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2009.11.4

이 성 호

유/무기 복합 소재의 필요성

사용감 개선?

피부 자극성?

제형 편리성?

나노 이슈?

Part 1. 나노 이슈

Trend: EU regulates use of nano particles in cosmetics

EU regulates use of nano particles in cosmetics
Life News
Jul 16, 2009, 14:33 GMT

Hamburg - Manufacturers, not wanting to miss a chance to apply the benefits of the new wave of technology, are placing a lot of faith in the future of nano materials - tiny particles designed to improve certain product characteristics.

Nano particles are smaller than a speck of dust. Though their effect on humans and on the environment has not yet been researched conclusively, they already are found in many products without being listed as ingredients on the packaging.

But a new decree issued by the European Parliament requires cosmetic makers in the future to list nano materials in the ingredients and put the word nano in parentheses next to the name of the material.

In addition they must file a security dossier with the European Commission. If there is doubt over the safety of a material used, the European Union can order an investigation of the material and, if necessary, issue special regulations for the material in question.

The materials titanium oxide and zinc oxide, for example, have been used as a UV filter in sunscreen creams. Birgit Huber of German's industry association for personal care and laundry products in Frankfurt said almost all sunscreen products on the market contain both ingredients.

The industry values materials like titanium oxide and zinc oxide in nano form because they open new possibilities.

'The two materials previously were included in cosmetics as white pigments. But they left a white film on the skin, something consumers didn't like,' said Huber.

The nano particles now used in sunscreen creams make the pigments invisible to the human eye. In addition they offer a higher protection against UV light.

Products with a very high UV protection can be produced only if nano pigments are included as ingredients.

Various scientific studies have come to the conclusion that under certain conditions the materials can damage human DNA, according to Germany's union for environmental protection. 'However, to our knowledge nano materials that are currently in products on the market applied to healthy skin result in **no direct** danger to consumers,' said Mario Goetz of Germany's federal institute for risk assessment in Berlin. He added that the new decree strengthens consumer protection.

Trend: EU regulates use of nano particles in cosmetics

Germany's union for environmental protection views the regulations as a step in the right direction. However, the regulations are not yet technically advanced enough to deal with the continued adoption of nano materials.

'The definition of nano materials in the EU decree is in our opinion too narrowly conceived,' said Katja Faupel of the union. What is still lacking is a worldwide uniform definition of the term nano materials. In the EU cosmetic decree **only insoluble and stable** materials with a size of 1 to 100 nano metres count as nano materials.

The union thinks the definition should be broadened to include degradable and soluble materials.

'Otherwise a lot of nano materials could be used without the appropriate label,' said Faupel, adding that she believes the regulations will soon be revised.

This is possible in principle, said Goetz. The new decree offers some room to fit definitions and regulations to technical progress.

Critics also complain about the long transition phase: The new decree takes affect in **2012.** Until then, nano materials may continue to be used without labelling. A consumer who would like to know whether a product contains nano materials has only one way of finding out: Call the maker of the product and ask.

Hanne Vedder of a German centre representing consumers said she has one other problem with the labelling of products that contain nano particles. There's no room on the packaging of small items such as lipstick to list all the ingredients. The EU decree envisions this information on a label on the shelf where the items are stocked. Vedder said this was impractical.

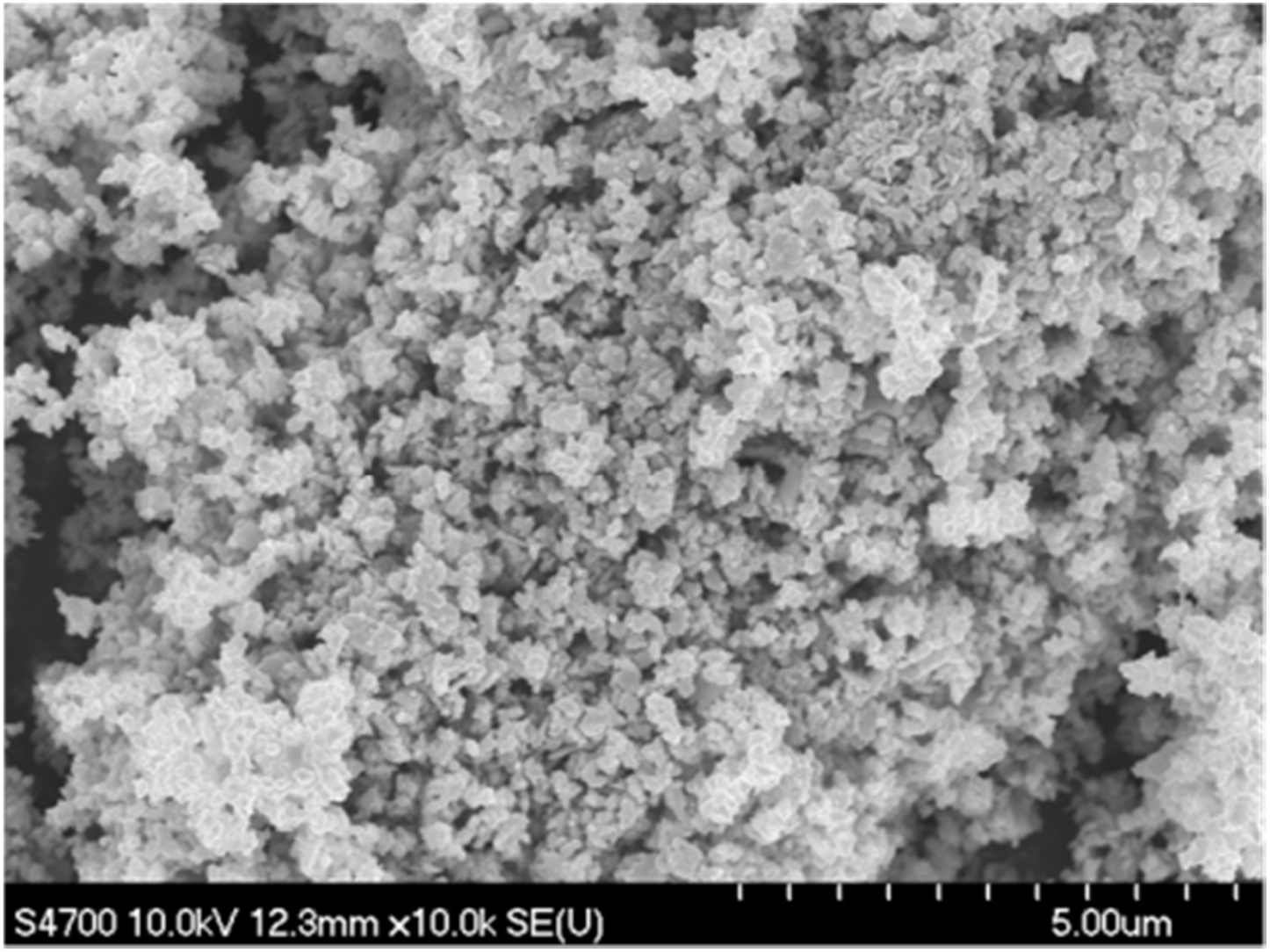
'We would have liked that the product could only be sold in a box that included the information on a sheet of paper or pamphlet,' she said. In general, she welcomes the new decree, adding that it means that from 2012 uniform regulations will go into effect in all member countries.

나노 화장품의 미래

NANO TECHNOLOGY

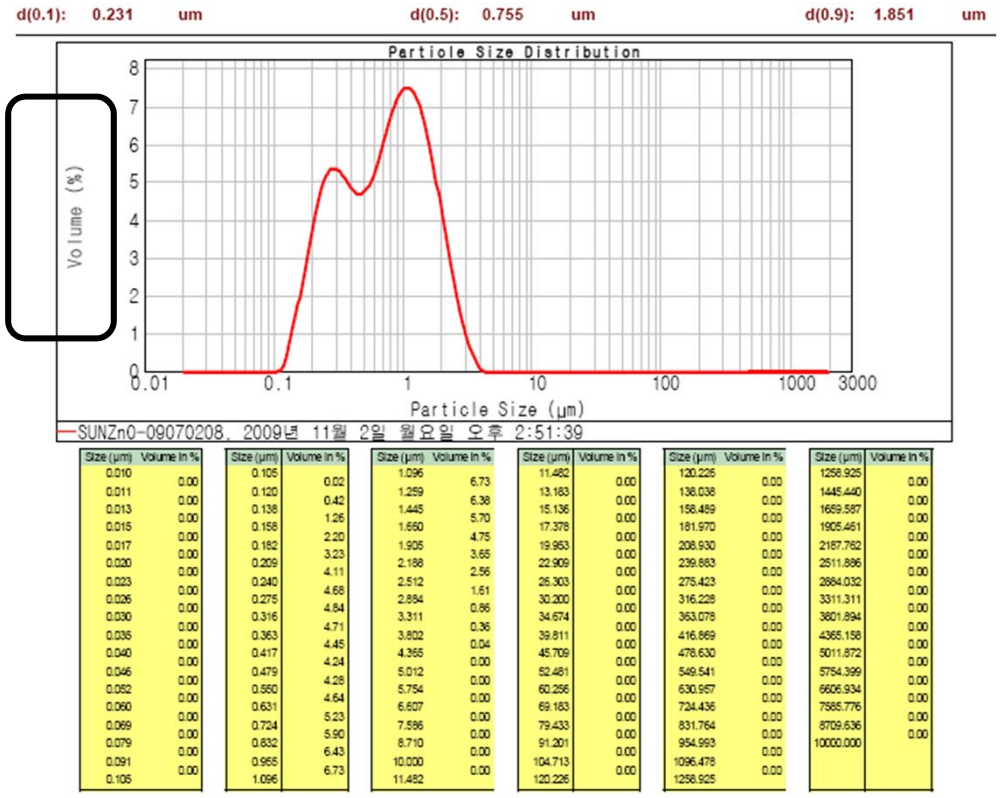
GMO(Genetically Modified Organism)

