

UV filters

® = Registered trademark
of BASF Aktiengesellschaft

Cosmetic Solutions

- Hair Care
- **Skin Care**
- Oral Care

Contents

	Page
Chemical Description	3
The Uvinul[®], T-Lite[™] and Z-COTE[®] portfolio	3
Applications	3
Use of the Uvinul[®] and Z-COTE[®] grades in protecting the skin	4
Approval status	4
Use of the Uvinul[®] grades in protecting sensitive products	5
Use of the Uvinul[®] grades in protecting the hair	5
Specifications	6
Physicochemical properties	10
Uvinul[®] MC 80, MC 80 N	11
Uvinul[®] T 150	12
Uvinul[®] N 539 T	14
Uvinul[®] M 40	15
Uvinul[®] MS 40	16
Uvinul[®] P 25	18
Uvinul[®] DS 49	19
Uvinul[®] A Plus	20
Uvinul[®] A Plus B	21
Z-COTE[®]	22
Z-COTE[®] HP 1[®]	22
Z-COTE[®] MAX[™]	22
T-Lite[™] SF	24
T-Lite[™] SF-S	24
Uvinul[®] TiO₂	25
Stability	26
Toxicology	26
Safety Data Sheets	26
Suppliers	27
Note	28

Chemical Description

The Uvinul[®], T-Lite[™] and Z-COTE[®] products are UV filters and pigments based on benzophenones, diphenyl cyanoacrylate, cinnamates, octyltriazone, p-aminobenzoic acid derivatives, titanium dioxide or zinc oxide.

Range

	INCI name	CAS number
Uvinul [®] MC 80	Ethylhexyl Methoxycinnamate	5466-77-3
Uvinul [®] MC 80 N	Ethylhexyl Methoxycinnamate	5466-77-3
Uvinul [®] T 150	Ethylhexyl Triazone	88122-99-0
Uvinul [®] N 539 T	Octocrylene	6197-30-4
Uvinul [®] M 40	Benzophenone-3	131-57-7
Uvinul [®] MS 40	Benzophenone-4	4065-45-6
Uvinul [®] P 25	PEG-25 PABA	113010-52-9
Uvinul [®] DS 49	Benzophenone-9	3121-60-6
Uvinul [®] A Plus	Diethylamino Hydroxybenzoyl Hexyl Benzoate	302776-68-7
Uvinul [®] A Plus B	Ethylhexyl Methoxycinnamate (and) Diethylamino Hydroxybenzoyl Hexyl Benzoate	5466-77-3 302776-68-7
Z-COTE [®]	Zinc Oxide	1314-13-2
Z-COTE [®] HP 1	Zinc Oxide (and) Triethoxycaprylylsilane	1314-13-2 2943-75-1
Z-COTE [®] MAX [™]	Zinc Oxide (and) Dimethoxydiphenylsilane/ Triethoxycaprylylsilane Crosspolymer	1314-13-2 827036-50-0
Uvinul [®] TiO ₂	Titanium Dioxide (and) Trimethoxycaprylylsilane	13463-67-7 3069-40-7
T-Lite [™] SF	Titanium Dioxide (and) Aluminum Hydroxide (and) Dimethicone/Methicone Copolymer	13463-67-7 21645-51-2 68037-59-2
T-Lite [™] SF-S	Titanium Dioxide (and) Hydrated Silica (and) Dimethicone/Methicone Copolymer (and) Aluminum Hydroxide	13463-67-7 1343-98-2 21645-51-2 68037-59-2

Applications

The Uvinul[®] filters are used in a large number of cosmetics to protect the skin or the hair, the product itself, particularly the colorant, the fragrance or the active ingredient against the harmful effects of UV radiation.

Some of the Uvinul[®] grades are typical UV-B absorbers, i. e. their absorption maximum lies in the 280-320 nm band. Other Uvinul[®] grades, particularly the benzophenone derivatives, are broad-band filters, i. e. they absorb both in the UV-A (320-400 nm) and the UV-B (280-320 nm) ranges. One filter absorbs in the UV-A range. The metal oxides are micronized pigments with a broad UV attenuation.

As both oil-soluble and water-soluble types are available, there are products for almost every cosmetic preparations, including emulsions, oils, gels, eau de toilettes, lipsticks, nail varnishes etc. This also applies for the pigments.

Use of the Uvinul[®], Z-COTE[®] and T-Lite[™] grades in skin protection

UV radiation is responsible for various physiological effects in the skin, as a result of its high energy content. These effects include sunburn, the premature appearance of wrinkles, i. e. accelerated ageing of the skin and, with frequent intensive exposure, an increased risk of skin cancer. UV filters and micro pigments provide vital protection for the skin against these harmful effects of UV radiation. They are now increasingly being used not only in sun preparations but also in other skin cosmetics such as day creams.

The use of UV filters and micro pigments to protect the skin is subject to legislation in many countries. Table 1 shows the approval status and the permitted concentration in the EU, USA and Japan. The concentrations of UV filters in sun preparations depend on the desired degree of protection, measured in terms of the sun protection factor (SPF). Commonly, organic UV filters are combined with micro pigments in products with a high SPF. They can also be used together with radical scavengers, e. g. sodium ascorbyl monophosphate, vitamin E or vitamin E acetate which provide additional passive sun protection.

For day creams, UV filters with low skin penetration are preferable. Uvinul[®] T 150 meets this requirement.

Also the combination of Z-COTE[®] HP 1 and Z-COTE[®] MAX[™] with Uvinul[®] MC 80 and Uvinul[®] T 150 is recommended.

Approval status

Table 1

	EU	USA	Japan
Uvinul [®] MC 80 (both grades)	+ (10%)	+ (7.5%)	+ (20%)
Uvinul [®] T 150	+ (5%)	-	+ (5%)
Uvinul [®] N 539 T	+ (10%)	+ (10%)	+ (10%)
Uvinul [®] M 40	+ (10%)	+ (6%)	+ (5%)
Uvinul [®] MS 40	+ (5%)	+ (10%)	+ (10%)
Uvinul [®] P 25	+ (10%)	-	-
Uvinul [®] DS 49	-	-	-
Uvinul [®] A Plus	+ (10%)	-	+ (10%)
Uvinul [®] A Plus B	+ (15.38%)	-	+ (15.38%)
Z-COTE [®]	+ (25%)*	+ (25%)	+ (no limit)
Z-COTE [®] HP1	+ (25%)*	+ (25%)	+ (no limit)
Z-COTE [®] MAX [™]	+ (25%)*	+ (25%)	+ (no limit)
Uvinul [®] TiO2	+ (25%)	+ (25%)	+ (no limit)
T-Lite [™] SF	+ (25%)	+ (25%)	+ (no limit)
T-Lite [™] SF-S	+ (25%)	+ (25%)	+ (no limit)

+ = Approved as a sunscreen agent (with max. concentration)

- = Not approved

* = preliminary approved in Germany up to 25%, EU pending

In the EU, cosmetics that contain more than 0.5% Uvinul[®] M 40 for skin protection must be labeled, „Contains oxybenzone“.

Use of the Uvinul® grades in Protecting sensitive products (product protection)

UV filters can be used in cosmetics to protect the colorants against fading, to improve the stability of fragrance oils and active constituents against oxidation and to stabilize the viscosity of gels and shampoos. It is always necessary to add a UV filter if the cosmetic product is exposed to UV radiation, as is the case when the packaging is transparent. The protection of products usually requires concentrations of 0.05 - 0.5%, rather less than for skin protection. In these concentrations, the Uvinul® grades are generally not subject to legislation (though such legislation as exists must be observed), i. e. all the Uvinul® grades can, in principle, be used to protect products against UV radiation.

Particularly Uvinul® A Plus, A Plus B, M 40 and MS 40 have proved effective in protecting colorants against fading, though their efficiency depends on the colorant and on the medium in which it is used.

It is recommended that users conduct their own tests on their finished products.

Apart from the protection they offer against UV rays, the solubility of the individual Uvinul® grades also determines their suitability for a particular product. Tables 2 and 3 show their solubility in solvents of different polarity. Further data can be found in the descriptions of the products.

