

# IR Protection

## Improved Sun Protection Beyond UV



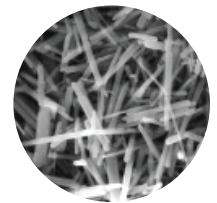
Using a broad spectrum sunscreen to protect against both UV-A and UV-B radiation of the sun is now widely accepted as a way to protect skin against the harmful effects of the sun, skin cancers and pre-mature aging.

However, more than half of the solar energy that the skin receives is infrared radiations. Contrary to UV, these radiations, in particular the IR-A in near Infrared region, have the capacity to penetrate deep into the skin, as deep as the hypodermis. Recent studies have shown they are capable of generating free-radicals, diminishing the ability of the skin to fight oxidative-stress as well as creating biological damage such as the destruction of collagen fibers.

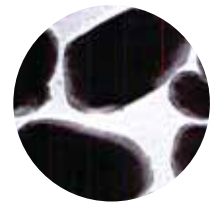
Kobo Products has performed extensive studies, testing a large number of ingredients for their capacity to attenuate IR radiations, and has selected two grades of large size (in the micron range) Titanium Dioxide: **TiO<sub>2</sub>-IR300** and **A1K-TiO<sub>2</sub>**. These two pigments have been tested in vitro (transmittance in the IR range) and in vivo (reduction of the IR-induced heat increase on the skin surface). They are now available surface-treated with three hydrophobic / lipophilic treatments for ease of formulation.

**WO 2018232379A1, CN 111093601A**  
*Cosmetic composition using titanium dioxide particles for IR protection*

Product Name	INCI Name	Natural	Shape & Size (µm)
<b>TiO<sub>2</sub>-IR300-11S2</b>	<i>Titanium Dioxide (And) Triethoxycaprylylsilane</i>		Acicular (5µm)
<b>TiO<sub>2</sub>-IR300-ASG3</b>	<i>Titanium Dioxide (And) Stearoyl Glutamic Acid</i>		
<b>TiO<sub>2</sub>-IR300-I2</b>	<i>Titanium Dioxide (And) Isopropyl Titanium Triisostearate</i>		
<b>A1K-TiO<sub>2</sub>-11S2</b>	<i>Titanium Dioxide (And) Aluminum Hydroxide (And) Triethoxycaprylylsilane</i>		Granular (1µm)
<b>A1K-TiO<sub>2</sub>-ASG3</b>	<i>Titanium Dioxide (And) Aluminum Hydroxide (And) Stearoyl Glutamic Acid</i>		
<b>A1K-TiO<sub>2</sub>-I2</b>	<i>Titanium Dioxide (And) Aluminum Hydroxide (And) Isopropyl Titanium Triisostearate</i>		



TiO<sub>2</sub>-IR300

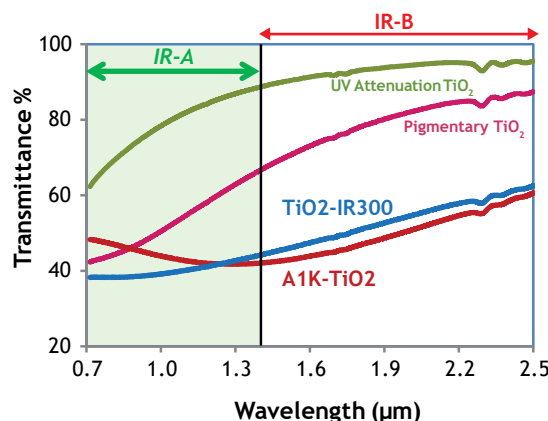


A1K-TiO<sub>2</sub>

### Transmittance in Infrared

Transmittance in the near infrared (IR-A and IR-B) was measured for the two **IR-Attenuation TiO<sub>2</sub>** and compared to a UV-attenuation grade Titanium Dioxide and a Pigmentary grade Titanium Dioxide. Pigments were dispersed in Dimethicone and drawn down on a quartz plate.

The curves on the right show that the two **IR-Attenuation TiO<sub>2</sub>** have a lower transmittance, attenuating more IR radiations in most of the spectrum than UV-attenuation or Pigmentary TiO<sub>2</sub>.



**Instrument:**  
 PE Spectrum NIR Frontier

**Sample preparation:**  
 1. Samples were dispersed in Dimethicone  
 2. Draw film on fused quartz plate with a 0.5 mil wire rod

**KOBO**

USA

BRASIL

UK

FRANCE

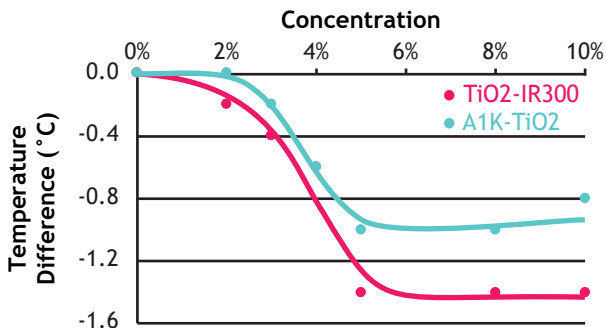
ASIA PACIFIC

## In vivo Thermoprotection of the Skin

The two IR-Attenuation TiO<sub>2</sub> were evaluated in an in vivo test: they were formulated in a lotion, then applied on the skin of 5 people of different skin types (ranging from type I to type III). A lotion with no pigment was also tested as control.

Temperature of the skin surface was measured, then the skin was irradiated with an IR lamp and skin temperature was measured again. The difference in skin temperature was then calculated and used as a measure of the capacity of the pigments to attenuate IR radiation at the skin's surface.

Both lotions that had IR-Attenuation TiO<sub>2</sub> were found to limit the temperature increase, compared to the control.