How to measure NANO? SEM

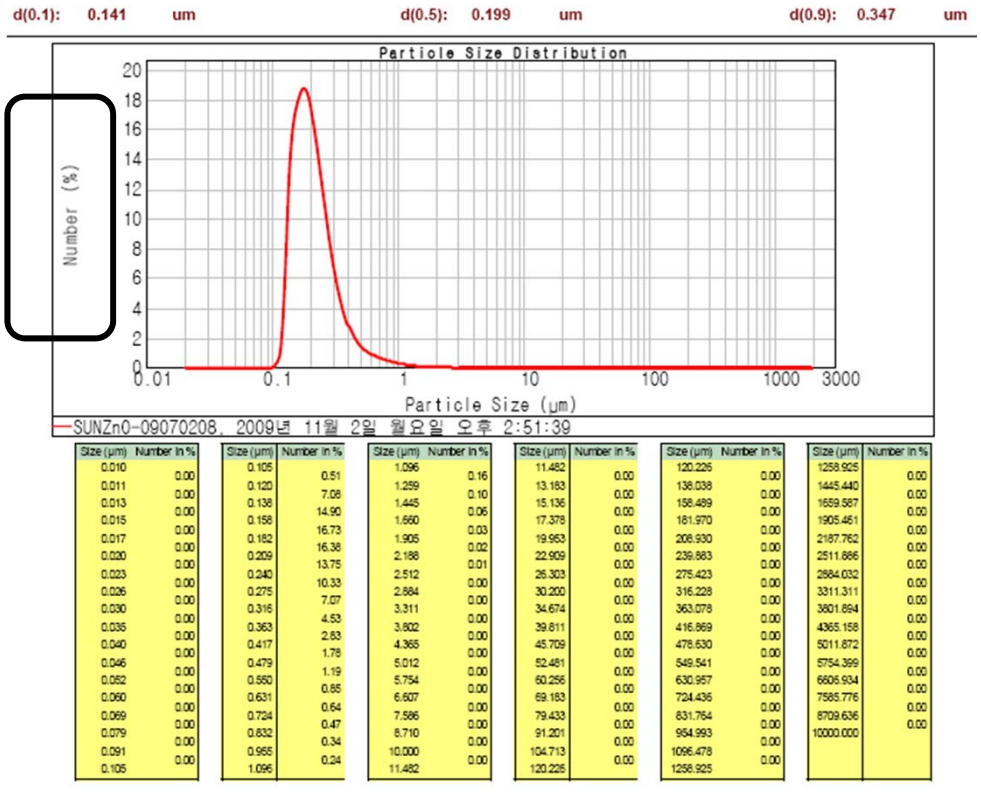


How to measure NANO? Particle Size Analyzer

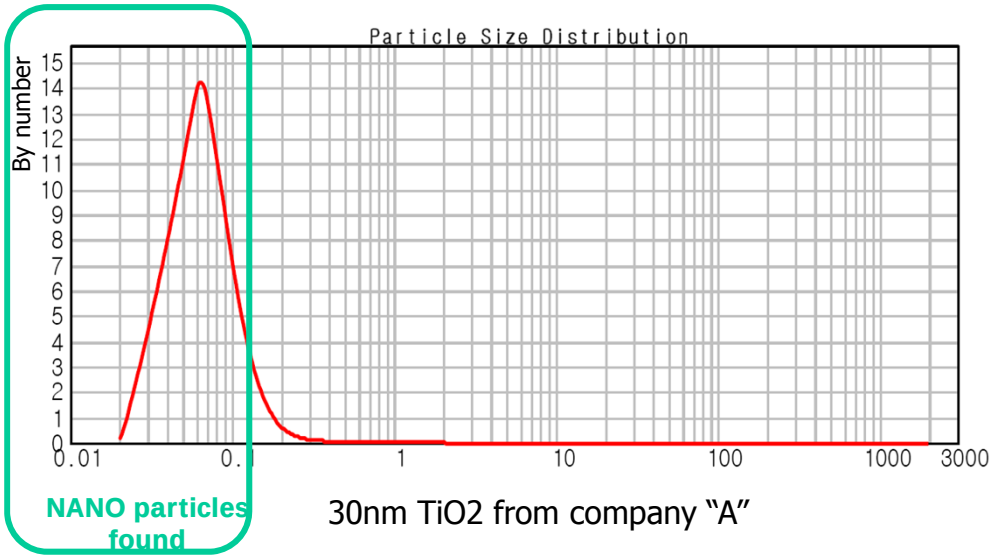
By Volume



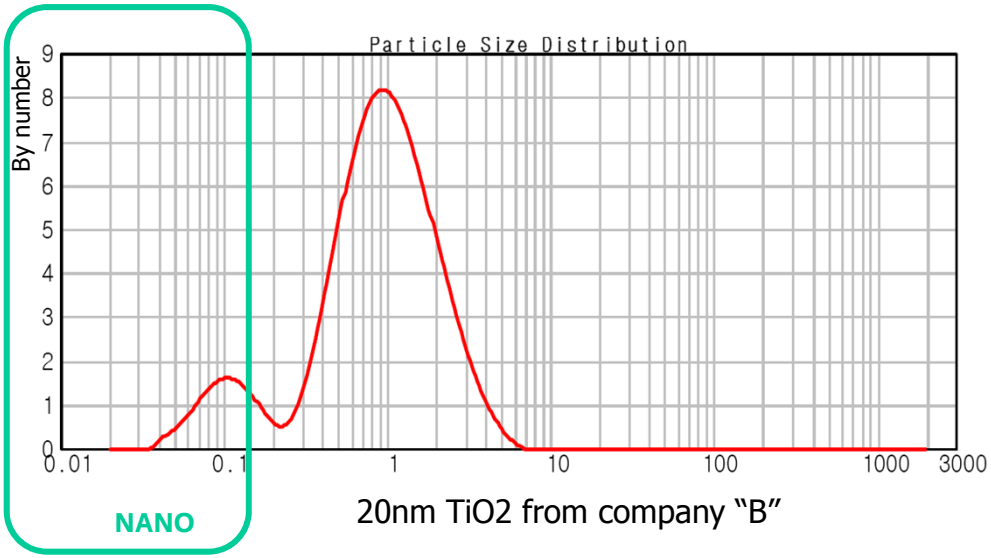
By Number



NANO TiO2

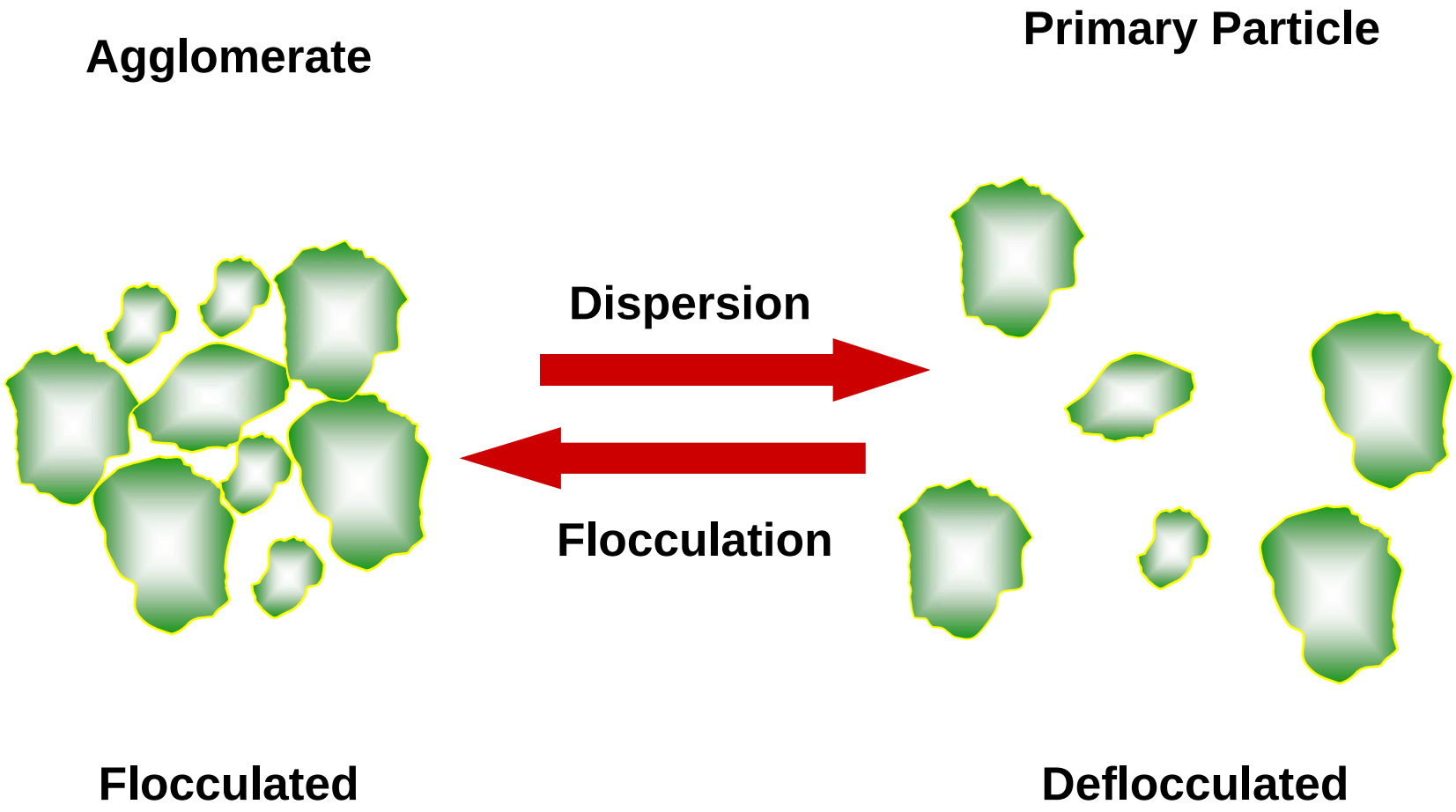


30nm TiO2 from company "A"

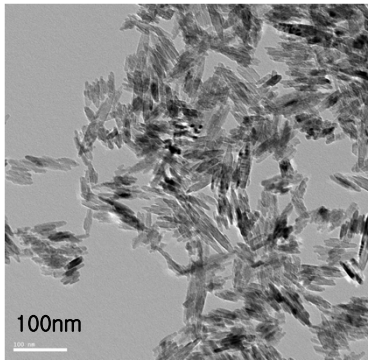


20nm TiO2 from company "B"

나노 입자의 분산과 재응집



15nm TiO2



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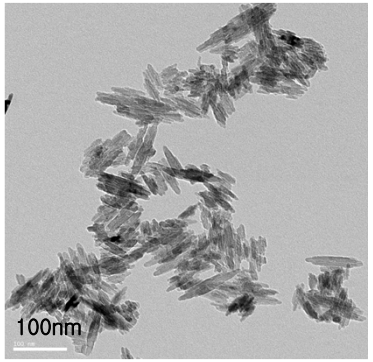

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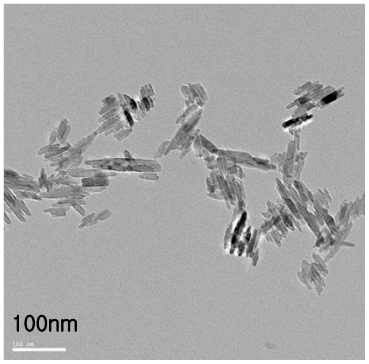

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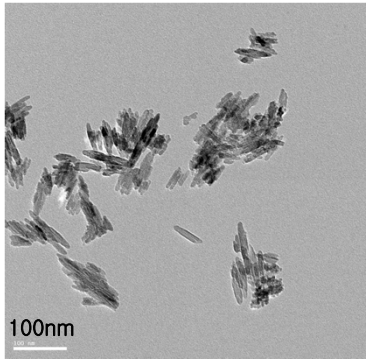

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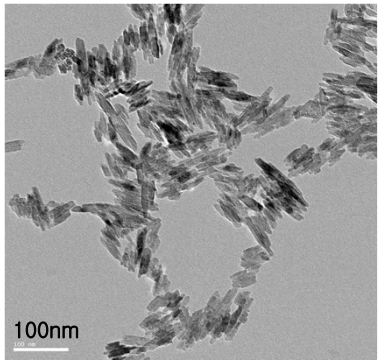


#25

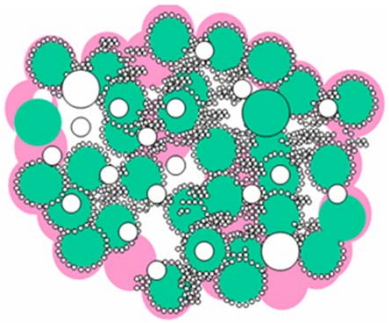
Part 2. 무기 복합화 기술

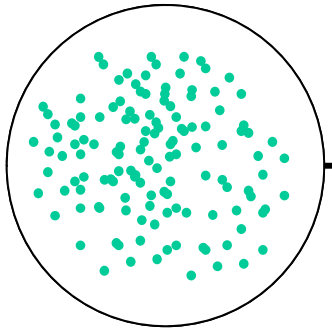
무기 복합화 방법

1) Particle Growth

3) Classification / Screening

2) Composition / Hybrid

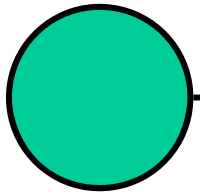




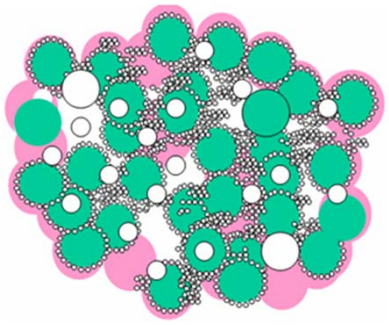
Nano particle

How to make NON NANO

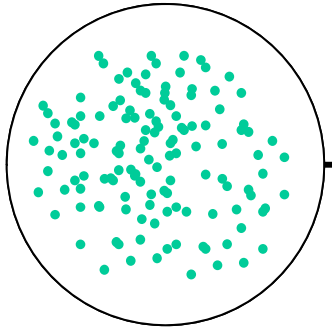
1) Particle Growth



2) Composition / Hybrid



3) Classification / Screening



Nano particle

Nano & Non-Nano Zinc Oxides, for UVA protection

Grade	Surface treatment	Crystal size (nm)	surface area(m2/g)	Remarks
SUNZNO-UFAS	Alkyl Silane	25	35~40	The Smallest Particle Size The most Transparent
SUNZNO-NAS	Alkyl Silane	40	19~23	Good Transparency
SUNZNO-NCO	Dimethicone/ Methicone Copolymer	35	21~28	Excellent Silicone Oil compatibility
SUNZNO-AS	Alkyl Silane	80	5~10	Standard
SUNZNO	none	150	n.a.	**Non-Nano, ECOCERT, Natural UV Filter**
SUNZNO-SA	Stearic Acid	150	n.a.	**Non-nano, ECOCERT, Natural UV Filter**

NANO ZnO

SUNZNO-UFAS:

- 25nm, the smallest particle size,
- The most transparent grade

SUNZNO-NCO:

- Dimethicone/Methicone copolymer treatment provides better compatibility with Silicone Oil(D5)
- Lower viscosity could be achieved

NON NANO ZnO

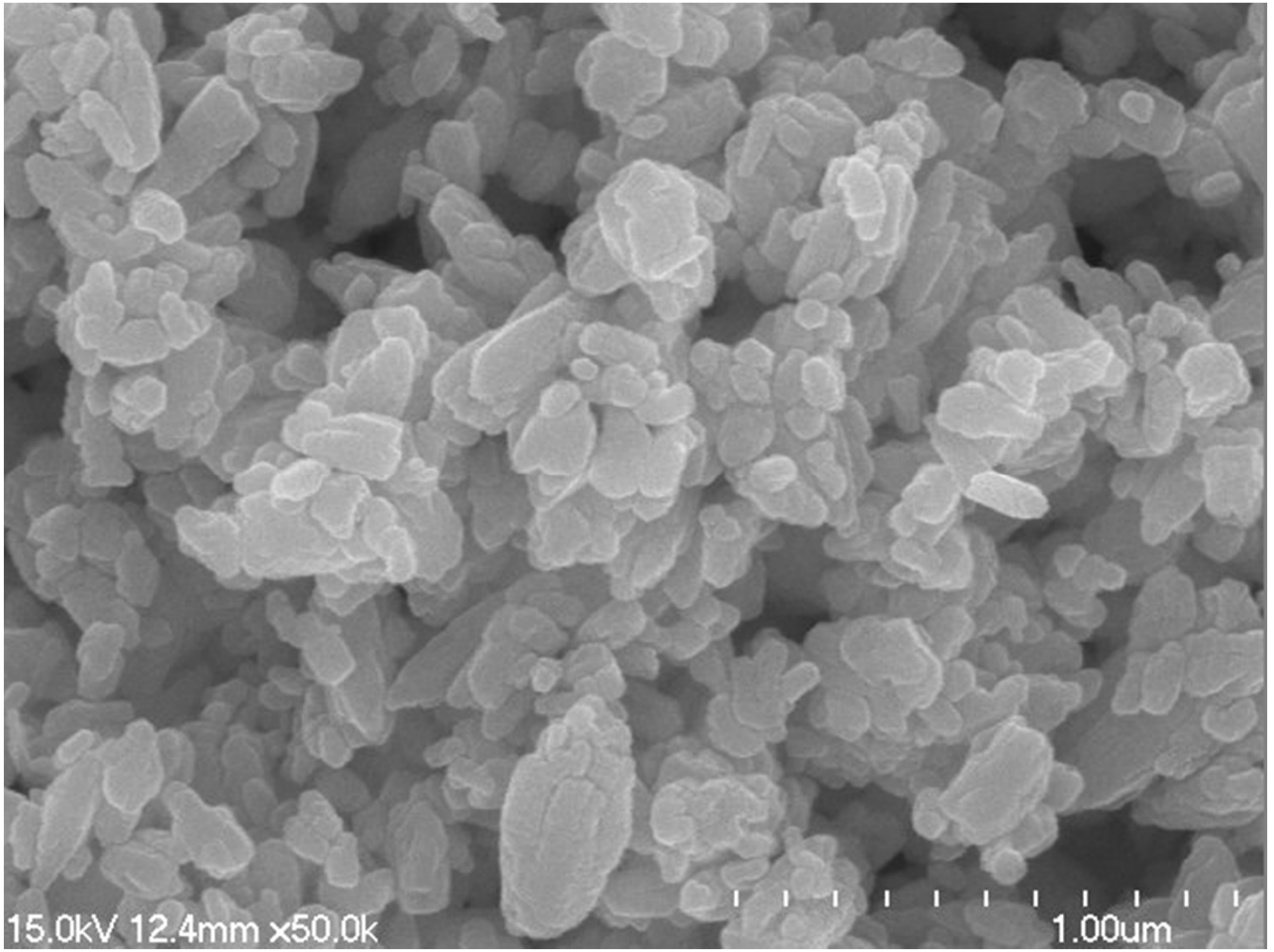
SUNZNO

- 150nm

SUNZNO-SA

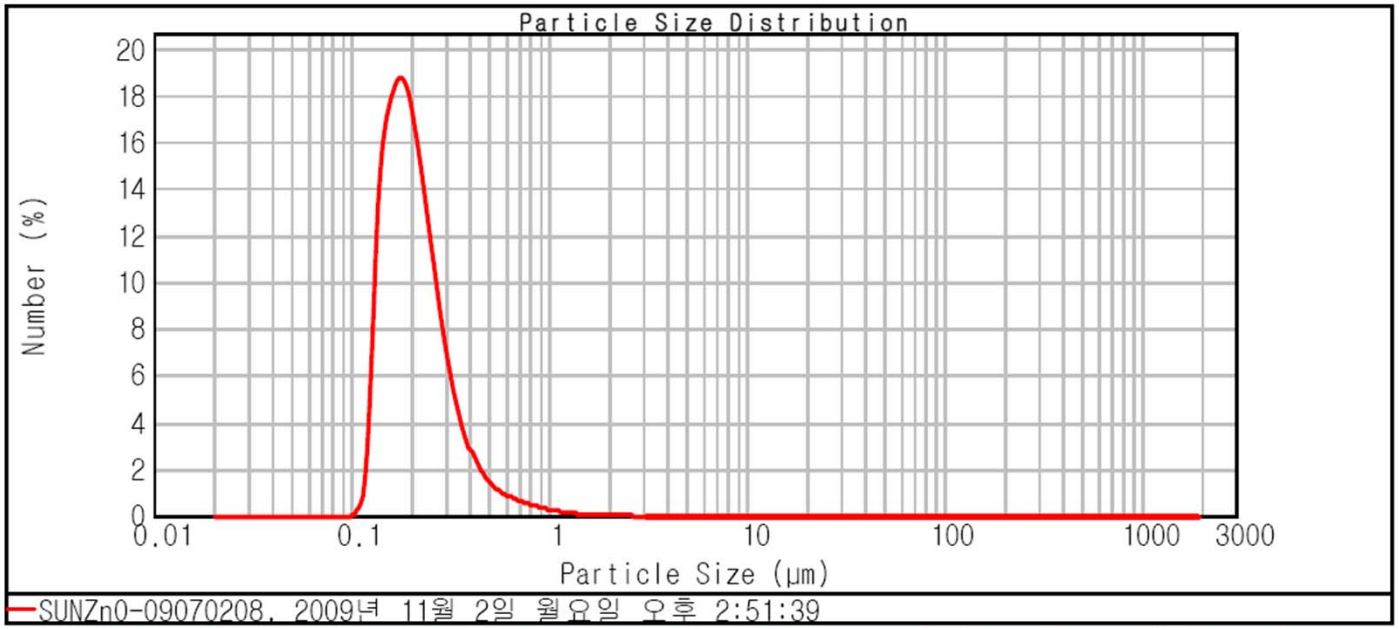
- 150nm
- Natural surface treatment, ECOCERT grade