Table 2

Solubility in % at 20°C

	Ethanol	Propylene Glycol	Luvitol® EHO	Miglyol® 812	IPM	Liquid paraffin
Uvinul® M 40	approx. 6	approx. 1	approx. 7	approx. 15	approx. 12	approx. 1,5

Table 3

Solubility in % at 20°C

	Water	Ethanol	Propylene Glycol
Uvinul® MS 40 (neutralized with TEA)	approx. 34	approx. 2	approx. 15
Uvinul® DS 49	approx. 5	< 0,01	approx. 1

Use of the Uvinul® grades in protecting the hair

Both the ultraviolet and visible components of sunlight have tangible effects on the hair in that they bleach it and make it brittle. As has been demonstrated in studies, it is possible to provide protection against these effects with UV filters. Broad-band filters such as the benzophenones are particularly suitable and can be used in hair-care products such as gels, setting lotions, normal and gloss hair sprays. But UV-B filters such as Uvinul® MC 80 are also effective.

Specifications

Uvinul® MC 80 and MC 80 N

Parameter	Specification
Assay (GC, USP)	95.0 - 105.0 g/100 g
Purity (GC)	min. 99 area-%
$A_{1\text{cm}}^{1\%}$ at $\lambda = 310 \text{ nm}$	min. 850
Chromatographic purity (GC, USP)	max. 0.5% individual impurity max. 2.0% total impurities
Ethylhexanol (GC)	max. 20.0 mg/kg
Hazen colour	max. 70
Odour	Very weak, characteristic
Refractive index (USP)	1.542 - 1.548
Acid value	max. 1.0 mg KOH/g
Peroxide value (Wheeler)	max. 1.0 meq/kg
Specific Gravity (USP)	1.005 - 1.013 g/cm ³
Identification (USP)	
a) IR	passes current USP
b) UV	passes current USP
Acidity (USP)	passes current USP analogous USP
Appearance	Colourless slightly yellow liquid

The product meets USP requirements.

Uvinul® T 150

Parameter	Specification
Assay (UV)	98.0 - 103.0%
$A_{1\text{cm}}^{1\%}$ in ethanol at 314 nm	min. 1,500
Melting point	128.0 - 132.0
Colour (Gardner, 100 g/l in Acetone)	max. 2
Water (Karl Fischer)	max. 0.5 g/100 g

Uvinul® N 539 T

Parameter	Specification
Assay (GC)	95.0 - 105.0 g/100 g
Purity (GC) Impurities	min. 98.0 area-% Benzophenone max. 0.5 area-% any impurity max. 0.5 area-% total impurities max. 2.0 area-%
$A_{1\text{cm}}^{1\%}$ in methanol	340 - 369
K-value	34.0 - 36.9
λ_{max}	300 - 304 nm
Identification UV Spectrum	conforms
Specific gravity (D 25/25)	1.045 - 1.055
Refractive index (n 20/D)	1.561 - 1.571
Acidity	conforms
Colour (Gardner)	max. 4.0
Appearance	conforms

The product meets USP requirements.

Uvinul® MS 40

Parameter	Specification
Assay (dry product by titration)	97.0 - 103.0%
Water (Karl Fischer)	max. 2.0 g/100 g
Identification (UV)	conforms
A $\frac{1\%}{1\text{ cm}}$ in water at 286 nm K-value	460-490 46-49
Colour (Gardner, 100 g/l in water)	max. 4.0
Sulfuric acid (titration)	max. 0.5 g/100 g

The product meets USP requirements.

Uvinul® M 40

Parameter	Specification
1. Assay (dried product by UV)	97.0-103.0%
2. Loss on drying	max. 2%
3. Identification (UV and IR)	conforms
4. Melting point	62.0-65.0°C
5. Congealing point	62.0-65.0°C
6. A $\frac{1\%}{1\text{ cm}}$ in methanol at 287 nm K-value 64-67	640-670
7. Colour (Gardner, 100 g/l in toluene)	max. 4.0

The product meets USP requirements.

Uvinul® P 25

Parameter	Specification
A $\frac{1\%}{1\text{ cm}}$ at 309 nm in water	160 - 180
Colour (Gardner)	max. 4.0
Cloud Point (10% in water)	60 - 67°C
Appearance (at 50°C)	clear, slightly yellow to brownish viscous liquid
λ_{max} . (in water)	306 - 312
Water (Karl Fischer)	max. 1%
pH (10% in water)	5 - 7

Uvinul® DS 49

Parameter	Specification
A $\frac{1\%}{1\text{ cm}}$ at 331 nm in water	165 - 175
Colour (Gardner, 10 g/l in water)	max. 5.0

Uvinul® A Plus

Parameter	Specification
Purity (GC)	min. 98.0 area-%
A $\frac{1\%}{1\text{ cm}}$ value at 354 nm	min. 910 max. 940
Colour (Gardner)	max. 8.2
Identity UV	min. 352 nm max. 356 nm
Odour	conforms
Appearance	conforms

Uvinul® A Plus B

Parameter	Specification
Concentration Uvinul® A Plus (GC)	min. 35 area-% max. 37 area-%
Concentration Uvinul® MC 80 (GC)	min. 63 area-% max. 65 area-%
Odour	conforms
Appearance	conforms

Z-COTE®

Parameter	Specification
Assay (USP)	99.0 - 100.5%
Loss on ignition	max. 1.0%
Identification A/Identification B	passes current USP
Average Particle Size	less than 0.2 μ
Pb	passes currently USP
As	max. 6 ppm
Iron and other heavy metals	passes current USP
Carbonate & Color	passes current USP
Alkalinity	passes current USP

The product meets USP requirements.

Z-COTE® HP1

Parameter	Specification
Assay*(USP)	99.0-100.5%
Loss on ignition (as coated)	max. 2.0%
Loss on drying (as coated)	max. 1.0%
Identification A*/Identification B*	passes current USP
Average Particle Size	less than 0.2 µ
Pb*	passes current USP
As*	max. 6 ppm
Iron & other heavy metals*	passes current USP
Carbonate & Color*	passes current USP
Alkalinity*	passes current USP
Loss on ignition*	max. 1.0%

*Refers to zinc oxide prior to coating

The product meets USP requirements.

Z-COTE® MAX™

Parameter	Specification
Assay*(USP)	99.0 to 100.5%
Identification A*/Identification B*	passes current USP
Specific Surface Area (BET)	12 to 24 m ² /g
Pb*	passes current USP
As*	max. 6 ppm
Iron & other heavy metals*	passes current USP
Carbonate & Color*	passes current USP
Alkalinity*	passes current USP
Loss on ignition*	max. 1.0%
Loss on ignition (as coated)	max. 2.5%

*Refers to zinc oxide prior to coating

The product meets USP requirements.

Uvinul® TiO2

Parameter	Specification
Specific Surface Area (BET)	35-55 m ² /g
pH-value (4% dispersion)	3.0-4.0
Carbon content	2.7-3.7%

The product meets USP requirements.

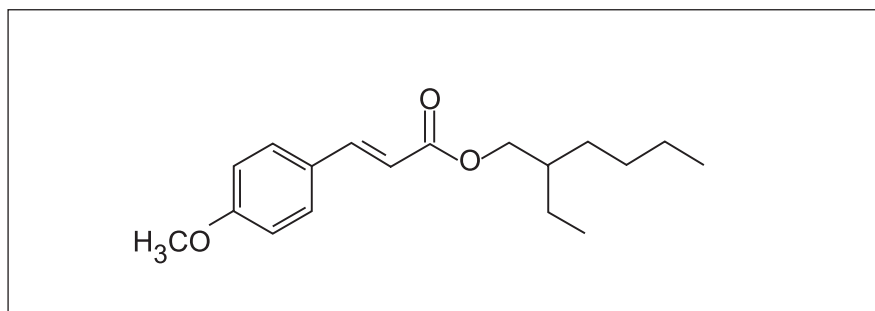
T-Lite™ SF and T-Lite™ SF-S

Parameter	Specification
Identification (IR)	conforms
Appearance (white powder)	conforms
Loss on drying	max 2.0g/100g
Hydrophobicity	conforms
TiO ₂ content (prior to coating)	min 99.0 g/100g max 100.5 g/100g
Lead as Pb	max 10 mg/kg
Arsenic as As	max 1 mg/kg
Antimony as Sb	max 2 mg/kg
Mercury as Hg	< 1 mg/kg
Loss on ignition	max 13 g/100g
Water-soluble substances	max 0.25 g/100g
Acid-soluble substances	max 0.5 g/100g
Organic volatile impurities	conforms
Odor (odorless)	conforms

