	paste
	TNQP50TEL6	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Alumina (And) Silica (And) Polyhydroxystearic Acid	50 nm	190 nm	44%	pourable
Natural Esters/Oils	JOSP40TIS	Simmondsia Chinensis (Jojoba) Seed Oil (And) Titanium Dioxide (And) Aluminum Hydroxide (And) Isostearic Acid (And) Polyhydroxystearic Acid	15 nm	130 nm	33%	pourable
	GCO45TV	Titanium Dioxide (And) Caprylic/Capric Triglyceride (And) Sorbitan Olivate (And) Stearic Acid (And) Aluminum Hydroxide	15 nm	131 nm	37%	paste
	GC40S4	Caprylic/Capric Triglyceride (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide	15 nm	140 nm	33%	paste
	JO40S4	Simmondsia Chinensis (Jojoba) Seed Oil (And) Titanium Dioxide (And) Aluminum Hydroxide (And) Stearic Acid	15 nm	145 nm	32%	paste
	GCQP55T5S	Caprylic/Capric Triglyceride (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid	35 nm	161 nm	45%	pourable
Hydrocarbons	PM9P50M170	Titanium Dioxide (And) Isododecane (And) Alumina (And) Methicone (And) Polyhydroxystearic Acid	14 nm	110 nm	40%	pourable
	PM9P50VM-AL	Titanium Dioxide (And) Isododecane (And) Alumina (And) Methicone (And) Polyhydroxystearic Acid	10 nm	103 nm	38%	pourable
Aqueous	WBG40M40	Water (And) Titanium Dioxide (And) Butylene Glycol (And) Silica (And) Glycerin (And) Ammonium Polyacrylate	14 nm	196 nm	28%	paste
	WBG45M40ML	Water (And) Titanium Dioxide (And) Butylene Glycol (And) Silica (And) Glycerin	14-30 nm	160 nm	31%	pourable

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

This table was prepared to assist in formulating with Titanium Dioxide 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.

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

Our dispersions are often divided into two general categories:

1. **High Solids® Dispersions**: These are usually in paste form and have a high active TiO_2 loading and efficacy (up to 5 SPF units/ TiO_2%), which is necessary for formulating for very high SPF.
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

10 -15 nm TiO_2 Dispersions

1. SPF < 20 : 2.0-2.5 SPF / % TiO_2
2. SPF > 25 : 2.5-3.0 + SPF / % TiO_2

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