Non-Nano Zinc Oxides



Non-Nano Zinc Oxides

d(0.1): 0.141 um d(0.5): 0.199 um d(0.9): 0.347 um



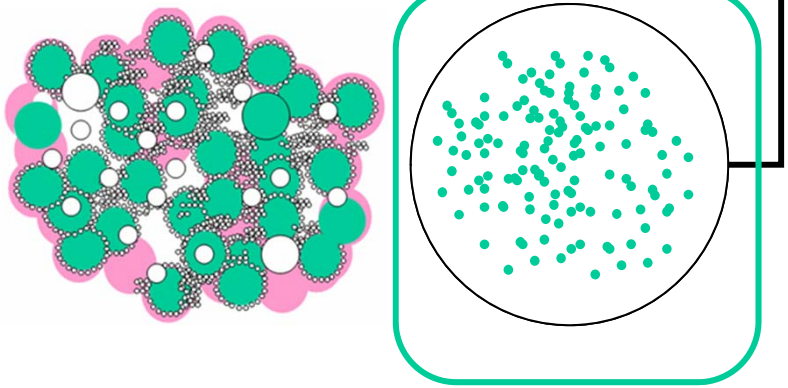
Size (μm)	Number In %	Size (μm)	Number In %	Size (μm)	Number In %	Size (μm)	Number In %	Size (μm)	Number In %	Size (μm)	Number In %
0.010	0.00	0.105	0.51	1.096	0.16	11.482	0.00	120.226	0.00	1258.925	0.00
0.011	0.00	0.120	7.08	1.259	0.10	13.183	0.00	138.038	0.00	1445.440	0.00
0.013	0.00	0.138	14.90	1.445	0.06	15.136	0.00	158.489	0.00	1659.587	0.00
0.015	0.00	0.158	16.73	1.660	0.03	17.378	0.00	181.970	0.00	1905.461	0.00
0.017	0.00	0.182	16.38	1.905	0.02	19.953	0.00	208.930	0.00	2187.762	0.00
0.020	0.00	0.209	13.75	2.188	0.01	22.909	0.00	239.883	0.00	2511.886	0.00
0.023	0.00	0.240	10.33	2.512	0.00	26.303	0.00	275.423	0.00	2884.032	0.00
0.026	0.00	0.275	7.07	2.884	0.00	30.200	0.00	316.228	0.00	3311.311	0.00
0.030	0.00	0.316	4.53	3.311	0.00	34.674	0.00	363.078	0.00	3801.894	0.00
0.035	0.00	0.363	2.83	3.802	0.00	39.811	0.00	416.869	0.00	4365.158	0.00
0.040	0.00	0.417	1.78	4.365	0.00	45.709	0.00	478.630	0.00	5011.872	0.00
0.046	0.00	0.479	1.19	5.012	0.00	52.481	0.00	549.541	0.00	5754.399	0.00
0.052	0.00	0.550	0.85	5.754	0.00	60.256	0.00	630.957	0.00	6606.934	0.00
0.060	0.00	0.631	0.64	6.607	0.00	69.183	0.00	724.436	0.00	7585.776	0.00
0.069	0.00	0.724	0.47	7.586	0.00	79.433	0.00	831.764	0.00	8709.636	0.00
0.079	0.00	0.832	0.34	8.710	0.00	91.201	0.00	954.993	0.00	10000.000	
0.091	0.00	0.955	0.24	10.000	0.00	104.713	0.00	1096.478	0.00		
0.105		1.096		11.482	0.00	120.226	0.00	1258.925	0.00		