These products meet USP requirements

Table 4**Physicochemical properties of the Uvinul®, T-Lite™ and Z-COTE® grades**

	Molecular formula	Molecular weight	Appearance
Uvinul® MC 80 (both grades)	C ₁₈ H ₂₆ O ₃	290	Colourless to light yellow liquid
Uvinul® T 150	C ₄₈ H ₆₆ N ₆ O ₆	823	White to light yellow powder
Uvinul® N 539 T	C ₂₄ H ₂₇ NO ₂	361	Clear yellow viscous liquid
Uvinul® M 40	C ₁₄ H ₁₂ O ₃	228	Light yellow powder
Uvinul® MS 40	C ₁₄ H ₁₂ O ₆ S	308	Off white fine to coarse powder
Uvinul® P 25	C ₅₉ H ₁₁₁ NO ₂₇	approx. 1265	Light yellow wax that melts to a clear liquid at 30-40°C
Uvinul® DS 49	C ₁₅ H ₁₂ O ₁₁ S ₂ Na ₂	478	Light yellow powder
Uvinul® A Plus	C ₂₄ H ₃₁ NO ₄	397	Yellow melt that crystallizes upon storage. It remelts easily without any decomposition by heating it up to approx. 70-80°C.
Uvinul® A Plus B	C ₁₈ H ₂₆ O ₃ C ₂₄ H ₃₁ NO ₄	290 397	Yellow solution
Z-COTE®	ZnO	81	White powder
Z-COTE® HP 1	ZnO	81 (for ZnO)	White powder
Z-COTE® MAX™	ZnO	81 (for ZnO)	White powder
T-Lite™ SF	TiO ₂	80 (for TiO ₂)	White powder
T-Lite™ SF-S	TiO ₂	80 (for TiO ₂)	White powder
Uvinul® TiO2	TiO ₂	80 (for TiO ₂)	White powder

Uvinul® MC 80 and MC 80 N**Structural formula****Chemical name**

p-Methoxycinnamic acid 2-ethylhexyl ester

CAS number

5466-77-3

Description

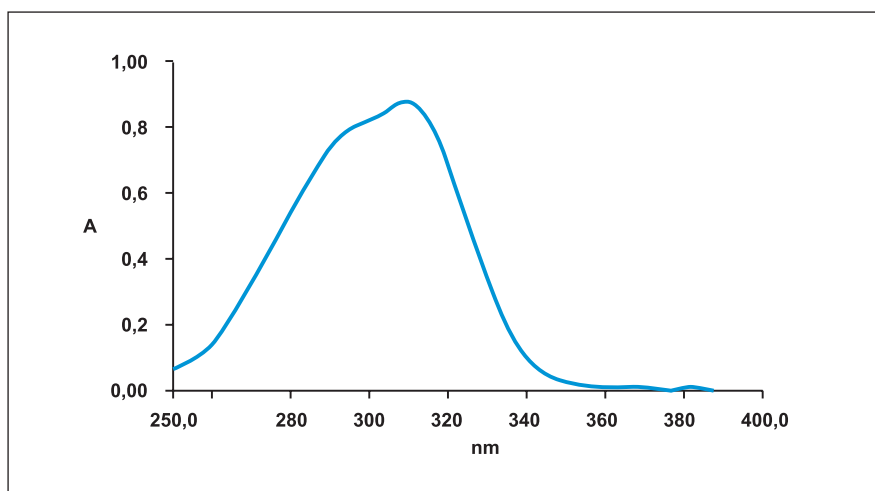
The product is available in 2 different grades:

Uvinul® MC 80: stabilized with 0.07 ± 0.02% BHT

Uvinul® MC 80 N: unstabilized

UV spectrum**Uvinul® MC 80**

(10 mg/l in ethanol)

**Properties and applications**

Uvinul® MC 80 is approved worldwide and is the most frequently used UV filter. It can readily be incorporated without problem in all the usual cosmetic raw materials (fats and oils).

Table 5**Miscibility of Uvinul® MC 80**

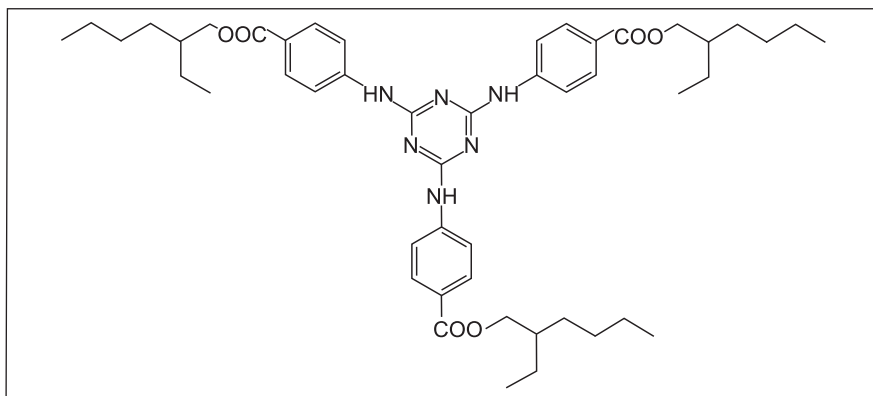
Solvent	Supplier*	Solubility
Paraffin oil		Freely miscible
Jojoba oil		Freely miscible
Arachis oil		Freely miscible
Olive oil	(126)	Freely miscible
Witconol® APM	(47)	Freely miscible
Isopropyl myristate		Freely miscible
Isopropyl palmitate		Freely miscible
Cetiol® V	(27)	Freely miscible
Miglyol® 812	(11)	Freely miscible
Finsolv® TN	(101)	Freely miscible
Ethanol		Freely miscible
Isopropanol		Freely miscible
Water		Insoluble
Water/ethanol (to 1 : 7)		Insoluble
Water/isopropanol (to 1 : 7)		Insoluble

* suppliers see pages 22 and 23

Uvinul® MC 80 is a good solvent for other ingredients of suncare products, e. g. Uvinul® T 150 (see Table 6).

Thanks to a new manufacturing process, Uvinul® MC 80 always gives a negative result in the Ames test.

The product is available in 2 different grades, giving the user a choice of stabilizer systems.

Uvinul® T 150**Structural formula****Chemical name**

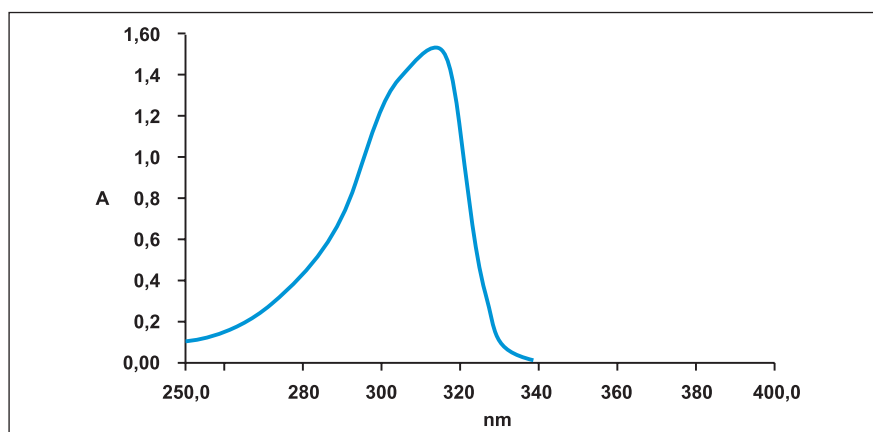
2,4,6-Trianilino-p-(carbo-2'-ethyl-hexyl-1'-oxi)-1,3,5-triazin

CAS number

88122-99-0

UV spectrum

Uvinul® T 150 (10 mg/l in ethanol)



Properties and application

Uvinul® T 150 is a highly effective UV-B filter with an exceptionally high absorptivity of over 1,500 at 314 nm. Because of its high A1/1 value, only small concentrations are required in cosmetic sun care preparations, to achieve a high SPF value. Concentrations up to 3% are recommended.

The polar nature of Uvinul® T 150 gives it good affinity to the keratin in the skin, so that formulations in which it is used are particularly water-resistant. This property is further enhanced by its complete insolubility in water.

As Table 6 shows, Uvinul® 150 dissolves readily in polar oils such as Cetiol® HE, Velsan® D8P-3, the Cosmacol® - and Myritol® grades, and Witconol® APM. Non-polar oils such as liquid paraffin are unsuitable.

Uvinul® T 150 can crystallize after prolonged storage, as a result of supersaturation.

Some of these oils are mentioned in patents, and these must be respected.

We are able to offer a free license to 31 patents which cover the use of Uvinul® T 150 in combination with many different oils and emulsifiers. This formulation know-how allows the use of Uvinul® T 150 in concentrations up to 5%. A table with all 31 patents is available on request.

