

Balanced UV Protection

The UV Balance requirement came into effect in order to ensure protection of the skin from both UVB and UVA rays. Thus, for every 3 units of UVB protection there must also be 1 unit of UVA protection being provided in an SPF product. When working with inorganic sunscreen ingredients such as micronized Titanium Dioxide or Zinc Oxide it is important to find the right combination of particle sizes in order to yield the 3:1 ratio for protection. In order to achieve these results, Kobo has developed both UV Balance Powders and Dispersions, as well as recommended use levels for specific combinations of dispersions.

For Sunscreens

While formulating with inorganic sunscreen ingredients, it is difficult to achieve a high SPF and UV Balanced Formula. TiO₂ is often too whitening while ZnO is not an efficient UVB agent. By combining TiO₂ and ZnO of correct particle sizes, balanced UV protection can be achieved. A combination of very fine ZnO and large ZnO can also give high SPF and provide UV Balanced Protection. The following dispersion combinations are recommended:

Combination of TiO₂ and ZnO for Balanced UV protection

For Oil Phase

	TNP50T7	TiO ₂ %	TNP65MZS	ZnO%
SPF 30 (KSL-043E)	13	5.0	20	12.0
SPF 20	8.6	3.3	15	9.0
SPF 15	6.5	2.5	11.5	7.0

	IN65S4	TiO ₂ %	INH73MZ	ZnO%
SPF 30 (KSL-043E)	11.3	6.0	17	12.0
SPF 20	8	4.25	12	8.5
SPF 15	6	3.2	9	6.35

For Silicone Phase

	CM3K40T4	TiO ₂ %	CM3K50XZ4	ZnO%
SPF 30	22	7.0	25	12.0
SPF 20	15.6	5.0	19	9.0
SPF 15	12.5	4.0	14.6	7.0

Combination of ZnO for Balanced UV protection

	INH73MZ	ZnO%
SPF 15 (KSL-016)	22	16.0

	CM3K50XZ4	ZnO%
SPF 15	32	15.0

	TNP65MZS	ZnO%
SPF 15	25	15.0

Balanced W/O Sunscreen Milk

KSL-269A

Part 1

- CM3K50XZ4 - Kobo Products: Zinc Oxide (And) Cyclopentasiloxane (And) PEG-10 Dimethicone (And) Methicone 35.00%
- CM3K40T4 - Kobo Products: Cyclopentasiloxane (And) Titanium Dioxide (And) PEG-10 Dimethicone (And) Alumina (And) Hydrogen Dimethicone 30.00%
- Permethyl 99A - Presperse: Isododecane 11.50%
- BPD-500 - Kobo Products: HDI/Trimethylol Hexyllactone Crosspolymer (And) Silica 3.00%
- KSP-102 - Shin Etsu: Vinyl Dimethicone/Methicone Silsesquioxane Crosspolymer 2.00%
- Lipo Polyglycol® 400 - Vantage: PEG-8 1.00%
- Wickenol 155 - Alzo International Inc.: Ethylhexyl Palmitate 0.50%

Part 2

- Permethyl 99A - Presperse: Isododecane 1.50%
- SR1000 - Momentive: Trimethylsiloxysilicate 1.50%

Part 3

- Deionized Water - Water 7.75%
- Glycerin U.S.P. Natural 96% - Ruger Chemical: Glycerin 5.00%
- Germaben® II - ISP: Propylene Glycol (And) Diazolidinyl Urea (And) Methylparaben (And) Propylparaben 1.00%
- Sodium Citrate - DSM Nutritional Products: Sodium Citrate 0.20%
- EDTA-3Na - DSM Nutritional Products: Trisodium EDTA 0.05%

in vivo SPF 71
in vivo UVA-PF 26
FDA CW 370

Manufacturing Procedure

1. Dissolve and disperse each Part uniformly.
2. Combine Part 2 with propeller mixing for 1 hour until homogeneous.
3. While mixing Part 1 with homogenizer at 2500rpm, add Part 2 to Part 1 gradually.
4. Combine Part 3 until homogeneous.
5. Slowly add Part 3 to Parts 1 and 2 at 4000rpm for 5 minutes with homogenizer.

Description

A very thin 'milk' type sunscreen with high SPF and UVA that glides effortlessly onto the skin. CM3K40T4 is a low-whitening TiO₂ dispersion that allows the formula to attain a high SPF. ZnO dispersion, CM3K50XZ4 improves UVA to yield a UV Balanced formula with minimal whitening. BPD-500 is a microsphere that gives soft focus and enhanced feel.

Active Ingredients

Titanium Dioxide	8.70%
Zinc Oxide	16.10%

Testing

SPF: in vivo on 3 subjects

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Balanced UV Protection

SPF 32 Balanced Sunscreen with Methyl Trimethicone

in vivo SPF 32
in vivo UVA-PF 11.64

KSL-160A

Part 1

- **MTM3F40T7** - Kobo Products: Methyl Trimethicone (And) Titanium Dioxide (And) Alumina (And) Hydrogen Dimethicone (And) Lauryl PEG-9 Polydimethylsiloxylethyl Dimethicone 27.00%
- Abil® Care 85 - Evonik: Bis-PEG/PEG-16/16 PEG/PEG 16/16 Dimethicone (And) Caprylic/Capric Triglyceride 2.50%