무기 복합화 방법

1) Particle Growth

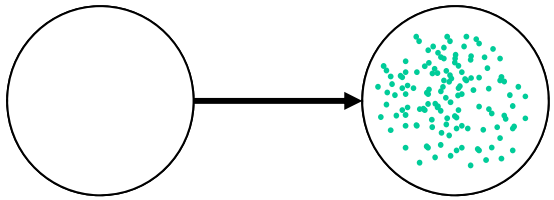
3) Classification / Screening

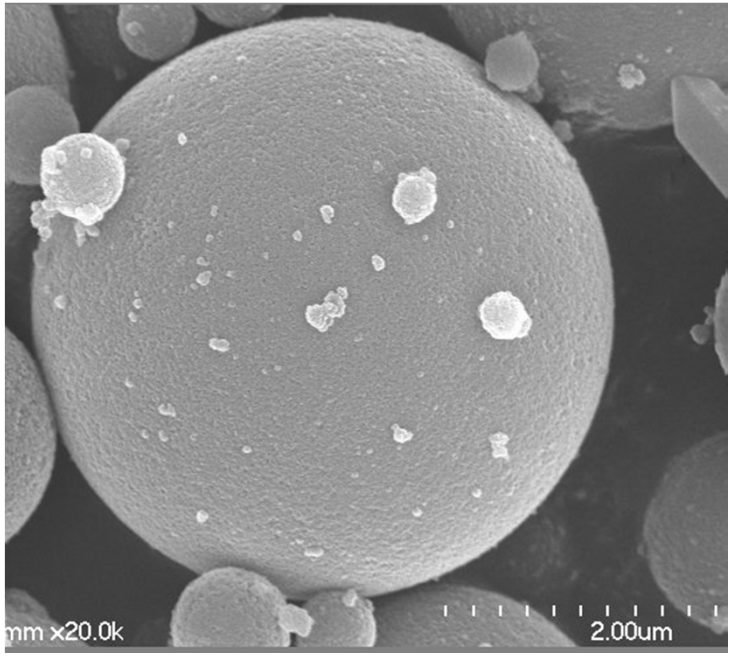
2) Composition / Hybrid

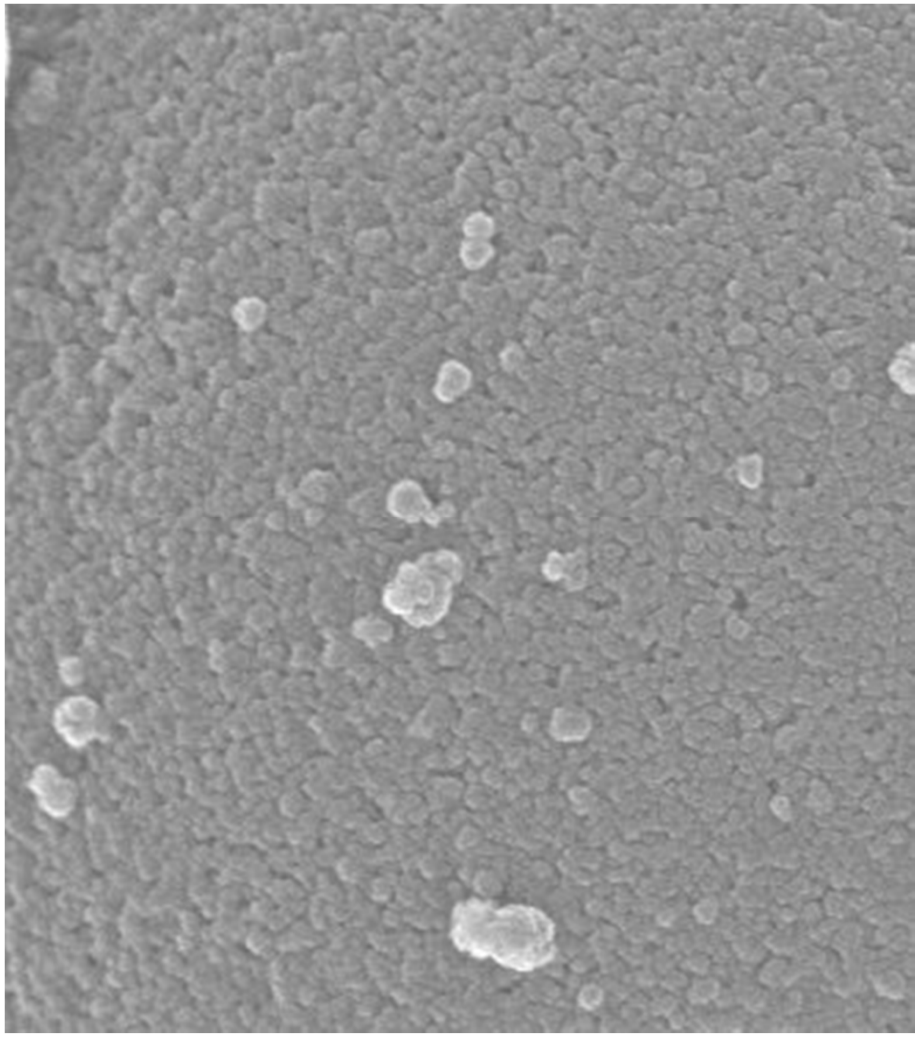


Nano particle

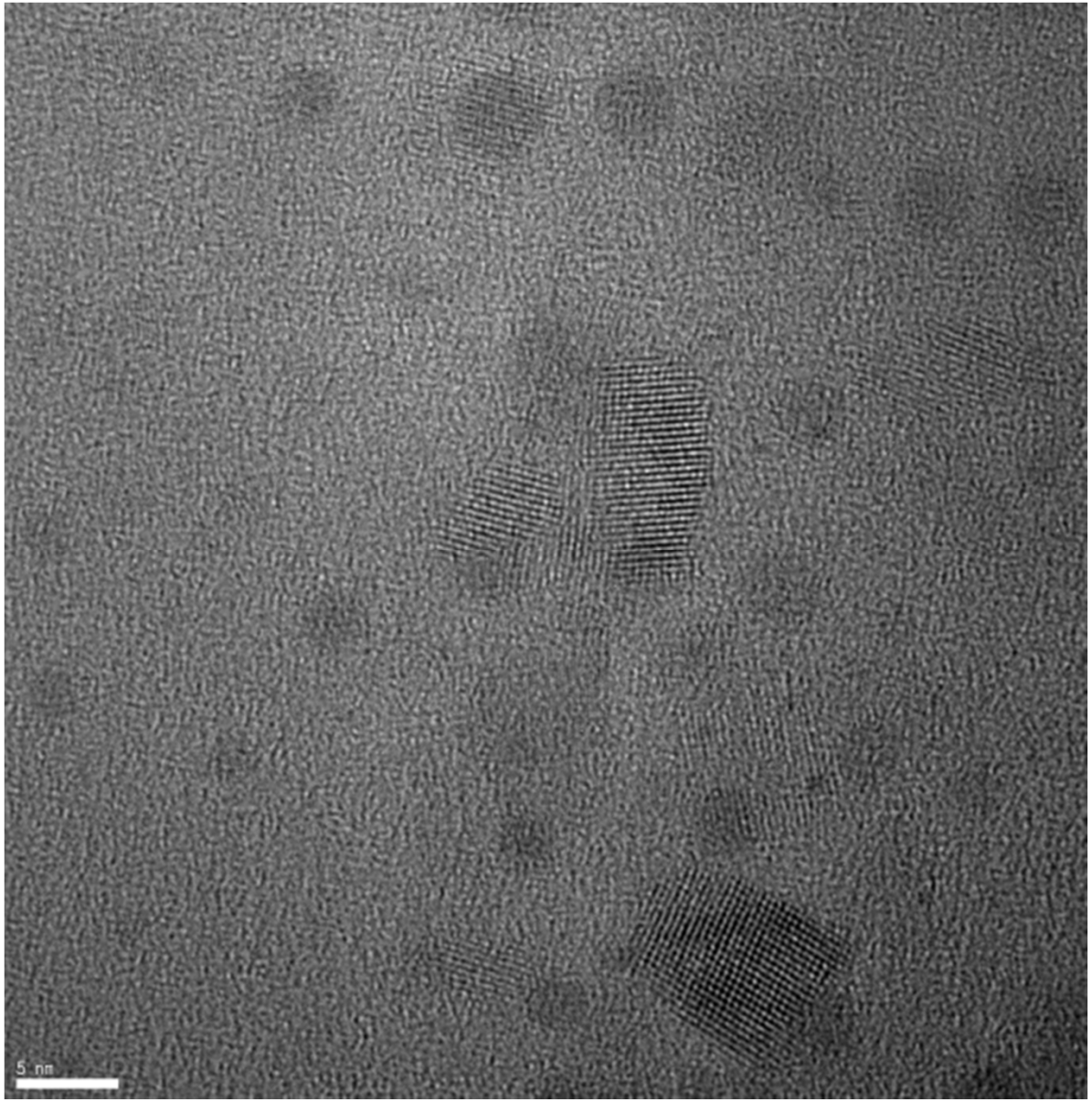
출발 원료: 다공성 실리카 비드

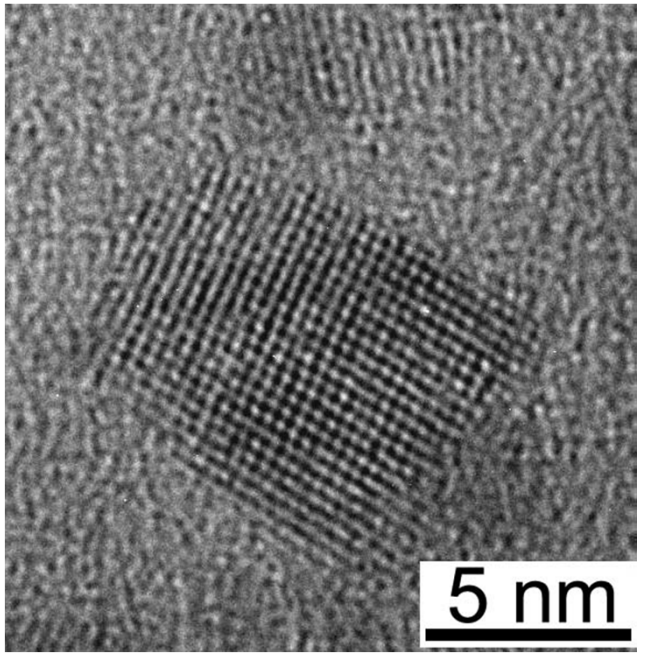




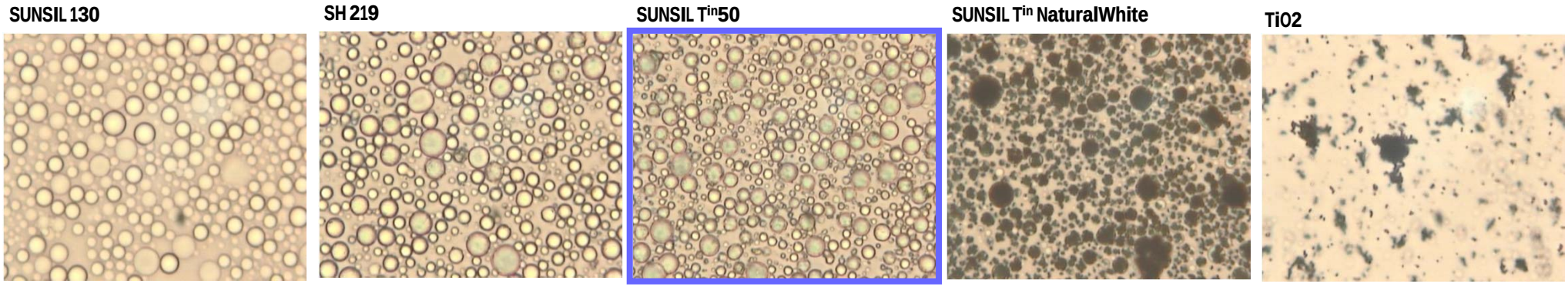


TEM





매우 투명한 실리카/TiO2 복합 소재



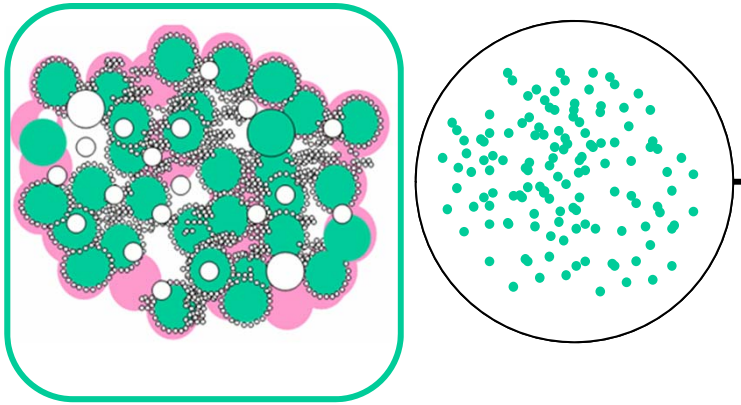
Silica 100%	Silica 75% TiO2 25%(12nm)	Silica 58% TiO2 42%(12nm)	Silica 65% TiO2 35%(200nm)	TiO2 100%

무기 복합화 방법

1) Particle Growth

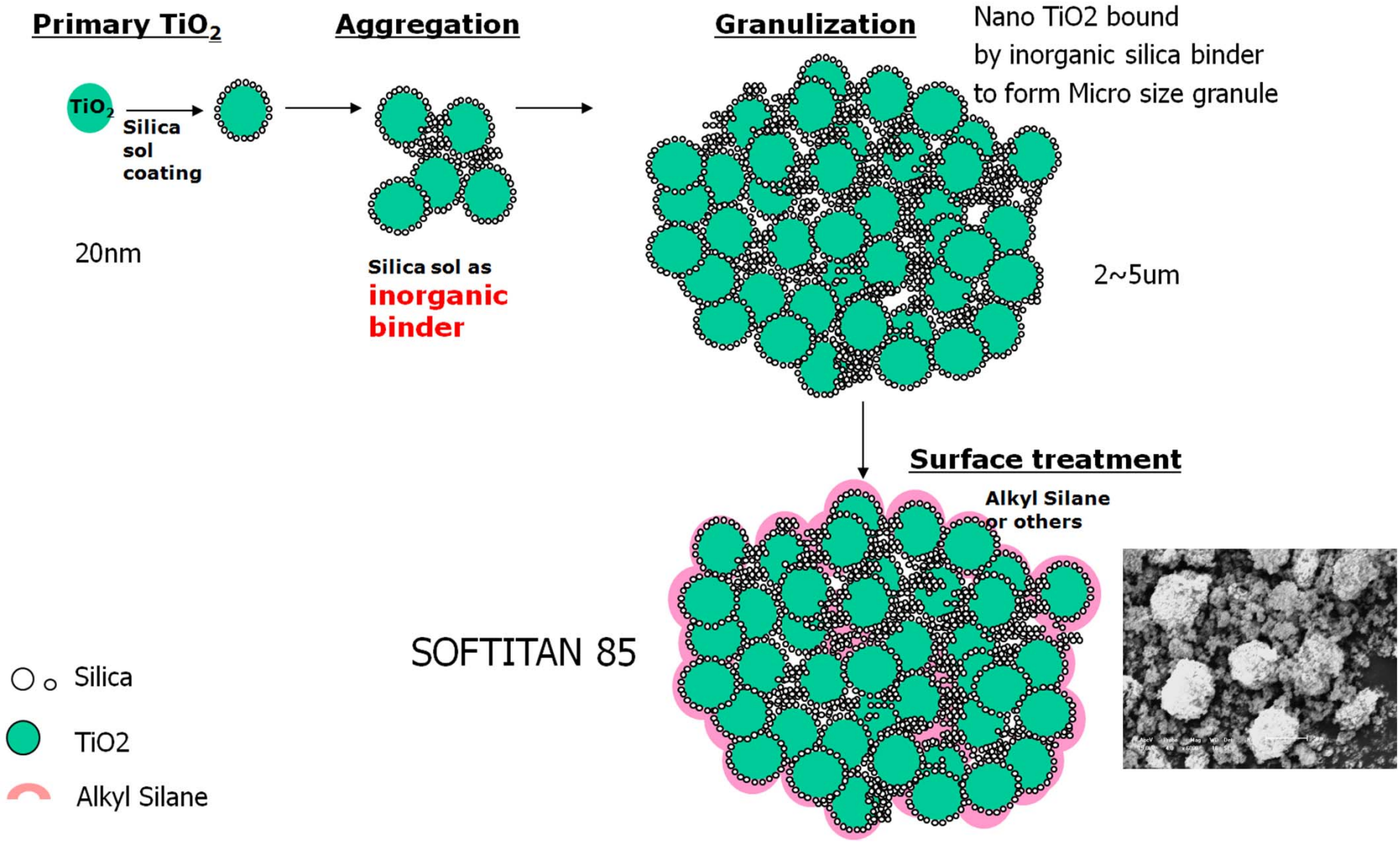
3) Classification / Screening

2) Composition / Hybrid

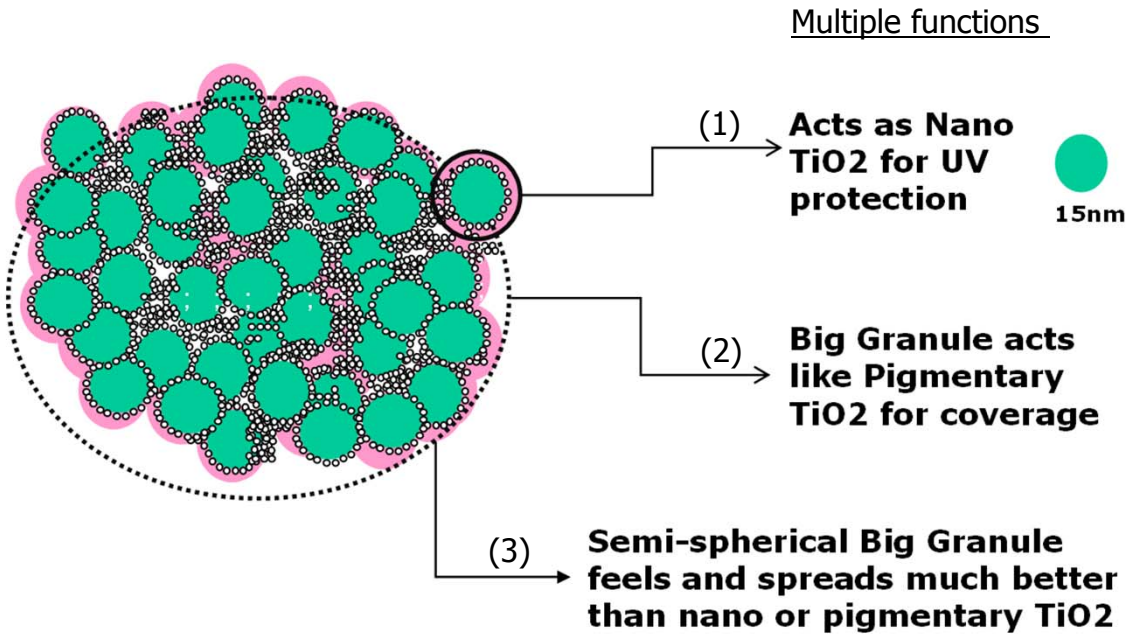


Nano particle

SOFTITAN series are for NANO TiO2 concerns



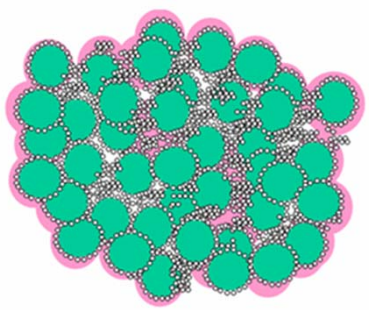
SOFTITAN series have UV protection efficacy like Nano TiO2 and Coverage like Pigmentary TiO2



Individual primary TiO2 particles are gapped by silica so binder.
So big TiO2 granule functions as good as primary TiO2 particles
While the big granules feel and spread better and show also covering power

SOFTITAN 60, truly non-nano, ECOCERT TiO2

Nano TiO2



SOFTITAN 85

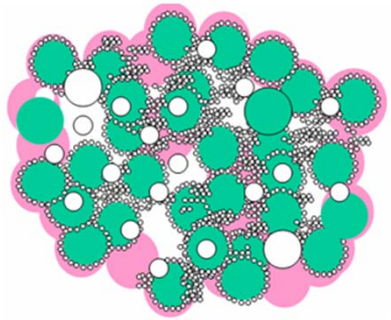
TiO2	83 %
SiO2	12 %
Alkyl Silane	5 %

Good Spread & Skin Feel

As compared to conventional Nano TiO2

With Excellent UV protection efficacy

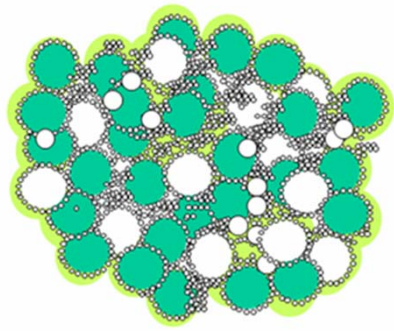
Non-Nano TiO2



SOFTITAN 60

TiO2	55 %
SiO2	40 %
Alkyl Silane	5 %

No single particles less than 100nm



SOFTITAN 60-LL

TiO2	55 %
SiO2	40 %
Lauroyl Lysine	5 %

No single particles less than 100nm

Plus natural surface treatment

ECOCERT grade

Silica

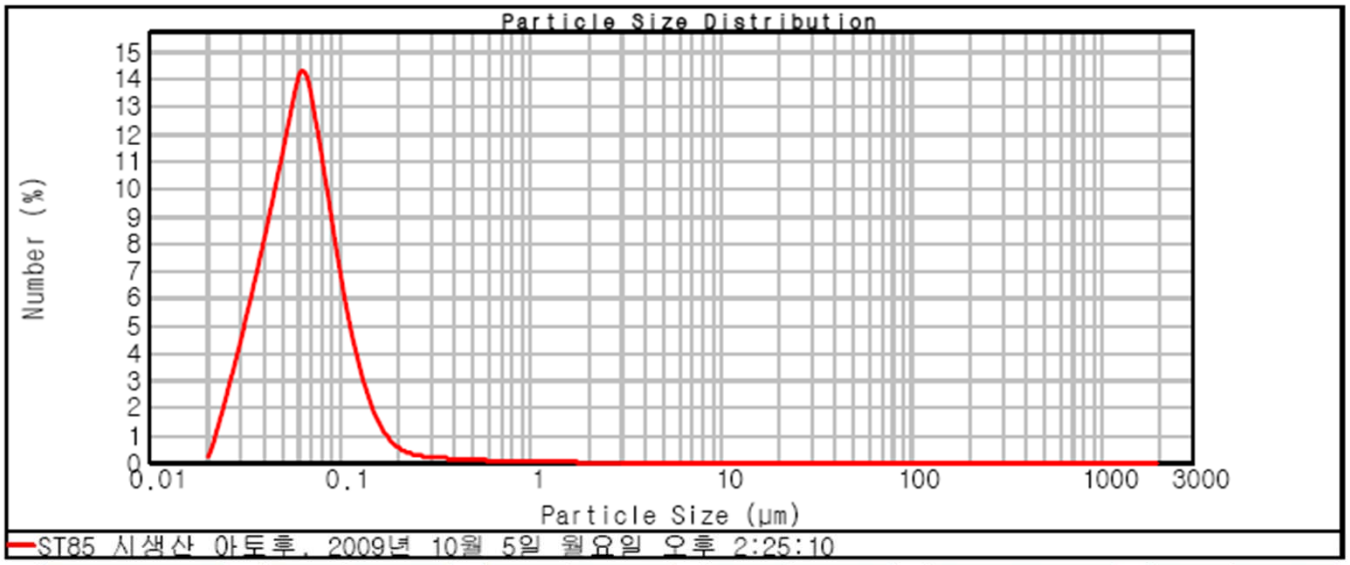
TiO2

Alkyl Silane

Lauroyl Lysine

SUNJIN CHEMICAL

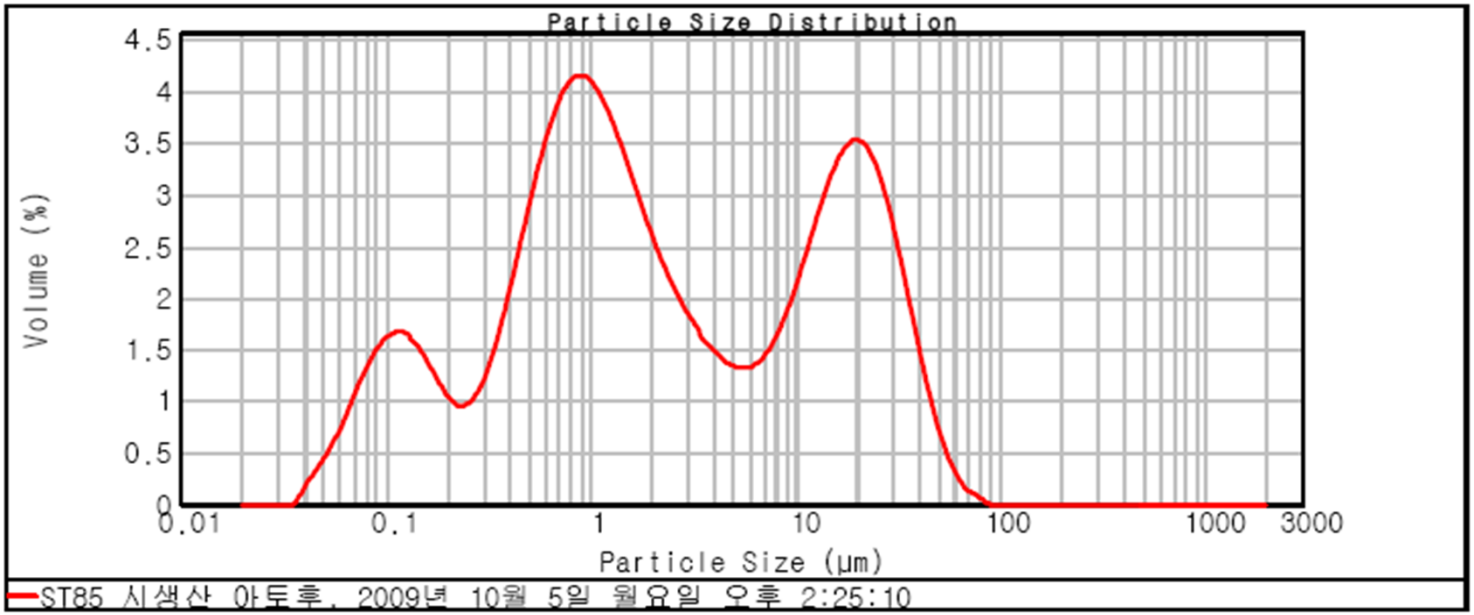
Particle Size Distribution: SOFTITAN 85 by number