Uvinul® T 150 is also very stable towards light. It remains practically unchanged, even when it is exposed to intense radiation.

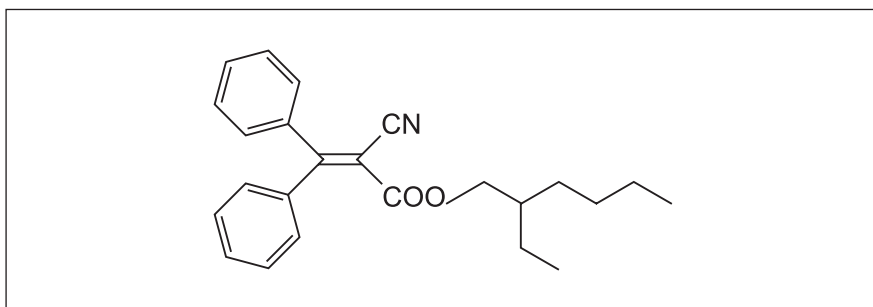
Uvinul® T 150 is usually dissolved in the oily phase of the emulsion.

Table 6

Solubility of Uvinul® T 150 in different oils

Trade name	Supplier*	INCI name	Concentration
Ceraphyl® 45	(65)	Diethyl Malate	13%
Cetiol® A	(27)	Hexyl Laurate	8%
Cetiol® HE	(27)	PEG-7 Glyceryl Cocoate	15%
Cosmacol® ECI	(165)	Tri-C12-13 Alkyl Citrate	17%
Cosmacol® ELI	(165)	C12-13 Alkyl Lactate	22%
Cosmacol® EMI	(165)	Di-C12-13 Alkyl Malate	23%
Cosmacol® EOI	(165)	C 12-13 Alkyl Octanoate	24%
Cosmacol® ESI	(165)	Tridecyl Salicylate	10%
Cosmacol® ETI	(165)	Di-C12-13 Alkyl Tartrate	35%
Cremophor® W07		PEG-7 Hydrogenated Castor Oil	10%
Crodamol® DOA	(13)	Diethyl Adipate	9%
Crodamol® HE	(13)	PEG-7 Glyceryl Cocoate	12%
Crodamol® PMP	(13)	PPG-2 Myristyl Ether Propionate	8%
DUB Synersol®	(181)	Isodecyl Neopentanoate (and) Diisopropyl Sebacate (and) Lauryl Lactate	16%
Estol® 1526	(48)	Propylene Glycol Dicaprylate/ Dicaprate	10%
Miglyol® 840	(11)	Propylene Glycol Dicaprylate/ Caprate	13%
Myritol® 311	(27)	Cocoglycerides	8%
Myritol® 331	(27)	Cocoglycerides	10%
Prisorine® 2034		Propylene Glycol Monoisostearate	9%
Uvinul® MC 80		Ethylhexyl Methoxycinnamate	13%
Velsan® D8P-3	(28)	Isopropyl PPG-2 Isodeceth-7-Carboxylate	26%
Witconol® APM	(47)	PPG-3 Myristyl Ether	14%

* suppliers see pages 22 and 23

Uvinul® N 539 T**Structural formula****Chemical name**

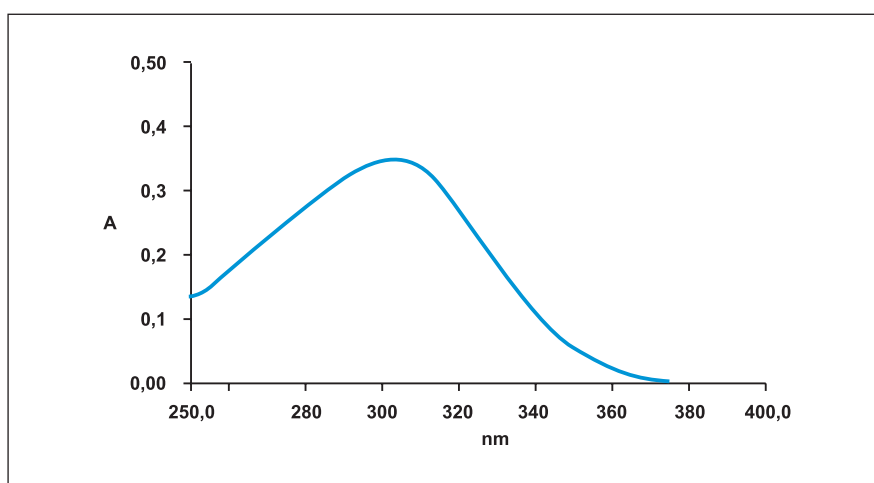
2-Cyano-3,3-diphenylacrylic acid 2'-ethylhexyl ester

CAS number

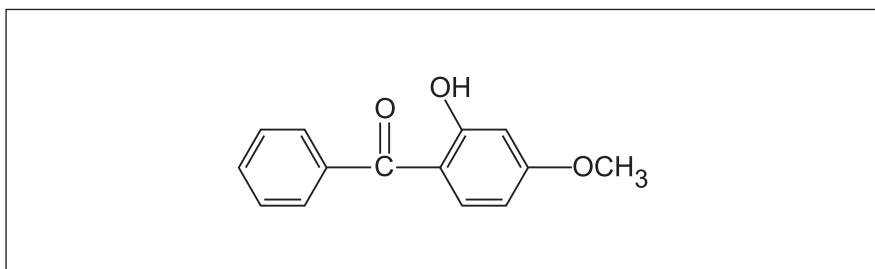
6197-30-4

UV spectrum**Uvinul® N 539 T**

(10 mg/l in ethanol)

**Properties and applications**

Uvinul® N 539 T is an oil-miscible UV-B filter that is approved in the USA, Europe and in Japan for use in sun care preparations. As it is miscible with many cosmetic oils, it can easily be incorporated in the oily phase of an emulsion. Because it is hydrophobic and oil-soluble, it is preferred for water-resistant and water-repellant formulations. It is particularly recommended to combine Uvinul® N 539 T with other oil-soluble UV filters such as Uvinul® M 40 or MC 80 to obtain high SPF values. A further feature of Uvinul® N 539 T is its excellent photostability, and its ability to stabilize Butyl Methoxydibenzoylmethane (please note the patents on this application).

Uvinul® M 40**Structural formula****Chemical name**

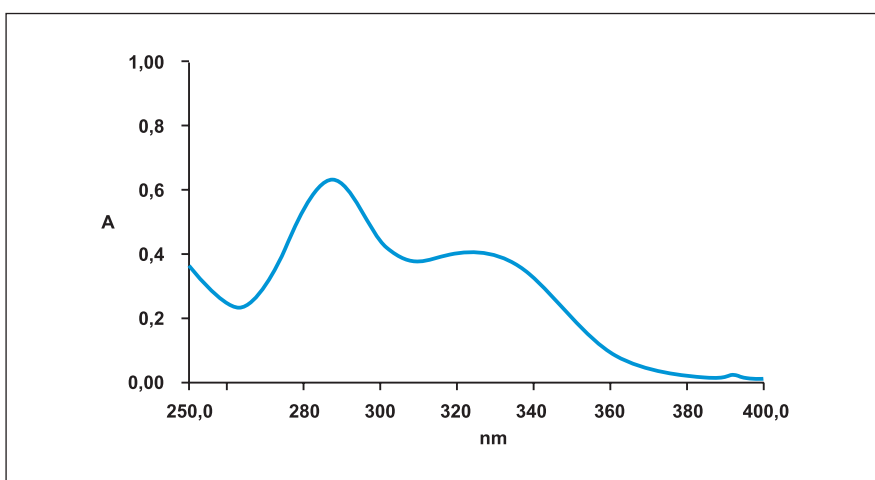
2-Hydroxy-4-methoxybenzophenone

CAS number

131-57-7

UV spectrum**Uvinul® M 40**

(10 mg/l in ethanol)

**Properties and applications**

Since Uvinul® M 40 is approved for skin care in the EU, the USA and Japan, it is widely used in sun preparations. Uvinul® M 40 is a broad-band filter and can therefore also be used in day creams to prevent premature ageing of the skin and to protect the lips.

As it is soluble in oil, Uvinul® M 40 is incorporated in the oily phase. Its solubility in different oils is shown in Tables 2 and 7.