**Application:**  
2 mg/cm<sup>2</sup> of each lotion

**Irradiation:** Infrared Lamp (125 W) - Site is 11 inches from lamp. Irradiated for 5 min.

**Measure skin temperature**

The graph above shows the temperature differences between the skin surface protected with lotions containing IR-Attenuation TiO<sub>2</sub> at different concentrations vs. a control lotion.



Skin whitening of IR-Attenuation TiO<sub>2</sub> in formulation, compared to other titanium dioxides. At 5% in an emulsion, both IR-Attenuation TiO<sub>2</sub> (1 and 3) are less whitening than Pigmentary TiO<sub>2</sub> (2) and similar to UV-attenuation grade TiO<sub>2</sub> (4).

## Opacity on the Skin

A UV-attenuation grade Titanium Dioxide (4), a pigmentary grade Titanium Dioxide (2) and the 2 IR-Attenuation TiO<sub>2</sub>, TiO<sub>2</sub>-IR300 (3) and A1K-TiO<sub>2</sub>(1) were dispersed in an O/W emulsion at 5%, then applied on the skin.

The IR-Attenuation TiO<sub>2</sub> do not cause noticeable whitening, similar to that of the UV attenuation grade TiO<sub>2</sub>, while the pigmentary grade TiO<sub>2</sub> is more whitening. This shows that IR-Attenuation TiO<sub>2</sub> can easily be added to a formula for additional sun protection without affecting formula aesthetics.



KSL-378A-EU

## Tinted Sunscreen with IR Protection



### Part 1

- Deionized Water - Water 28.05%
- Sodium Chloride - Fisher: Sodium Chloride 1.50%

### Part 2

- Glycerin - Interchimie: Glycerin 4.00%
- Keltrol® CG - CP Kelco: Xanthan Gum 0.25%

### Part 3

- HBQP75FZS - Kobo Products: Zinc Oxide (And) Butyloctyl Salicylate (And) Polyhydroxystearic Acid (And) Triethoxycaprylylsilane 19.00%
- GCP45TV - Kobo Products: Caprylic/Capric Triglyceride (And) Titanium Dioxide (And) Stearic Acid (And) Aluminum Hydroxide (And) Polyhydroxystearic Acid 14.00%
- Tegosoft® AC - Evonik: Isoamyl Cocoate 10.00%
- TiO<sub>2</sub>-IR300-ASG3 - Kobo Products: Titanium Dioxide (And) Stearoyl Glutamic Acid 5.00%
- Tegosoft® TN - Evonik: C12-15 Alkyl Benzoate 4.00%
- SunBoost ATB - Kobo Products: Argania Spinosa Kernel Oil (And) Tocopheryl Acetate (And) Bisabolol 3.00%
- GCB60USG - Kobo Products: Titanium Dioxide (And) Caprylic/Capric Triglyceride (And) Isopropyl Myristate (And) Stearoyl Glutamic Acid (And) Stearalkonium Hectorite (And) Trihydroxystearin (And) Propylene Carbonate 1.50%
- GCB50YSG - Kobo Products: Iron Oxides (CI 77492) (And) Caprylic/Capric Triglyceride (And) Isopropyl Myristate (And) Stearoyl Glutamic Acid (And) Stearalkonium Hectorite (And) Trihydroxystearin (And) Propylene Carbonate 1.00%
- GCB65RSG - Kobo Products: Iron Oxides (CI 77491) (And) Caprylic/Capric Triglyceride (And) Isopropyl Myristate (And) Stearoyl Glutamic Acid (And) Stearalkonium Hectorite (And) Trihydroxystearin (And) Propylene Carbonate 0.15%

- GCB70BSG - Kobo Products: Iron Oxides (CI 77499) (And) Caprylic/Capric Triglyceride (And) Isopropyl Myristate (And) Stearoyl Glutamic Acid (And) Stearalkonium Hectorite (And) Trihydroxystearin (And) Propylene Carbonate 0.05%

### Part 4

- Dehymuls® PGPH - BASF: Polyglyceryl-2 Dipolyhydroxystearate 4.00%
- Olivem® 900 - Hallstar: Sorbitan Oliviate 1.00%
- Lipex® Shea Tris - AAK: Shea Butter 0.50%

### Part 5

- ASO-I2 - Kobo Products: Aluminum Starch Octenylsuccinate (And) Isopropyl Titanium Triisostearate 2.00%
- Symdiol® 68 - Symrise: 1,2-Hexanediol (And) Caprylyl Glycol 1.00%

### Manufacturing Procedure

1. Pre-mix Part 2 and add to Part 1. Heat to 80°C.
2. Pre-mix Part 3 and mix until homogeneous using a propeller. Add Part 4 to Part 3 and mix while heating to 80°C.
3. Add Parts 1 and 2 to Parts 3 and 4 slowly while propeller mixing.
4. Homogenize at 7000 rpm for 5 minutes.
5. Add Part 5 and mix well with the propeller.
6. Cool to room temperature with continued propeller mixing.

### Description

This tinted sunscreen features a combination of GCP45TV, a natural dispersion of attenuation grade TiO<sub>2</sub>, and HBQP75FZS, a ZnO dispersion with a booster to optimize UV protection. SunBoost ATB adds anti-inflammatory, anti-irritant and anti-oxidant properties to the formulation, and TiO<sub>2</sub>-IR300-ASG3 provides IR protection. GCB Pigmentary dispersions give a tint to this sunscreen product and ASO-I2 offers a uniform application and creamy after feel.

### Active Ingredients

Titanium Dioxide	5.30%
Zinc Oxide	13.70%

### Testing

SPF: in vivo on 3 subjects

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