Size (µm)	Number In %	Size (µm)	Number In %	Size (µm)	Number In %	Size (µm)	Number In %	Size (µm)	Number In %	Size (µm)	Number In %
0.010	0.00	0.200	0.35	1.416	0.00	10.000	0.00	31.000	0.00	49.000	0.00
0.020	11.69	0.224	0.23	1.589	0.01	11.000	0.00	32.000	0.00	50.000	0.00
0.036	5.51	0.252	0.17	1.783	0.00	12.500	0.00	33.000	0.00	55.000	0.00
0.040	6.69	0.283	0.14	2.000	0.00	14.000	0.00	34.000	0.00	60.000	0.00
0.045	7.91	0.317	0.13	2.244	0.00	16.000	0.00	35.000	0.00	65.000	0.00
0.050	9.19	0.356	0.11	2.518	0.00	17.000	0.00	36.000	0.00	70.000	0.00
0.056	10.46	0.399	0.10	2.825	0.00	18.000	0.00	37.000	0.00	80.000	0.00
0.063	10.67	0.448	0.08	3.000	0.00	19.000	0.00	38.000	0.00	100.000	0.00
0.071	9.35	0.502	0.07	3.557	0.00	20.000	0.00	40.000	0.00	112.468	0.00
0.080	7.80	0.564	0.05	4.000	0.00	22.000	0.00	41.000	0.00	126.191	0.00
0.089	6.11	0.632	0.04	4.477	0.00	23.000	0.00	42.000	0.00	141.589	0.00
0.100	4.57	0.710	0.03	5.000	0.00	24.000	0.00	43.000	0.00	158.866	0.00
0.112	3.27	0.796	0.02	5.637	0.00	25.000	0.00	44.000	0.00	178.250	0.00
0.126	2.24	0.893	0.02	6.325	0.00	26.000	0.00	45.000	0.00	200.000	0.00
0.142	1.47	1.000	0.01	7.000	0.00	27.000	0.00	46.000	0.00		
0.159	0.92	1.125	0.01	8.000	0.00	28.000	0.00	47.000	0.00		
0.178	0.57	1.262	0.00	9.000	0.00	30.000	0.00	48.000	0.00		
0.200		1.416		10.000		31.000		49.000			

ator notes:

Particle Size Distribution: SOFTITAN 85 by volume



Size (μm)	Volume In %
0.010	0.00
0.020	0.00
0.036	0.00
0.040	0.04
0.045	0.18
0.050	0.28
0.056	0.40
0.063	0.54
0.071	0.72
0.080	0.90
0.089	1.06
0.100	1.17
0.112	1.24
0.126	1.26
0.142	1.22
0.159	1.13
0.178	1.00
0.200	0.86

Size (μm)	Volume In %
0.200	0.76
0.224	0.71
0.252	0.75
0.283	0.88
0.317	1.08
0.356	1.35
0.399	1.66
0.448	1.99
0.502	2.32
0.564	2.61
0.632	2.85
0.710	3.03
0.796	3.12
0.893	3.05
1.000	3.10
1.125	2.90
1.262	2.71
1.416	

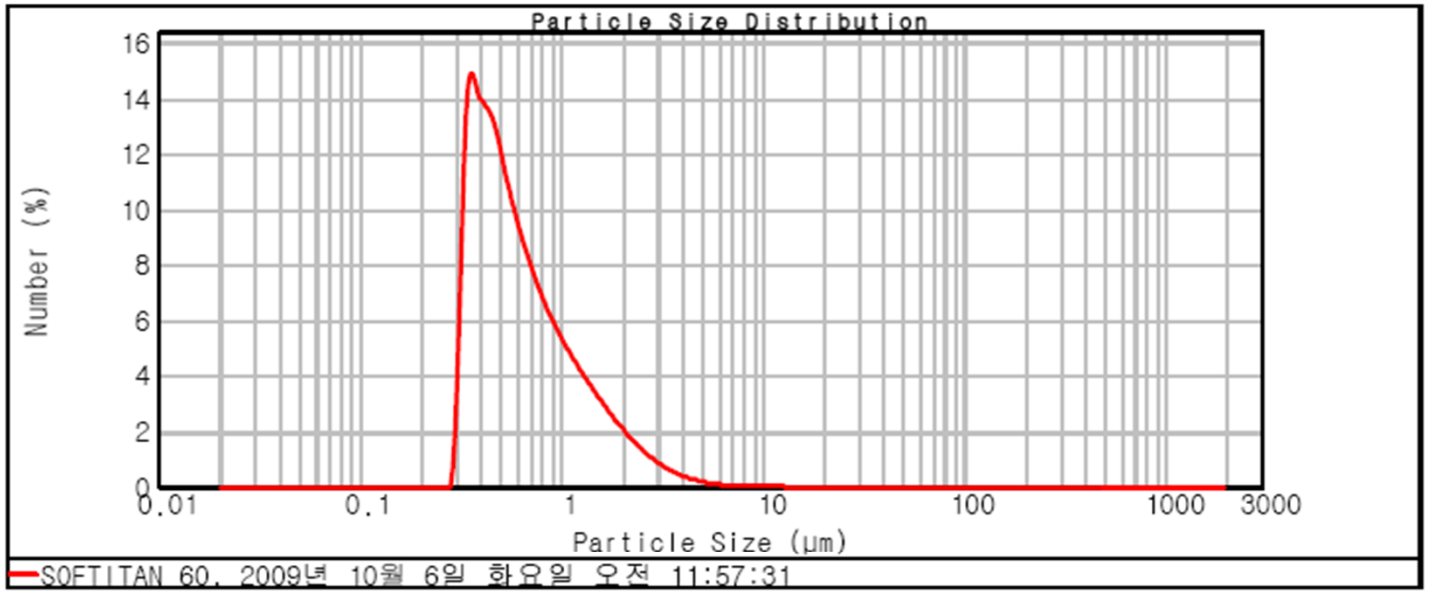
Size (μm)	Volume In %
1.416	2.50
1.589	2.27
1.783	2.06
2.000	1.85
2.244	1.67
2.518	1.52
2.825	0.74
3.000	1.91
3.557	1.19
4.000	1.07
4.477	0.99
5.000	1.04
5.637	0.99
6.325	0.91
7.000	1.30
8.000	1.30
9.000	1.33
10.000	

Size (μm)	Volume In %
10.000	1.37
11.000	2.10
12.500	2.12
14.000	2.77
16.000	1.33
17.000	1.29
18.000	1.24
19.000	1.18
20.000	2.19
22.000	1.01
23.000	0.94
24.000	0.88
25.000	0.83
26.000	0.77
27.000	0.72
28.000	1.28
30.000	0.57
31.000	

Size (μm)	Volume In %
31.000	0.52
32.000	0.48
33.000	0.44
34.000	0.41
35.000	0.37
36.000	0.34
37.000	0.31
38.000	0.55
40.000	0.24
41.000	0.22
42.000	0.20
43.000	0.18
44.000	0.16
45.000	0.15
46.000	0.13
47.000	0.12
48.000	0.11
49.000	

Size (μm)	Volume In %
49.000	0.10
50.000	0.36
55.000	0.22
60.000	0.13
65.000	0.07
70.000	0.08
80.000	0.01
100.000	0.00
112.468	0.00
126.191	0.00
141.589	0.00
158.866	0.00
178.250	0.00
200.000	

Particle Size Distribution: SOFTITAN 60 by number



Size (μm)	Number In %
0.010	0.00
0.020	0.00
0.036	0.00
0.040	0.00
0.045	0.00
0.050	0.00
0.056	0.00
0.063	0.00
0.071	0.00
0.080	0.00
0.089	0.00
0.100	0.00
0.112	0.00
0.126	0.00
0.142	0.00
0.159	0.00
0.178	0.00
0.200	

Size (μm)	Number In %
0.200	0.00
0.224	0.00
0.252	0.00
0.283	0.87
0.317	9.85
0.356	10.97
0.399	10.27
0.448	9.58
0.502	8.30
0.564	7.21
0.632	6.29
0.710	5.50
0.796	4.84
0.893	4.18
1.000	3.85
1.125	3.31
1.262	2.89
1.416	

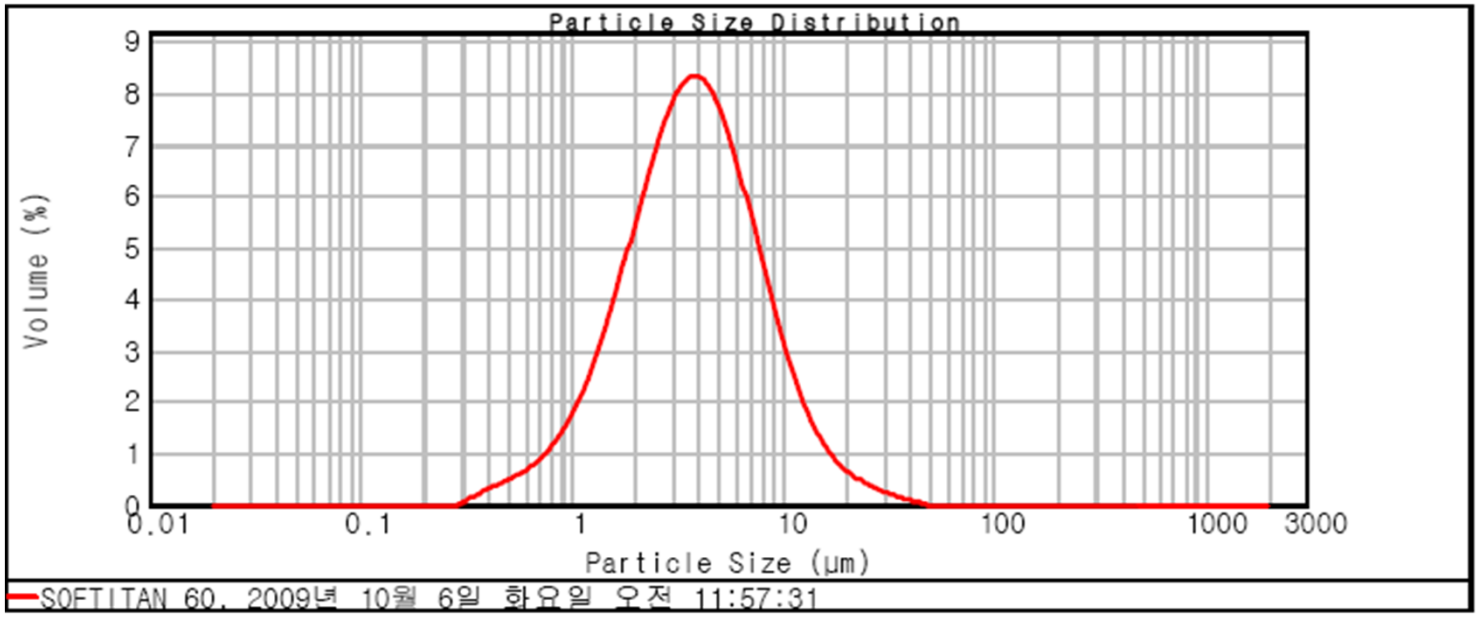
Size (μm)	Number In %
1.416	2.49
1.589	2.11
1.783	1.76
2.000	1.43
2.244	1.14
2.518	0.89
2.825	0.38
3.000	0.80
3.557	0.37
4.000	0.25
4.477	0.17
5.000	0.12
5.637	0.07
6.325	0.04
7.000	0.03
8.000	0.02
9.000	0.01
10.000	

Size (μm)	Number In %
10.000	0.00
11.000	0.01
12.500	0.00
14.000	0.00
16.000	0.00
17.000	0.00
18.000	0.00
19.000	0.00
20.000	0.00
22.000	0.00
23.000	0.00
24.000	0.00
25.000	0.00
26.000	0.00
27.000	0.00
28.000	0.00
30.000	0.00
31.000	

Size (μm)	Number In %
31.000	0.00
32.000	0.00
33.000	0.00
34.000	0.00
35.000	0.00
36.000	0.00
37.000	0.00
38.000	0.00
40.000	0.00
41.000	0.00
42.000	0.00
43.000	0.00
44.000	0.00
45.000	0.00
46.000	0.00
47.000	0.00
48.000	0.00
49.000	

Size (μm)	Number In %
49.000	0.00
50.000	0.00
55.000	0.00
60.000	0.00
65.000	0.00
70.000	0.00
80.000	0.00
100.000	0.00
112.468	0.00
126.191	0.00
141.589	0.00
158.866	0.00
178.250	0.00
200.000	

Particle Size Distribution: SOFTITAN 60 by volume



Size (µm)	Volume In %
0.010	0.00
0.020	0.00
0.036	0.00
0.040	0.00
0.045	0.00
0.050	0.00
0.056	0.00
0.063	0.00
0.071	0.00
0.080	0.00
0.089	0.00
0.100	0.00
0.112	0.00
0.126	0.00
0.142	0.00
0.159	0.00
0.178	0.00
0.200	

Size (µm)	Volume In %
0.200	0.00
0.224	0.00
0.252	0.00
0.283	0.02
0.317	0.11
0.356	0.18
0.399	0.26
0.448	0.33
0.502	0.41
0.564	0.50
0.632	0.61
0.710	0.76
0.796	0.94
0.893	1.15
1.000	1.49
1.125	1.82
1.262	2.24
1.416	