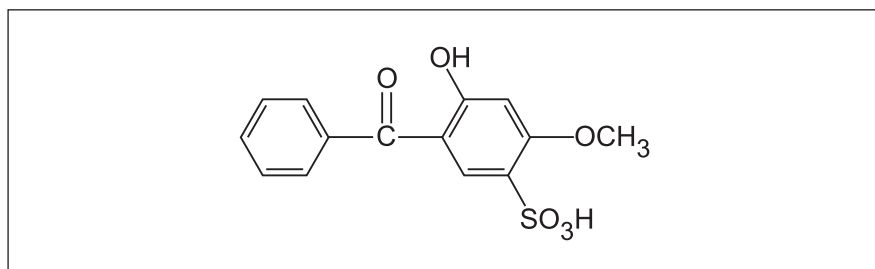
Polar oils such as Luvitol EHO, isopropyl myristate, Miglyol 812, Finsolv TN, and Cetiol HE are particularly suitable.

Non-polar oils such as liquid paraffin are less suitable as Uvinul® M 40 can crystallize out as a result of supersaturation after prolonged storage.

Table 7**Solubility of Uvinul® M 40 in different oils**

Solvent	Supplier*	Concentration
Glycerin		< 0.01%
Abil® AV 8853	(44)	2.0%
Jojoba oil		6.0%
Isostearyl stearate		7.0%
Isostearyl neopentanoate		8.0%
Olive oil		9.0%
Peanut oil		9.0%
Cetiol® V	(27)	9.0%
Isopropyl stearate		9.0%
Isopropyl myristate		11.0%
Miglyol® 812	(11)	14.0%
Finsolv® TN	(101)	15.0%
Cetiol® HE	(27)	17.0%

* suppliers see pages 22 and 23

Uvinul® MS 40**Structural formula****Chemical name**

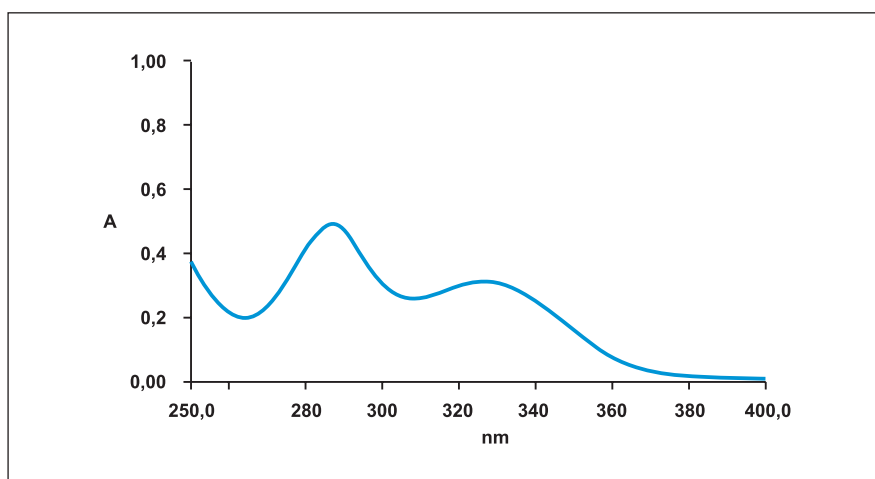
2-Hydroxy-4-methoxybenzophenone-5-sulfonic acid

CAS number

4065-45-6

UV spectrum

Uvinul® MS 40 neutralized with triethanolamine (10 mg/l in H₂O)

**Properties and applications**

The sulfonic acid group makes Uvinul® MS 40 soluble in water. The acid group must be neutralized with one of the usual neutralizing agents, e. g. triethanolamine, NaOH etc. The neutralizing agent has no effect on the absorption characteristics. However, if the product is overneutralized (pH 9), the absorption curve is shifted towards shorter wavelengths.

The quantities of neutralizing agent required to completely neutralize 100 g of Uvinul® MS 40 are as follows:

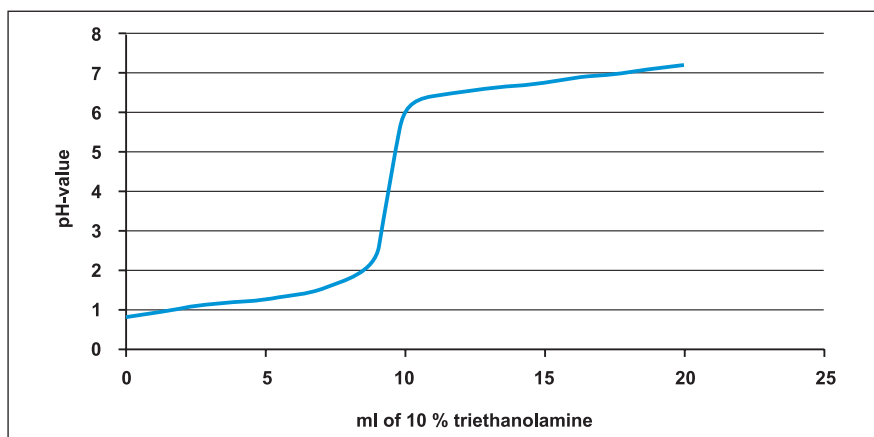
NaOH	approx. 13.0 g
TEA	approx. 50.0 g

The pH value of the resulting solutions lies between 5.6 and 6.0.

Fig. 1 shows a neutralization curve for TEA.

Neutralization curve of Uvinul® MS 40 (100 g of a 2% solution) with triethanolamine

Fig. 1



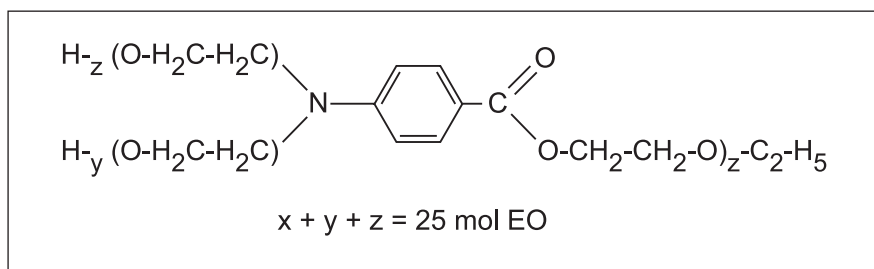
As Uvinul® MS 40 is approved in the EU, the USA and Japan for skin protection, it is widely used in sun preparations.

A combination of an oil-soluble UV filter, e. g. Uvinul® M 40 or MC 80 and a water-soluble UV filter, e. g. Uvinul® MS 40 is recommended for the highest sunprotection factors.

Tests have shown that Uvinul® MS 40 stabilizes the viscosity of gels based on polyacrylic acid (Carbopol, Pemulen) when they are exposed to UV radiation. Concentrations as low as 0.1% provide good results.

It must be noted that Uvinul® MS 40 is not compatible with Mg salts, particularly in W/O emulsions.

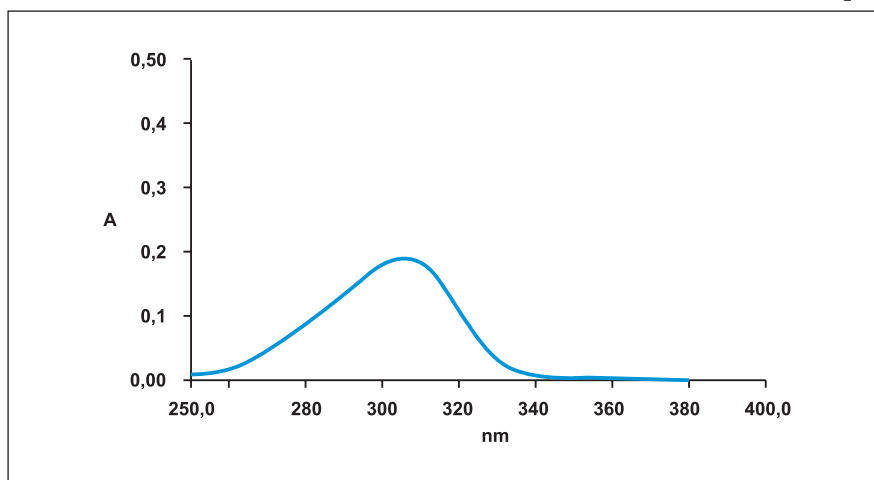
Uvinul® MS 40 has a yellow colour that becomes more intensive in the alkaline range and may alter the hue of coloured solutions.