Part 2

- Deionized Water - Water 53.80%
- Glycerin U.S.P. Natural 96% - Cognis Corp.: Glycerin 1.00%
- Crillet 4HP - Croda: Polysorbate 80 0.20%

Part 3

- Butylene Glycol - Ruger Chemical Co., Inc.: Butylene Glycol 1.00%
- Glycerin - Cognis Corp.: Glycerin 1.00%
- NOMCORT® ZZ - The Nisshin Oil Mills, Ltd.: Xanthan Gum 0.35%
- Natrosol® HHX-250 - Hercules-Aqualon: Hydroxyethyl Cellulose 0.15%

Part 4

- Tinosorb® M - Ciba Specialty Chemicals: Methylene Bis-Benzotriazolyl Tetramethylbutylphenol 10.00%

Part 5

- Aculyn™ 44 - Rohm & Haas: PEG-150/Decyl Alcohol/SMDI Copolymer 2.20%
- Germaben® II - ISP: Propylene Glycol (And) Diazolidinyl Urea (And) Methylparaben (And) Propylparaben 0.80%

Manufacturing Procedure

This is entirely a cold process procedure based on the strong emulsifying properties of Abil® Care 85.

1. In a suitable stainless steel tank equipped with a lightening type propeller mixer and side sweep action, mix Part 1 ingredients together.
2. In Part 2 mix Polysorbate 80 and Glycerin first, and then add water, while mixing between additions.
3. Add Part 2 to Part 1 with homogenization. Homogenize until uniform and a milky white emulsion forms.
4. Mix Part 3 ingredients together (wet powders) and add to Parts 1 and 2 with mixing. Mix until it thickens.
5. Add Part 4 to Parts 1, 2 and 3 with mixing. Mix until homogeneous.
6. Add Part 5 to Parts 1, 2, 3 and 4 with mixing. Add one item at a time, mixing between additions.

Description

This UV Balanced Sunscreen formulation is an elegant O/W white emulsion with exceptional "feel". Kobo's Attenuation grade, volatile non-D5, Titanium Dioxide Dispersion, MTM3F40T7, used in combination with Tinosorb® M provides a balanced UV protection.

Tinosorb® cannot be used in the USA.

Active Ingredients

- Titanium Dioxide 8.50%
- Methylene Bis-Benzotriazolyl Tetramethylbutylphenol 10.00%

Balanced TiO₂ Sunscreen Featuring TNQP55T5S

in vivo SPF 32
in vivo UVA-PF 11
CW 376

KSL-181B

Part 1

- Finsolv® TN - Finetex: C12-15 Alkyl Benzoate 12.00%
- Squalane NF - Barnet Products: Squalane 3.00%
- ARGAN OIL - Centerchem: Argania Spinosa Kernel Oil 1.00%
- **KOBOGUARD® 5400 CCT** - Kobo Products: Hydrogenated Polycyclopentadiene (And) Caprylic/Capric Triglyceride 1.00%
- **SUMECTON SAN-P** - Kobo Products: Quaternium-18 Hectorite 0.50%
- Covi-ox® T-50- Cognis Corp.: Tocopherol 0.30%

Part 2

- Propylene Carbonate - Spectrum Chemical Mfg Corp.: Propylene Carbonate 0.05%

Part 3

- **TNQP55T5S** - Kobo Products: C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid 20.00%
- Abil® WE 09 - Evonik: Polyglyceryl-4 Isostearate (And) Cetyl PEG/PPG-10/1 Dimethicone (And) Hexyl Laurate 3.00%
- Arlachel™ P135 - Croda: PEG-30 Dipolyhydroxystearate 2.00%
- Dow Corning 556 Fluid - Dow Corning: Phenyl Trimethicone 1.00%

Part 4

- Deionized Water 52.90%
- Aculyn™ 44 - Rohm & Haas: PEG-150/Decyl Alcohol/SMDI Copolymer 1.00%

- Glycerin U.S.P. Natural 96% - Cognis Corp.: Glycerin 1.00%
- Sodium Chloride - Morton Salt: Sodium Chloride 0.75%

Part 5

- Botanistat P-64 - DD Chemco: Phenoxyethanol (and) Caprylyl Glycol (and) Ethylhexylglycerin (and) Hexylene Glycol 0.50%

Manufacturing Procedure

1. Combine Part 1 and homogenize.
2. Add Part 2 to Part 1 while homogenizing.
3. Combine Part 3 and heat slightly.
4. Heat Parts 1 and 2 slightly.
5. Homogenize Parts 1 and 2 while adding Part 3.
6. Heat Part 4 slightly.
7. Add Part 4 while homogenizing.
8. Add Part 5 at end.

Description

This sunscreen has a light, elegant feel with minimal whitening. TNQP55T5S offers broad spectrum protection. Koboguard® 5400 CCT gives gloss to the formula and helps to provide long wear properties. SUMECTON SAN-P gives thickening and stabilizes the emulsion.

Active Ingredients

- Titanium Dioxide 9.02%

Trade Name	INCI Name	Product Type
GCQP55T5S	Caprylic/Capric Triglyceride (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid	Dispersion
TNQP55T5S	C12-15 Alkyl Benzoate (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid	Dispersion

The TiO₂ products in the chart above comply with the conditions for Titanium Dioxide (nano) as set forth in the Annex VI to Regulation (EC) No 1223/2009.

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