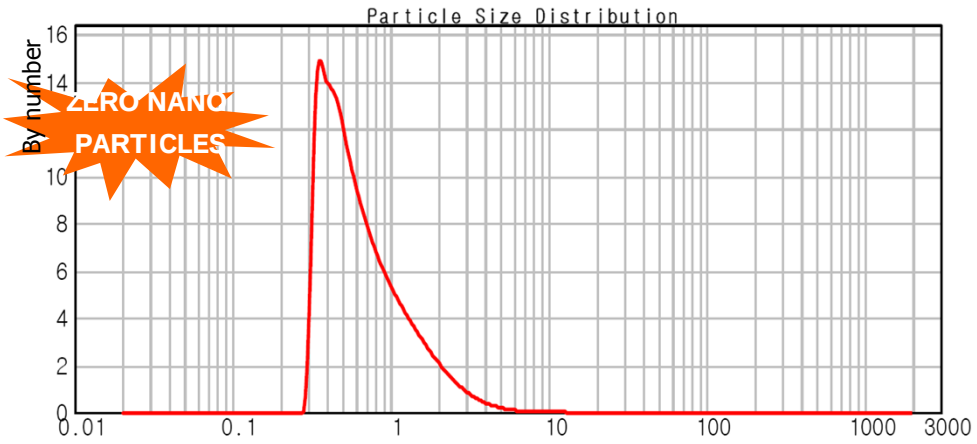
Size (µm)	Volume In %
1.416	2.73
1.589	3.27
1.783	3.85
2.000	4.43
2.244	4.99
2.518	5.49
2.825	3.03
3.000	9.03
3.557	6.41
4.000	6.09
4.477	5.75
5.000	5.84
5.637	5.10
6.325	4.00
7.000	4.52
8.000	3.28
9.000	2.42
10.000	

Size (µm)	Volume In %
10.000	1.80
11.000	1.91
12.500	1.30
14.000	1.15
16.000	0.42
17.000	0.34
18.000	0.28
19.000	0.24
20.000	0.37
22.000	0.15
23.000	0.13
24.000	0.11
25.000	0.10
26.000	0.09
27.000	0.08
28.000	0.12
30.000	0.05
31.000	

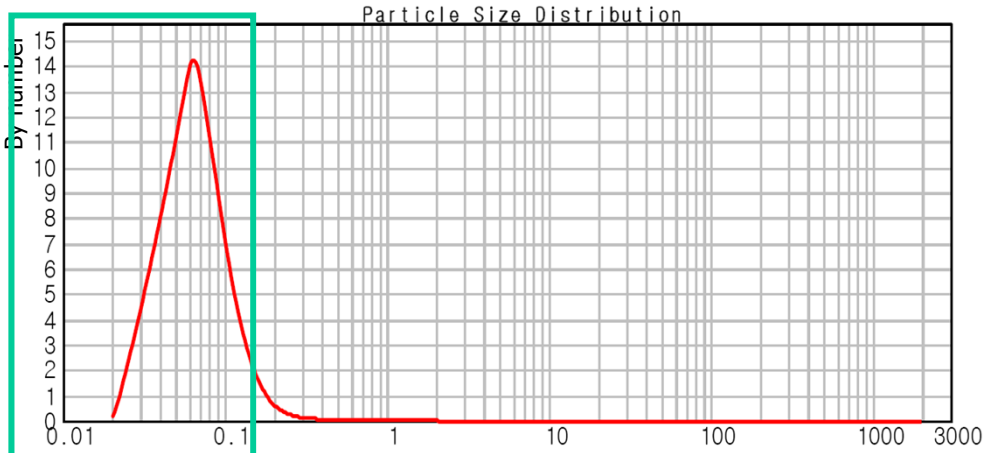
Size (µm)	Volume In %
31.000	0.05
32.000	0.04
33.000	0.04
34.000	0.03
35.000	0.03
36.000	0.02
37.000	0.02
38.000	0.03
40.000	0.01
41.000	0.01
42.000	0.01
43.000	0.01
44.000	0.01
45.000	0.00
46.000	0.00
47.000	0.00
48.000	0.00
49.000	

Size (µm)	Volume In %
49.000	0.00
50.000	0.00
55.000	0.00
60.000	0.00
65.000	0.00
70.000	0.00
80.000	0.00
100.000	0.00
112.468	0.00
126.191	0.00
141.589	0.00
158.866	0.00
178.250	0.00
200.000	

SOFTITAN60 is a solution for NON-NANO TiO2

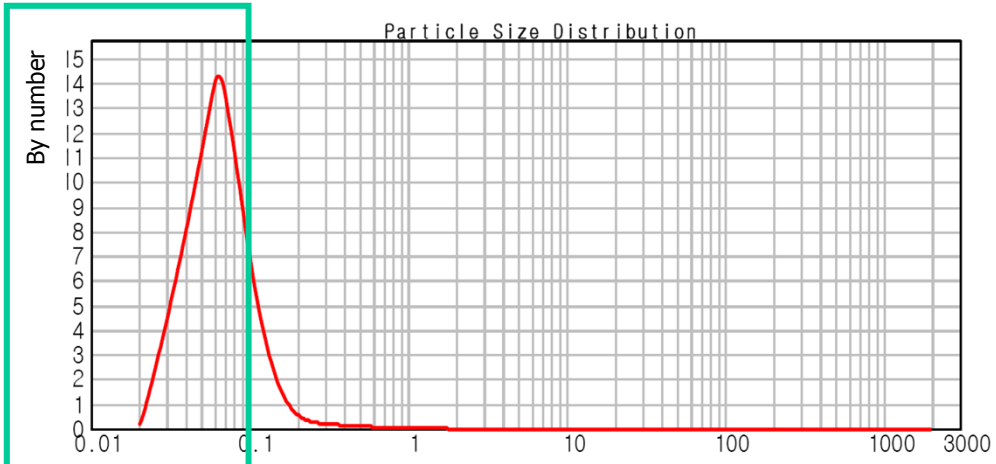


SOFTITAN60 from SUNJIN



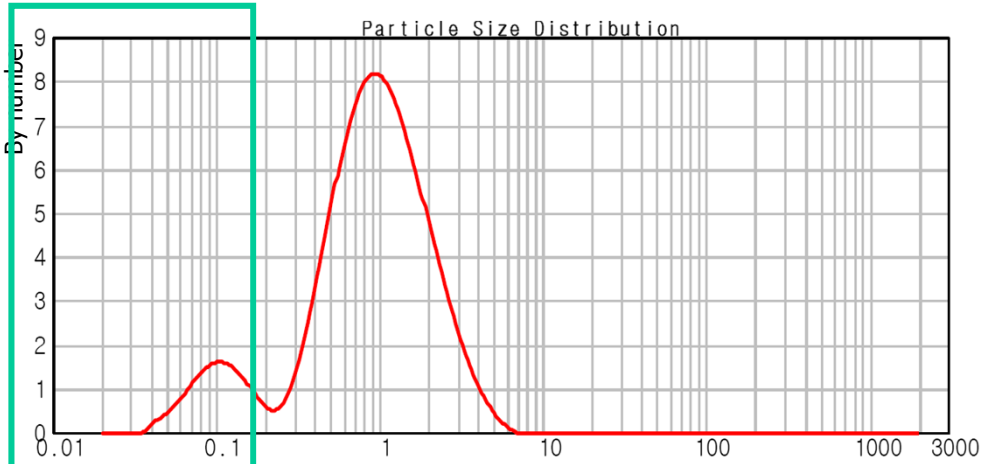
NANO particles found

30nm TiO2 from company "A"



NANO

SOFTITAN85 from SUNJIN



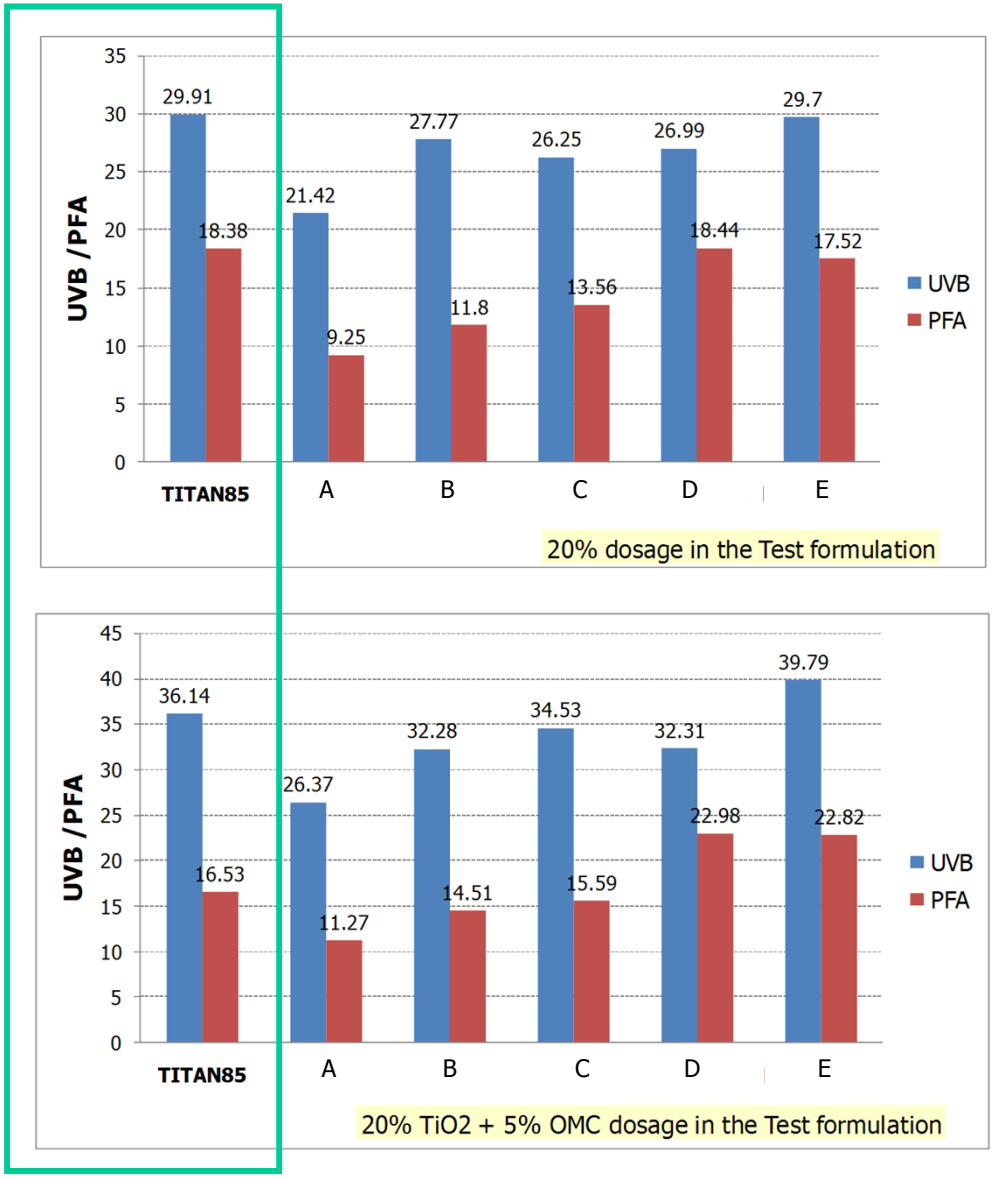
NANO

20nm TiO2 from company "B"

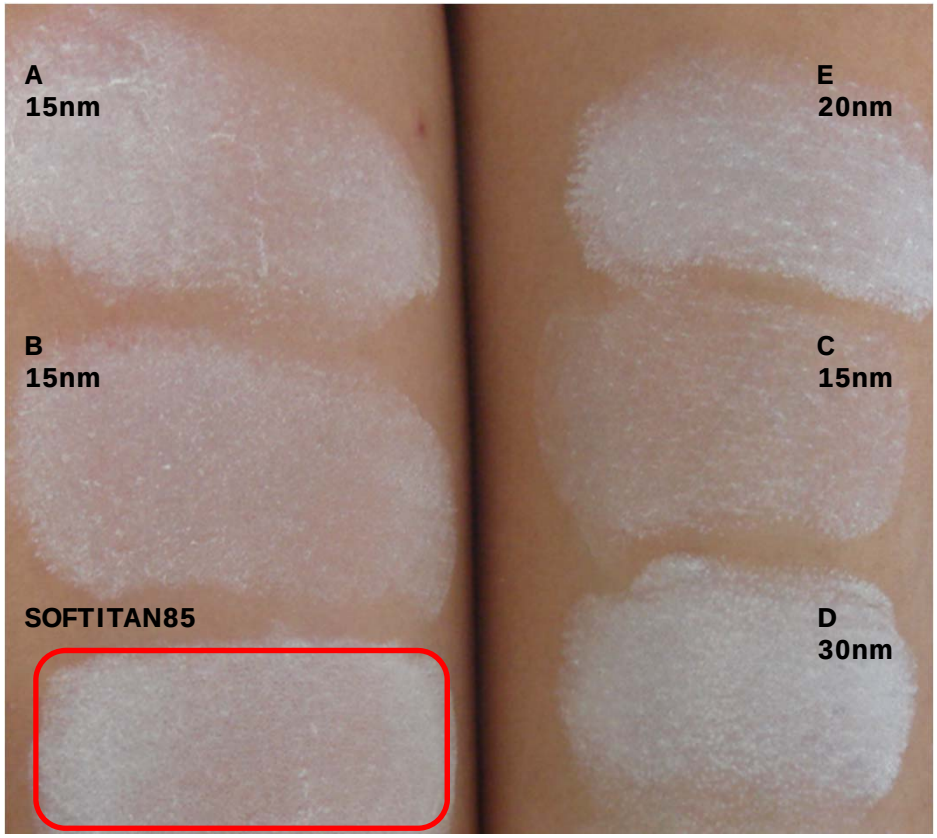
SOFTITAN 85 show good SPF/PA efficacy as compared to other Nano TiO2

Tested TiO2	TiO2 (%)	Size
SOFTITAN 85 (SUNJIN)	85	1 ~ 5 um
A	77	15 nm
B	79	15 nm
C	83	15 nm
D	89	30 nm
E	85	20 nm

Tested formula	%
Zinc Stearate	3
SUNMICA-AS	13
SUNSERI-AS	10
SUNTALC-AS	44
TiO2	20



SOFTITAN 85, feels good, blocks UV efficiently with Natural coverage



Coverage comparison(0.3g)

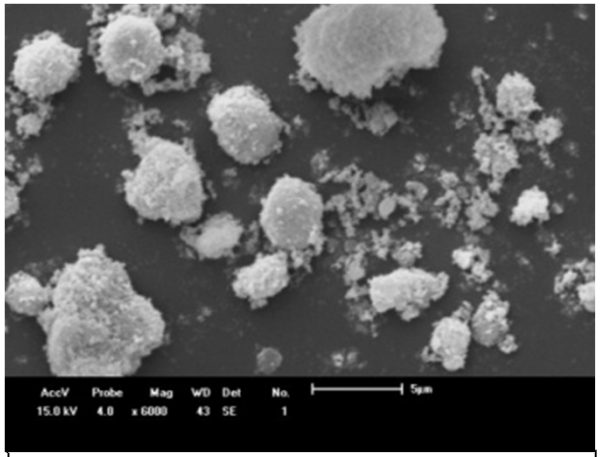
	Nano TiO2	Pigmentary TiO2	SOFTITAN 85
Size	15~30nm	200nm	1~5um
Coverage	Bluish, transparent	Chalky white	Natural white
UV protection	Excellent	little	Excellent
Spread	Very bad	OK	Good
Feel	Very bad	OK	Good