Uvinul® P 25**Structural formula****Chemical name**

4-Bis(polyethoxy)para-aminobenzoic acid polyethoxyethyl ester

CAS number

113010-52-9

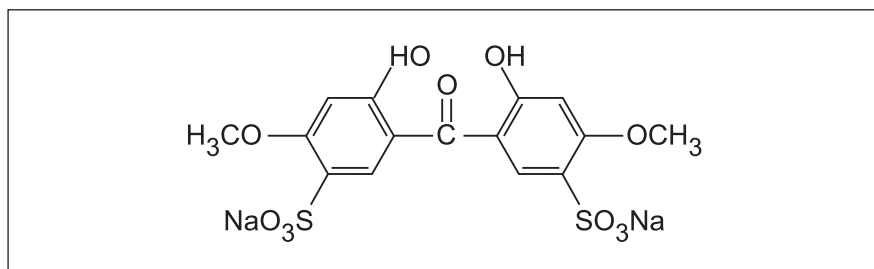
UV spectrum**Uvinul® P 25**(10 mg/l in H₂O)**Properties and applications**

Uvinul® P 25 is used in skin cosmetics for which a water-soluble UV-B filter is desired.

Its good solubility in water is a result of the high polyethylene glycol content in the molecule. This is also the reason why it readily forms emulsions and is mild to the skin - important features of Uvinul® P 25.

Its nonionic nature makes it possible to incorporate it in relatively labile emulsion systems.

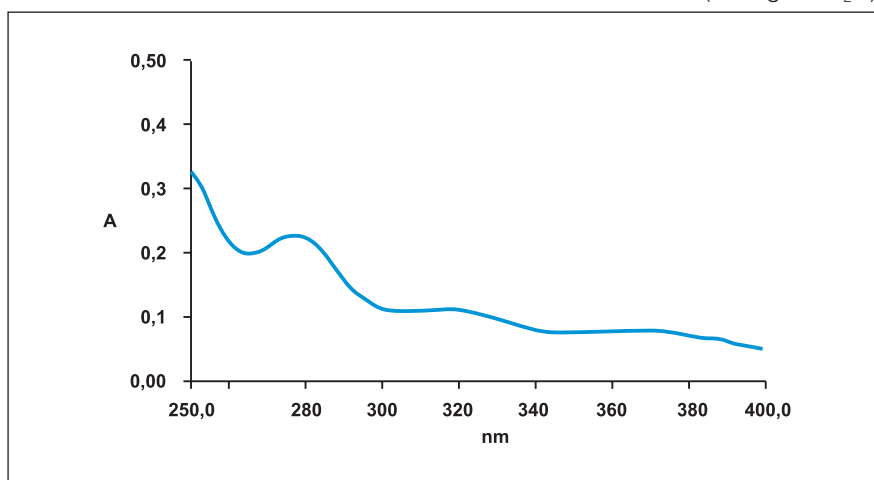
Uvinul® P 25 is stable in aqueous solutions, but strong acids and bases may saponify its ester ingredients.

Uvinul® DS 49**Structural formula****Chemical name**

2,2'-Dihydroxy-4,4'-dimethoxybenzophenone-5,5'-disodium sulfonate

CAS number

76656-36-5

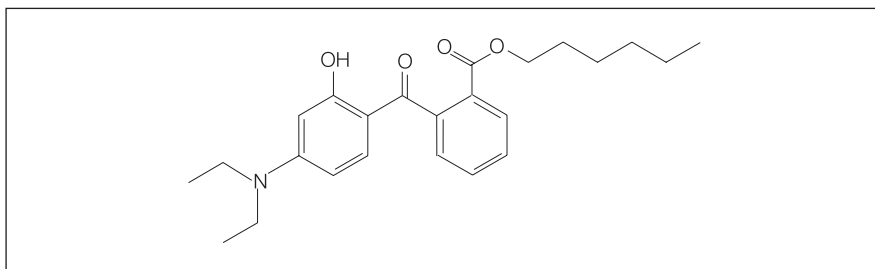
UV spectrum**Uvinul® DS 49**(10 mg/l in H₂O)**Properties and applications**

Uvinul® grade DS 49 is used to protect products from UV radiation.

It is used to protect colorants, active ingredients and fragrances in cosmetic preparations against the damaging effects of UV radiation.

Uvinul® A Plus

Structural formula



Chemical name

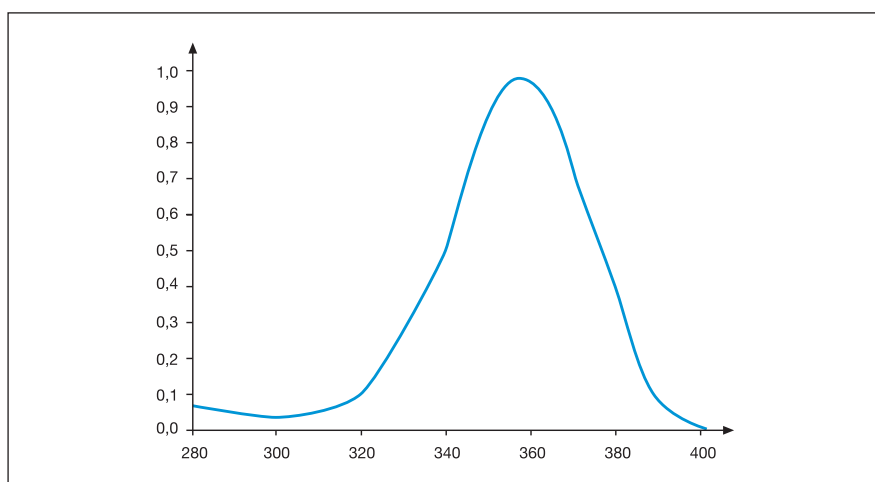
2-(4-Diethylamino-2-hydroxybenzoyl)- benzoic acid hexylester

CAS-No.

302776-68-7

UV spectrum

Uvinul® A Plus



Properties and applications

Uvinul® A Plus is a new photostable organic UVA-I absorber that covers the long wavelengths of the UVA spectrum. The product has a good solubility in cosmetic oils and is compatible with other ingredients, e.g. micronized TiO₂ and ZnO. Due to its high melting point (54°C) the product – a yellow melt – crystallizes during delivery or storage. It therefore has to be remelted at 70°C before use by the customer (Recommended Melting Procedure: Place the whole drum in the oven at a temperature of maximum 70°C overnight. No stirring necessary). If customers prefer a “ready to use” solution a second product type Uvinul® A Plus B is offered as a solution (35% Uvinul® A Plus in 65% Uvinul® MC 80).

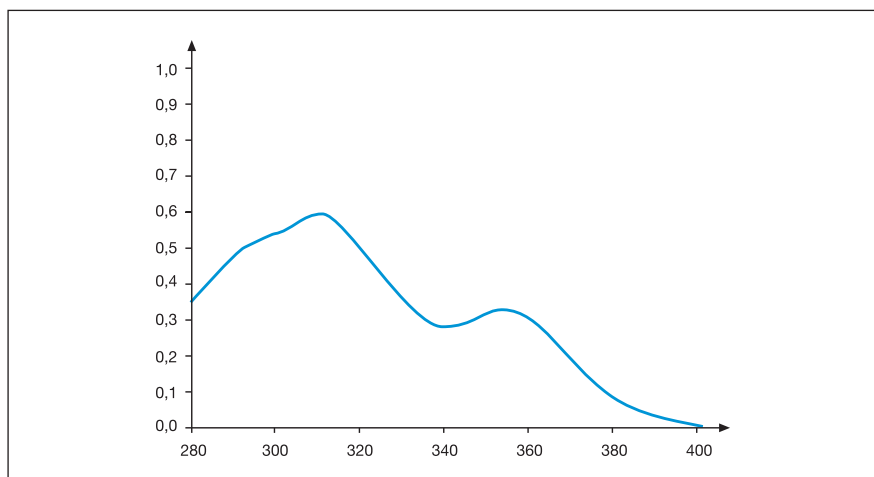
The outstanding photostability of Uvinul® A Plus provides reliable and efficient sun protection for the whole day.

Uvinul® A Plus B**Chemical name**

p-Methoxycinnamic acid 2-ethylhexyl ester (and) 2-(4-Diethylamino-2-hydroxy-benzoyl)-benzoic acid hexylester

CAS-No.

5466-77-3
302776-68-7

UV spectrum**Uvinul® A Plus B****Properties and applications**

Uvinul® A Plus B is a ready to use solution consisting of Uvinul® A Plus dissolved in Uvinul® MC 80 (35% Uvinul® A Plus in 65% Uvinul® MC 80). The solution has a viscosity of 1600 m·Pas at room temperature. Uvinul® A Plus B should be kept above 22°C to avoid crystallisation.