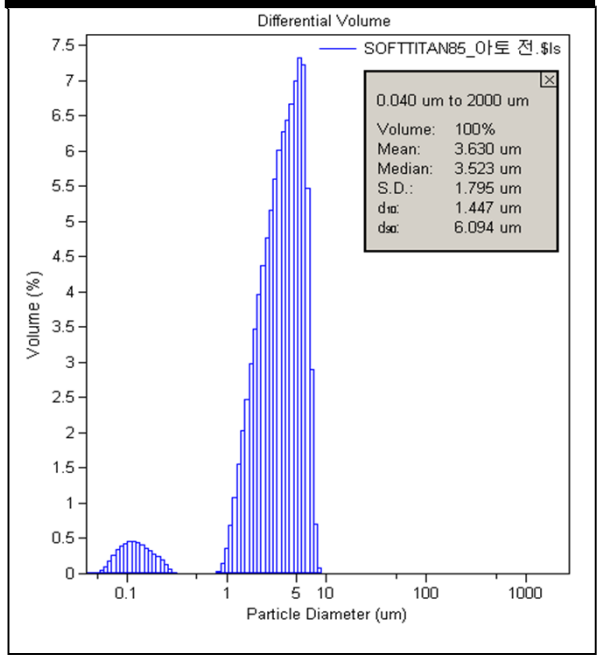
SOFTITAN 85

- Spreads very well, feels better
- No bluish tone
- 2 in 1 functions:
  - ⇨ UV protection from nano TiO2
  - ⇨ Coverage from pigmentary TiO2
  - ⇨ So, Broad UV protection
- Reduce the combined dosage of TiO2
  - ⇨ Enhance texture
  - ⇨ Save formulation cost

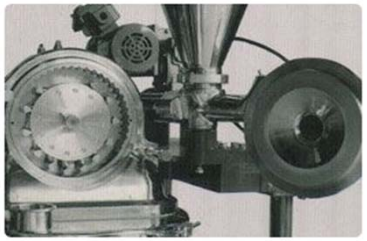
Granule is not breakable

Before

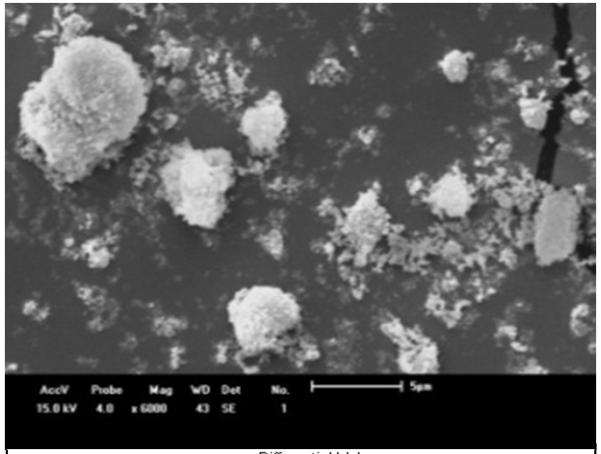


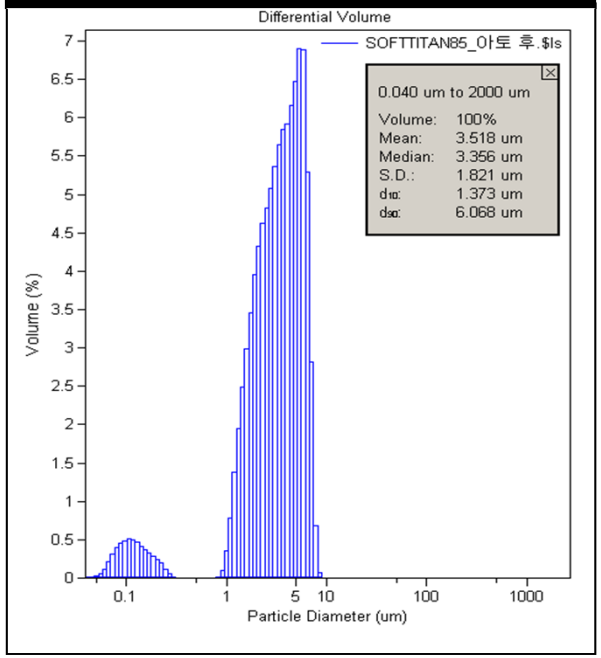


1,700rpm
Atomizing



After





Part 3. 유기 복합화 기술

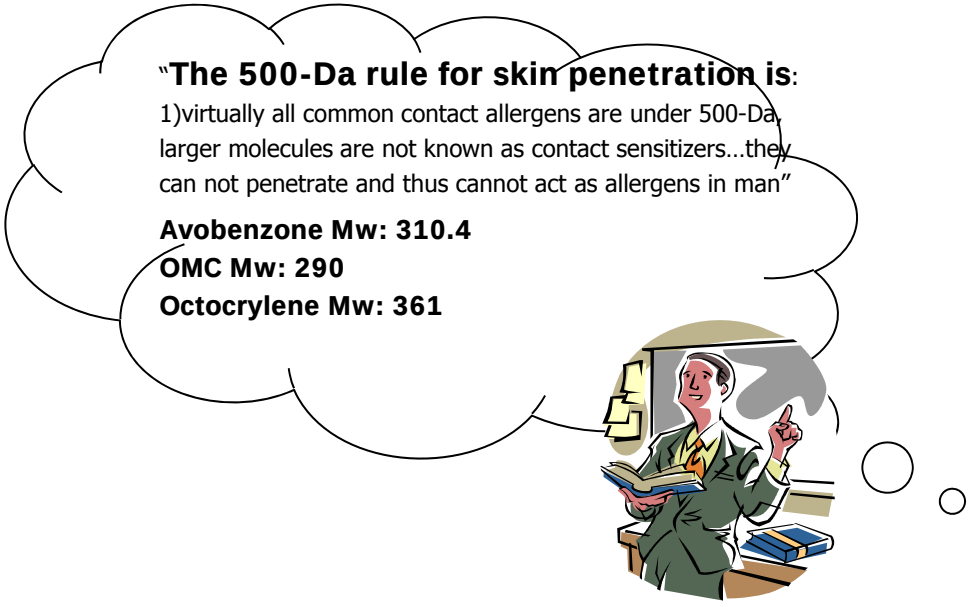
유기 자외선 차단제의 단점

(1) 피부 자극성

(2) 끈적이는 사용감

(3) 제형의 안정성/편리성

(4) 체내 흡수 가능성

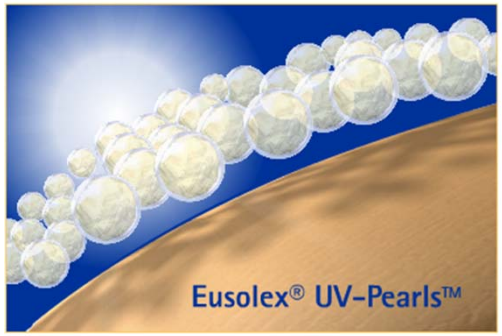


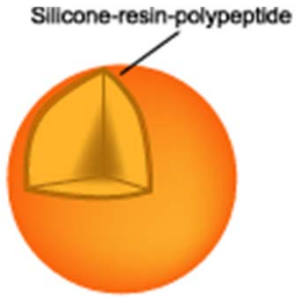
유기 자외선 차단제

Table 4 **Physicochemical properties of the Uvinul 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	$C_{48}H_{66}N_6O_6$	823	White to light yellow powder
Uvinul N 539 T	$C_{24}H_{27}NO_2$	361	Clear yellow viscous liquid
Uvinul MBC 95	$C_{18}H_{22}O$	254	White powder
Uvinul M 40	$C_{14}H_{12}O_3$	228	Light yellow powder
Uvinul MS 40	$C_{14}H_{12}O_6S$	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 D 50	$C_{13}H_{10}O_5$	246	Yellow powder
Uvinul DS 49	$C_{15}H_{12}O_{11}S_2Na_2$	478	Light yellow powder
Uvinul BMBM	$C_{20}H_{22}O_3$	310	Off white to light yellow powder
Z-COTE	ZnO	81	White powder
Z-COTE HP 1	ZnO	81 (for ZnO)	White powder
Uvinul TiO2	TiO_2	80 (for TiO_2)	White powder

해외 유기 자외선 차단제 복합 사례

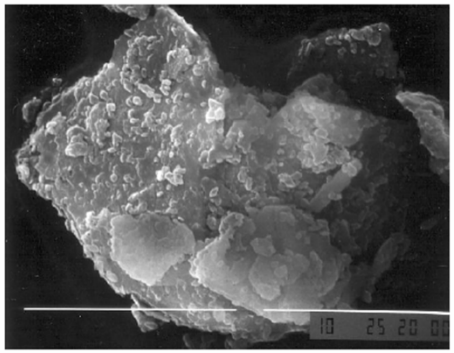




Product	INCI Name	Feature
SILASOMA ME	Polysilicone-14 (Wall Material) Ethylhexyl Methoxycinnamate (Encapsulated Material) Water	Microcapsules containing UV filter for UVB protection
SILASOMA MEA	Polysilicone-14 (Wall Material) Ethylhexyl Methoxycinnamate (Encapsulated Material) Butyl Methoxydibenzoylmethane (Encapsulated Material) Water	Microcapsules containing UV filter for both UVA and UVB protection

해외 사례

MBBT-TALC DM



INCI name

TALC / METHYLENE BIS-BENZOTRIAZOLYL TETRAMETHYL-BUTYLPHENOL / ALUMINUM HYDROXIDE / DIMETHICONE

Physical Property

Items	Standard Value
Average Particle Diameter (μm)	7～11
Oil Absorption (mL/100g)	40～50
MBBT contents (%)	8～10
Dimethicone contents (%)	2～3
Aluminum Hydroxide contents (%)	2～3

유기 자외선 복합 소재의 요구 특성

(1) High Loading %

(2) Physically Stable

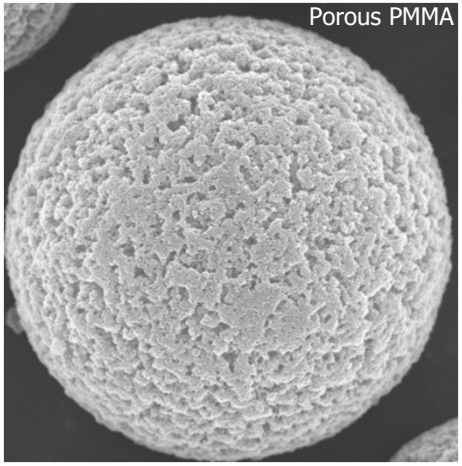
(3) 기능성 관련 규정

(4) 가격

유기 복합 소재 제조 방법

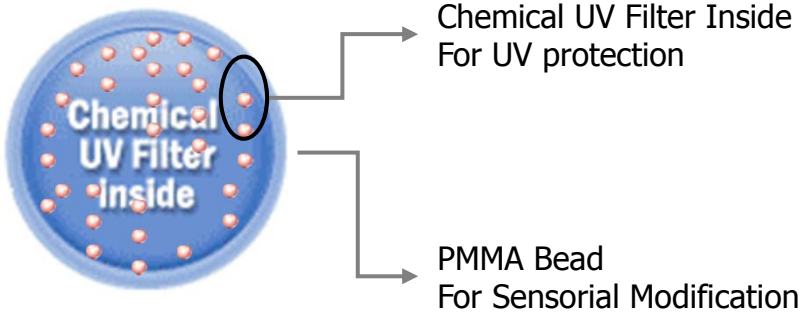
1) 액상 자외선 차단제

"Loading"



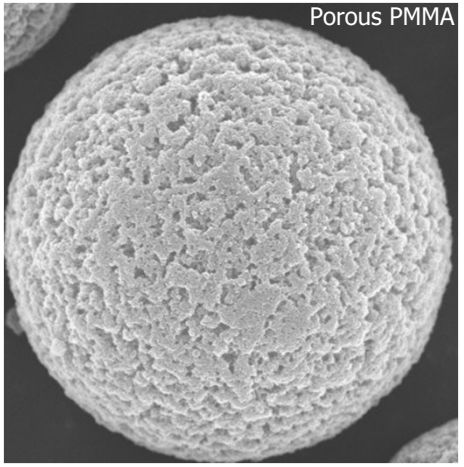
2) 고상 자외선 차단제

"Hybridization"



FP OMC is Porous PMMA containing OMC inside

Grade	INCI Name & compostion	Avg. Particle size(㎛)	EFFECT & APPLICATION
FP - OMC	Methyl methacrylate crosspolymer 60% Ethyl hexyl methoxycinnamate 40%	8	UV protecting High SPF sun care products



Best recommend for

(1)Make-up with UV protection

- OMC is normally used as a binder when to make UV protecting make-up.
- But OMC is skin irritant, of no good sensorial feel
- So rather than using OMC as binder, better to use FP-OMC

(2) Sun Protect GEL

Phase	No.	Trade Name	%
A	1	FP-OMC	12
	2	PARSOL EHS	3.0
	4	HYBRID ABOMC	3.0
	5	1,3-B.G.	10.0
	6	D.I. WATER	TO 100
	7	ARISTOFLEX AVC	0.4
	8	FRAGRANCE	0.15

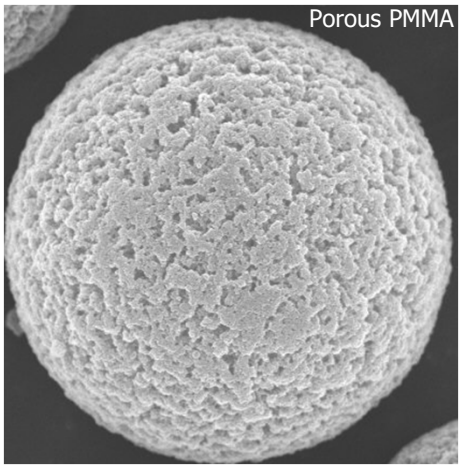
No emulsifier Used inside

- Chemical filters and water soluble components are mixed without emulsifier
- Very light texture
- Less skin irritation for OMC stays inside porous PMMA bead

How to make NON NANO

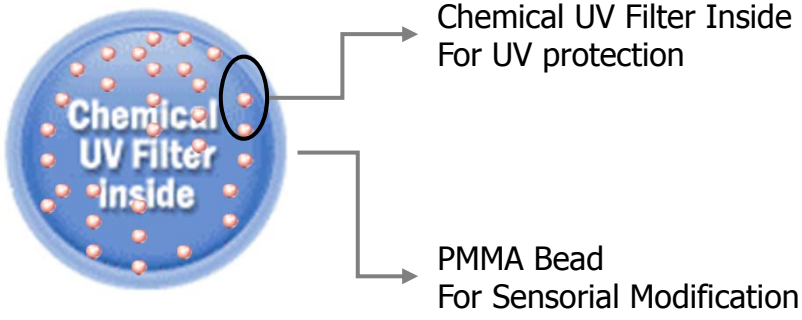
1) 액상 자외선 차단제

"Loading"