Z-COTE® / Z-COTE® HP 1 / Z-COTE® MAX™

Z-COTE® is an inorganic micronized pigment dry powder. The product line comes in three grades:

Z-COTE®

Chemical name Zinc Oxide
CAS No. 1314-13-2

Z-COTE® HP1

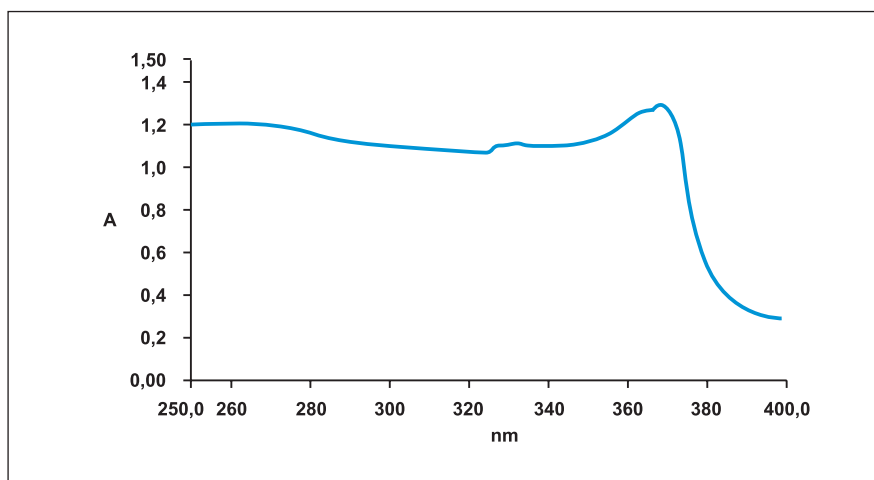
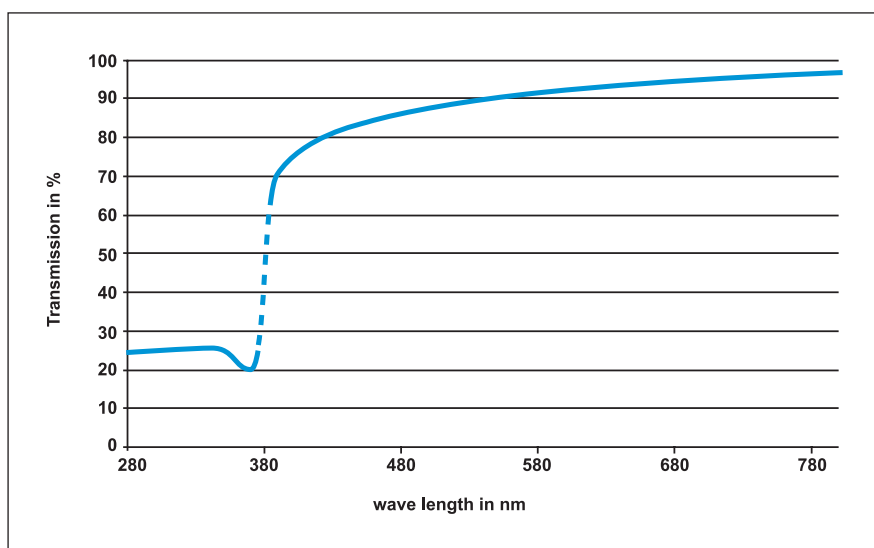
Chemical name Zinc oxide (and) Triethoxycaprylylsilane
CAS No. 1314-13-2, 2943-75-1

Z-COTE® MAX™

Chemical name Zinc Oxide (and) Dimethoxydiphenylsilane/Triethoxycaprylylsilane Crosspolymer
CAS No. 1314-13-2, 827036-50-0

UV absorption curve**Z-COTE® and Z-COTE® HP 1**

(5% dispersion in vaseline)

**Z-COTE® MAX™**

Applications

Zinc oxide is known for its skin compatibility since it is used as a skin protectant. It has antimicrobial properties and is non toxic.

Zinc oxide has broad-spectrum UV attenuation properties due to its absorbing and reflecting properties. This makes it an ideal candidate to formulate skincare products with broad-spectrum characteristics. It is particularly recommended for daily care and children's products.

The combination of zinc oxide with organic UV filters allows the formulation of very effective broad-spectrum skincare products. Compared to titanium dioxide, zinc oxide provides additional UVA protection. All Z-COTE® grades cover from 290 – 380 nm.

Z-COTE® is uncoated micronized zinc oxide and has an amphiphilic nature. It is preferentially incorporated into the water phase of a formulation.

Z-COTE® HP1 consists of approx 98% micronized zinc oxide and approx 2% of hydrophobic coating material (silicone derivative). It can be dispersed into the oil phase of a formulation.

Z-COTE® MAX™ is an innovative microfine zinc oxide grade that allows formulation freedom not possible with current zinc oxide products. It consists of approx. 96 – 99% micronized zinc oxide and 1-4% polar/hydrophobic coating (silicone derivative).

The biggest advantage of Z-COTE® MAX™ is its better compatibility with acrylate-based thickeners e.g. carbomer. Furthermore, it is dispersible in a wide range of oils and easier to disperse at high and low shear.

All Z-COTE® grades are recommended for the combination with organic sunscreens providing UVB protection. Substantial synergistic effects can be achieved namely with Uvinul® T 150, Uvinul® MC 80 or Uvinul® 539 T.

The product quality of all All Z-COTE® grades is in agreement with current USP requirements.

T-Lite™ SF / T-Lite™ SF-S

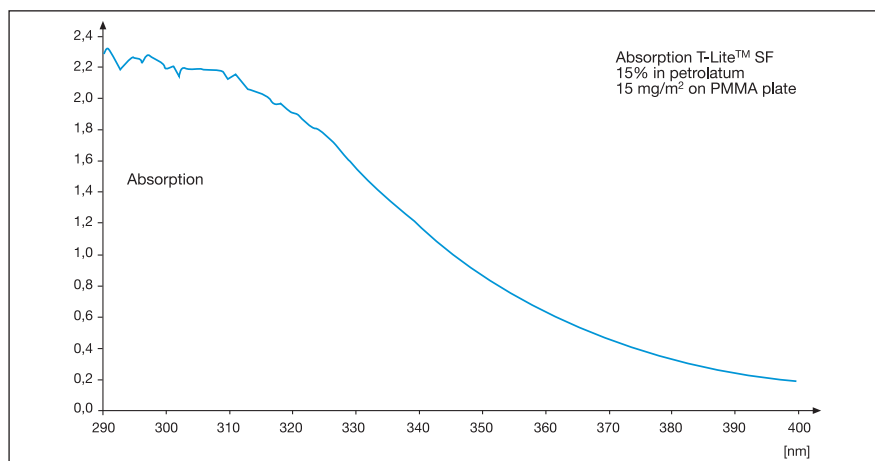
T-Lite™ is a microfine titanium dioxide. Two grades are available:

T-Lite™ SF**Chemical name**

Titanium Dioxide (and) Aluminum Hydroxide (and) Dimethicone/Methicone Copolymer

CAS-No.

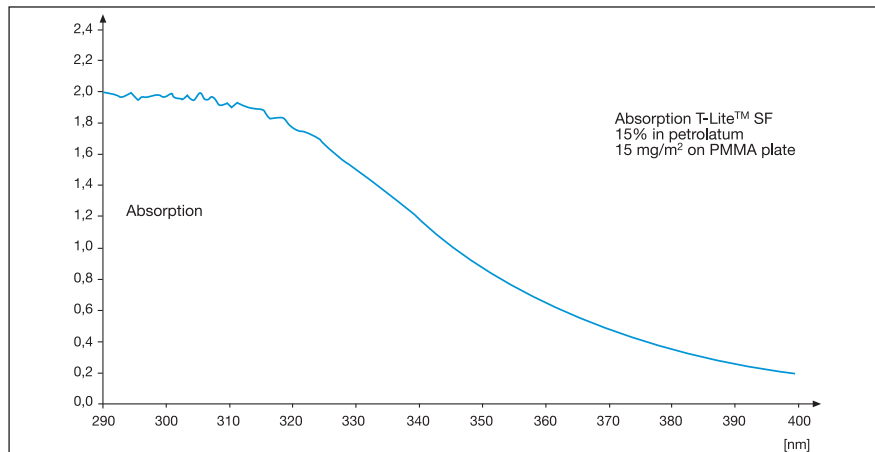
13463-67-7; 21645-51-2; 68037-59-2

**T-Lite™ SF-S****Chemical name**

Titanium Dioxide (and) Hydrated Silica (and) Aluminum Hydroxide (and) Dimethicone/Methicone copolymer

CAS-No.

13463-67-7; 1343-98-2; 21645-51-2; 68037-59-2



T-Lite™ grades are high performance, rutile microfine titanium dioxides, for transparent, broad-spectrum protection in all types of sunscreen applications. In addition, T-Lite™ grades provide excellent formulation flexibility for a wide application range.

T-Lite™ SF combines high performance with outstanding transparency.

T-Lite™ SF-S is a high-performance product with unique cosmetic elegance.

Both grades provide broad UVA and UVB protection, most importantly the long UVA I and short UVA II ranges are covered.

All grades represent excellent transparency and SPF protection at high concentrations even at 8% plus. T-Lite™ grades are easy to disperse, photostable (non-catalytic) and compatible with stearates. They can be used at high temperatures (80-100°C) and high shear. Further, T-Lite™ works synergistically with organic filters.

The product quality of the T-Lite™ grades is in agreement with USP requirements.

Uvinul® TiO₂**Chemical name**

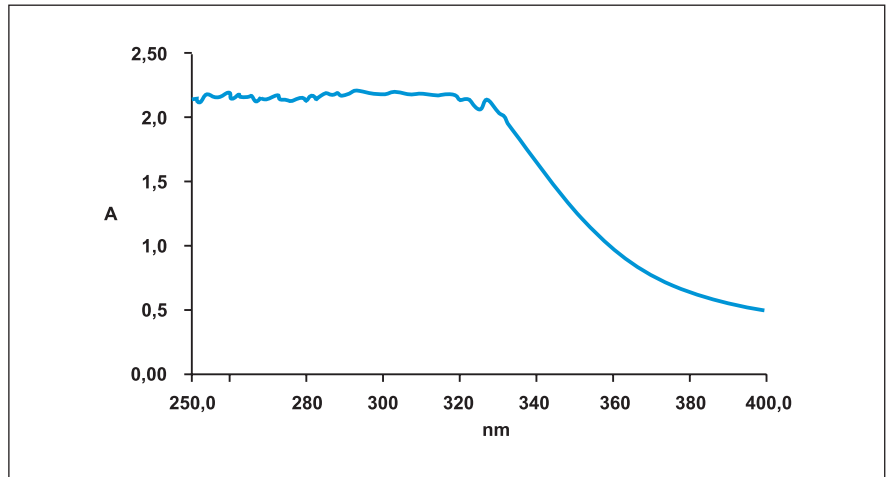
Titanium Dioxide (and) Trimethoxycaprylsilane

CAS-No.

13463-67-7, 3069-40-7

UV absorption curve**Uvinul® TiO₂**

(5% dispersion in vaseline)



Uvinul® TiO₂ is a surface treated micronized pigment. Due to the very small particle size whitening effect on the skin can be avoided. The surface treatment (coating) ensures easy incorporation into sunscreen formulations and prevents agglomeration of formulations and photocatalytic activity.

The product is manufactured via a flame hydrolysis process (fumed titania) yielding titanium dioxide with a high purity (min. 99.5% TiO₂ before coating) and a high specific surface area (approx. 50 m²/g). The crystalline structure consists of 75% anatase and 25% rutile. The primary particle size is at an average diameter of about 21 nm. These particles form agglomerates of 100 nm which form a dispersion in the oil phase.

The coating consists of Trimethoxyoctylsilyl groups which replace the OH groups of the metal surface. They are chemically bonded and stable against hydrolysis.

The product consists of approx. 95% TiO₂ and 5% coating material.

Uvinul® TiO₂ is used to generate high SPF values in sunscreen formulations. In combination with organic filters, e. g. Uvinul® MC 80, T 150, N 539 T and MBC 95 it shows strong synergistic effects.

The product quality of Uvinul® TiO₂ is in agreement with USP requirements.

Key Target Applications

Sun / Beach / Seasonal and Sports Care

- Protection against harmful effects of UVB and UVA radiation resulting from sun exposure
- Protection from sunburn, premature skin-ageing and photo carcinogenesis

Daily Care

- Protection against harmful UVB radiation
- Protection against UVA radiation which has been shown to increase premature skin-ageing, including wrinkles and loss of elasticity
- T-Lite™ allows transparent and elegant daily care formulations

Color Cosmetics

- Protection against broad-spectrum UV radiation without compromising cosmetic elegance
- T-Lite™ provides excellent transparency, and thus does not effect the color shade

SPF Booster (all applications)

- Small amount of T-Lite™ is sufficient to boost the overall efficacy of sun protection products
- T-Lite™ increases the optical path length and thus enhances efficiency of organic absorbers – total percentage of sunscreen can be reduced

Stability

The minimum storage times for the different Uvinul® grades in the original sealed containers are as follows:

1 year	2 years	3 years
MC 80 N	MC 80	M 40
	T 150	
	TiO2	
	Z-COTE®	
	Z-COTE® HP 1	
	Z-COTE® MAX™	
	N 539 T	
	MS 40	
	P 25	
	DS 49	
	A Plus	
	A Plus B	
	T-Lite™ SF	
	T-Lite™ SF-S	

Toxicology

The Uvinul® range of UV absorbers and micro pigments have been toxicologically assessed for their suitability in cosmetic preparations. On the basis of information at our disposal and provided that the recommended concentrations and fields of application are adhered to, there is no evidence of any toxicological risk associated with their use.

Safety Data Sheets

Safety Data Sheets are available on request.

Suppliers

1. **BASF Aktiengesellschaft**
67056 Ludwigshafen, Germany
Phone: (0621) 60-0
Fax: (0621) 60-42525
11. **Sasol Germany GmbH**
Paul Baumann-Strasse 1, D-45764 Marl, Germany
Phone: 49 2365 49-4863
Fax: 49 2365 49-6935
13. **Croda Oleochemicals Cowick Hall, Snaith, Goole**
Croda Oleochemicals Cowick Hall, Snaith, Goole
DN 149 AA North Humberside, England
Phone: (0044) 1405-860551
Fax: (0044) 1405-860205
www.croda.co.uk
27. **Cognis Deutschland GmbH - Care Chemicals**
Henkelstr. 67 or Postfach 130164
40551 Düsseldorf, Germany
Phone: +49 (211) 7940-2289
Fax: +49 (211) 798-2016
28. **Clariant - Functional Chemicals Div., Personal Care, GmbH**
65926 Frankfurt/Main, Germany
Phone: +49 (69) 305 44291
Fax: +49 (69) 305 89129

Clariant Coporation
4331 Chesapeake Drive, Charlotte, NC 28216, USA
Phone: +1 (704) 331-7240
Fax: +1 (704)377-1064
44. **Degussa Care Specialities**
710 South 6th Street
Hopewell VA 23860, USA
Phone: 1 800 46-1890

German adress:
Goldschmidtstraße 100
45127 Essen, Germany
Phone: 0201 173-0
47. **Witco Corporation**
1 American Lane, CT 06831-2559, Greenwich, USA
Phone: +1 (203) 552-3373
Fax: +1 (203) 552-2893

German subsidiary:
Witco Surfactants GmbH
Industriegebiet West, Postfach 11 60,
36392 Steinau an der Straße
Phone: +49 (6663) 540
Fax: +49 (6663) 54129
48. **Uniqema**
Steintor 9
46446 Emmerich, Germany
Phone: 02822/72455
Fax: 02822/72276
65. **ISP Internat. Specialty Products**
1361 Alps Road, 07470 Wayne, NJ, USA
Phone: +1 (973) 628-3000
Fax: +1 (973) 628-4117

German subsidiary:
ISP Global Technologies Deutschland GmbH
Emil-Hoffmann-Str. 1 a, 50006 Köln
Phone: +49 (2236) 9649-0
Fax: +49 (2236) 9649-211

101. **Finetex Inc.**
418 Falmouth Avenue
NJ 07407 Elmwood Park
USA
P.O. Box: 216
Phone: (201) 797-4686
Fax: (201) 797-6558
126. **Henry Lamotte GmbH**
Auf dem Dreieck 3 (Hohentorshafen)
28197 Bremen, Germany
P.O. Box: 103849
28038 Bremen
Phone: 0421/5239-0
Fax: 0241/5239-199
165. **Condea Augusta S. p. A.**
Via Medici del Vascello
26-20138 Milano, Italy
Phone: (02) 52029841
Fax: (02) 52029868
181. **Stearinerie Fils**
86, rue du Dôme
92514 Boulogne Cedex, France
Phone: 01 46 10 07 30
Fax: 01 49 10 99 48

Note

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July 2006