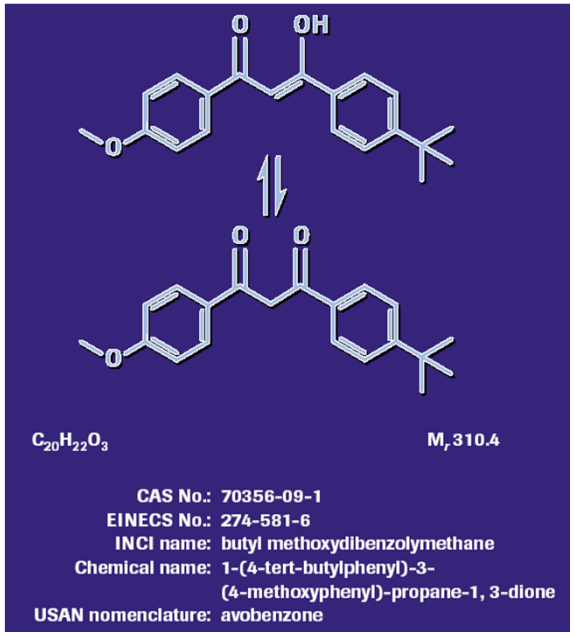
2) 고상 자외선 차단제

"Hybridization"



BMDBM(=Avobenzone) is a great UVA filter but has Problems too

BMDBM



- Globally Approved: USA, EU, Japan, Australia
- Approved % by FDA is 3%
- Very Affordable Price
- Very Efficient UVA Filter
- Avobenzone has exceptionally high molar extinction coefficient(>30,000) and λmax of 357nm…

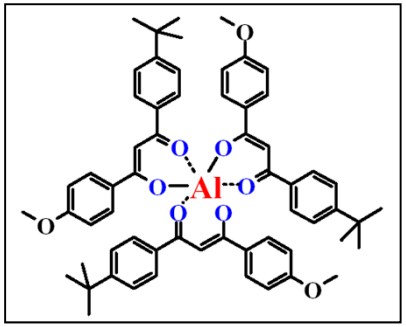
Problems

(1) Poor Solubility

	BMDBM	OMC
Dimethicone	0	3
Cyclomethicone	0	50
Mineral oil	1	50
Isostearyl Isosterate	3	50
Octylpalmitate	3	50
Cpric/Caprilic Triglyceride	7	50
Isopropyl Myristate	9	50
PG/Dicaprate/Dicaprylate	5	50
C12-C15 Alkyl Benzoate	11	50
Octyldodecanol	13	50
Ethyl Butylacetylaminopropionate	26	50

Avobenzone degrades quickly in the sun. Researchers have reported a 36% reduction in UVA absorption by avobenzone after only 15 minutes of exposure. In vitro studies have shown a 50% loss in UVA blockage for different sunscreen formulations, confirming the photodegradation of avobenzone.

(3) Poor Compatibility

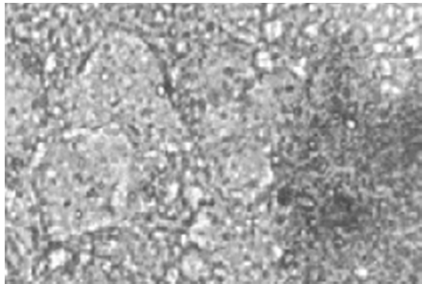


Aluminum oxide is one of the most common coating material for TiO2.

BMDBM forms a complex with Al3+ salts from TiO2 coatings

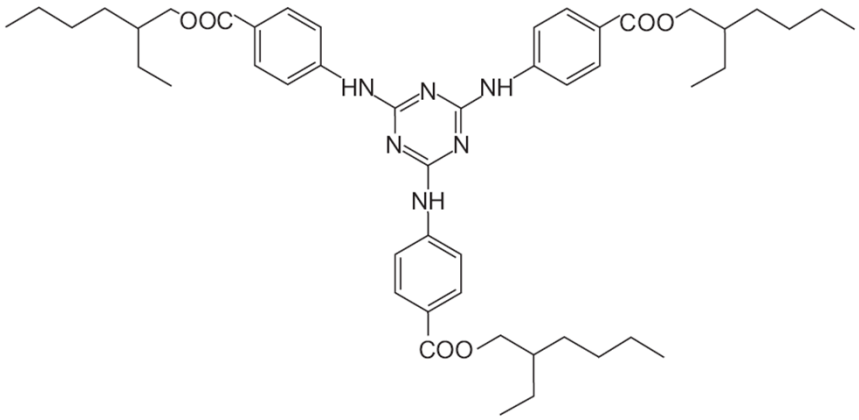
→The amount of BMDBM decreases
→ weakening of the UVA protection

(4) Crystallization



BMDBM is susceptible to crystallization that results in loss of product aesthetics, sun protection, appearance, stability

EHT



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

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 suncare preparations, to achieve a high SPF value. Concentrations up to 5% are recommended.

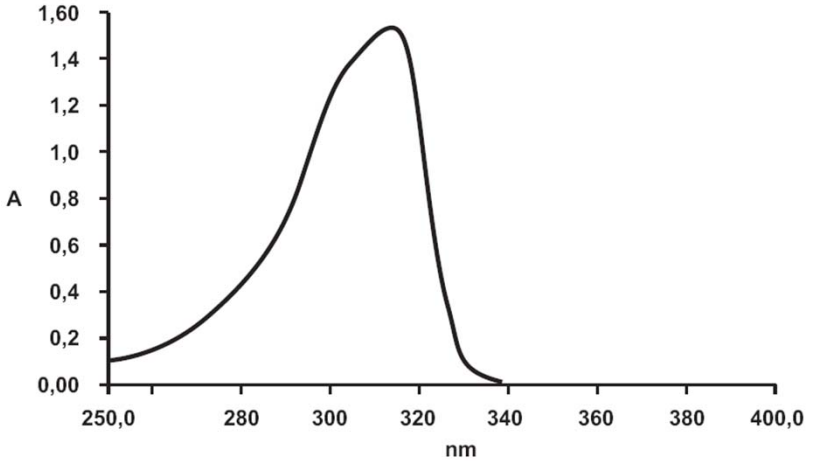
The polar nature of Uvinul T 150 gives it good affinity to the keratin in the skin, so that formulations in which it is used are particularly water-resistant. This property is further enhanced by its complete insolubility in water.

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.

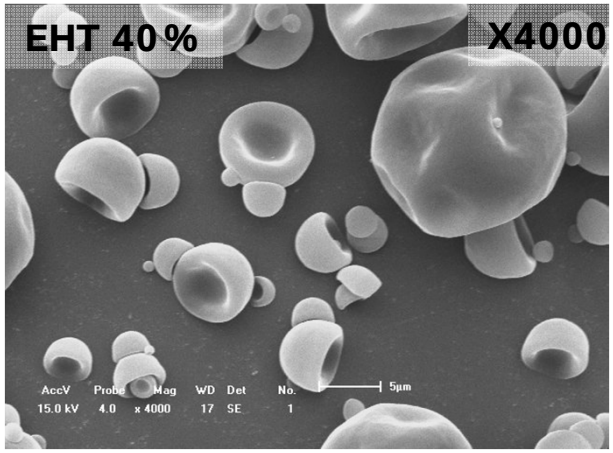
Uvinul T 150 can crystallize out after prolonged storage, as a result of supersaturation.

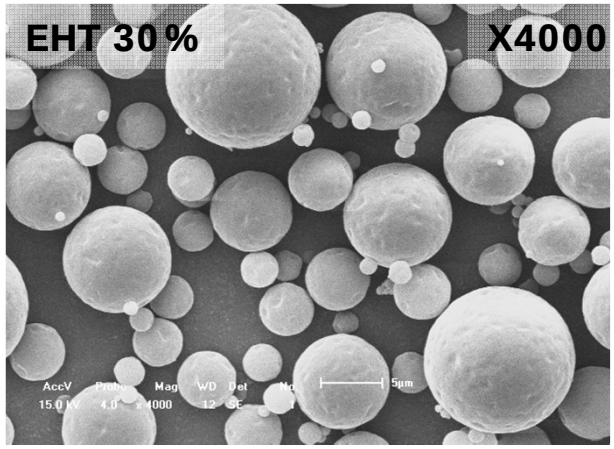
Solubility of Uvinul T 150 in different oils

Ceraphyl 45	Dioctyl Malate	13%
Cetiol A	Hexyl Laurate	8%
Cetiol HE	PEG-7 Glyceryl Cocoate	15%
Cosmacol ECI	Tri-C12-13 Alkyl Citrate	17%
Cosmacol ELI	C12-13 Alkyl Lactate	22%
Cosmacol EMI	Di-C12-13 Alkyl Malate	23%
Cosmacol EOI	C 12-13 Alkyl Octanoate	24%
Cosmacol ESI	Tridecyl Salicylate	10%
Cosmacol ETI	Di-C12-13 Alkyl Tartrate	35%
Cremophor® WO7	PEG-7 Hydrogenated Castor Oil	10%
Crodamol DOA	Dioctyl Adipate	9%
Crodamol HE	PEG-7 Glyceryl Cocoate	12%
Crodamol PMP	PPG-2 Myristyl Ether Propionate	8%
DUB Synersol	Isodecyl Neopentanoate (and) Diisopropyl Sebacate (and) Lauryl Lactate	16%
Estol 1526	Propylene Glycol Dicaprylate/ Dicaprate	10%
Miglyol 840	Propylene Glycol Dicaprylate/ Caprate	13%
Myritol 311	Cocoglycerides	8%
Myritol 331	Cocoglycerides	10%
Prisorine 2034	Propylene Glycol Monoisostearate	9%
Uvinul MC 80	Ethylhexyl Methoxycinnamate	13%
Velsan D8P-3	Isopropyl PPG-2 Isodeceth-7-Carboxylate	26%
Witconol APM	PPG-3 Myristyl Ether	14%

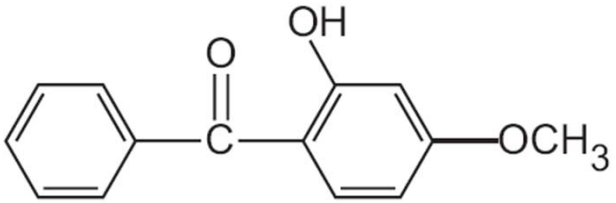


Hybrid EHT





Oxybenzone



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.

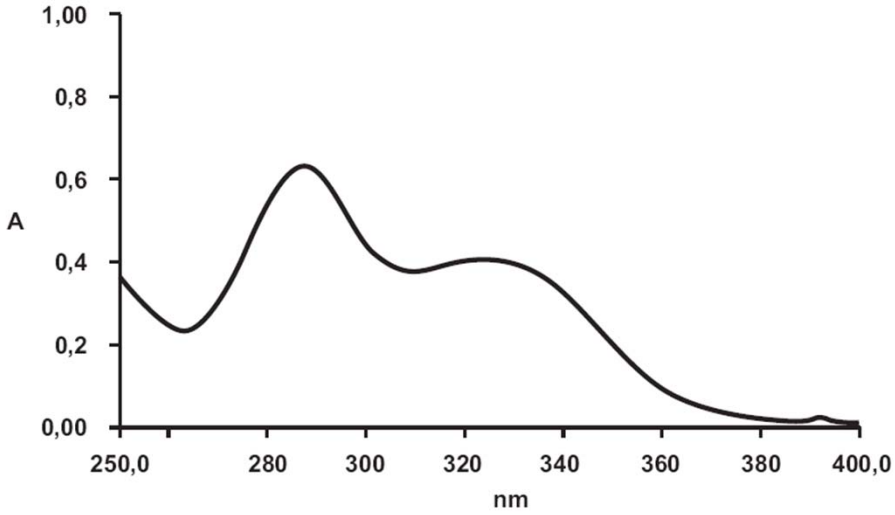
As it is soluble in oil, Uvinul M 40 is incorporated in the oily phase. Its solubility in different oils is shown in Tables 2 and 7.

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.

Solubility of Uvinul M 40 in different oils

Glycerin	< 0.01%
Abil AV 8853	2.0%
Jojoba oil	6.0%
Isostearyl stearate	7.0%
Isostearyl neopentanoate	8.0%
Olive oil	9.0%
Peanut oil	9.0%
Cetiol V	9.0%
Isopropyl stearate	9.0%
Isopropyl myristate	11.0%
Miglyol 812	14.0%
Finsolv TN	15.0%
Cetiol HE	17.0%



Play Tool Kit

Avobenzone

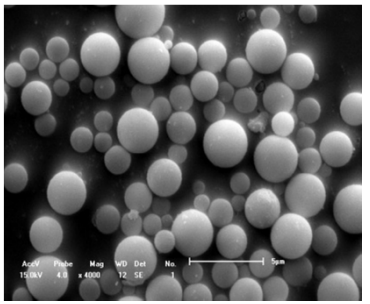
Oxybenzone

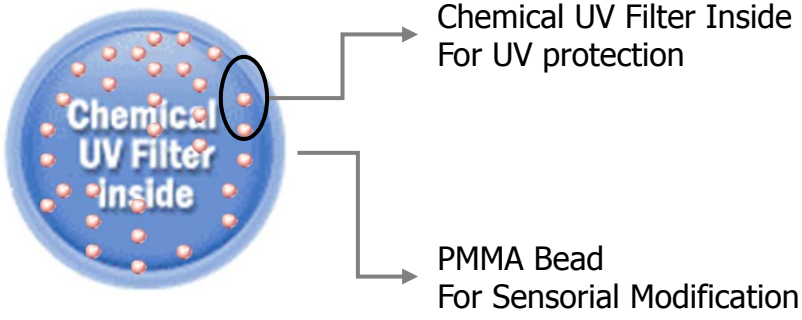
Octocrylene

Octyl Salicylate

HYBRID PMMA is PMMA bead containing UV filters inside

Grade	Composition	Particle size(um)	Remark
Hybrid ABOC	BMDBM(Avo Benzone) 28~32% Octocrylene 5~8% PMMA 62~67%	2~7	UVA
Hybrid ABOS	BMDBM(Avo Benzone) 28~32% Ethyl Hexyl Salicylate 5~8% PMMA 62~67%	2~7	UVA
Hybrid EHT	Ethyl Hexyl Triazone 28~32% PMMA 68~72%	2~7	UVB





Hybrid PMMA = UV protection + Good Sensory + More

Korean Patent Registered No. 10-2007-0083469
US Patent Application No. 11/872,456
"POLYMER COMPOSITE PARTICLES CONTAINING SUNSCREEN AGENT AND MANUFACTURING METHOD THEREOF"
Japanese Patent Application *特願 2007-272539*

Hybrid PMMA is Much less skin irritant & Much better sensory

Benefits

(1) Diminished skin irritancy

- The encapsulation of UV filters inside PMMA bead reduces dermal uptake, thereby reducing the potential for irritation
- The encapsulation of UV filters eliminates distribution of the organic filter in the skin layers so good for Sun Cares for Sensitive Skin Types

(2) Excellent sensorial feeling

- Most chemical filters are very oily and leave behind an unpleasant, sometimes sticky feel on the skin
- Hybrid PMMA has the excellent skin feel of PMMA bead which is frequently used as a texture additive, and therefore lend the formula a soft-touch effect

(3) Good for W/Si formula & O/W formula

- BMDBM is not soluble to silicone oils so BMDBM is extremely difficult to be incorporated into silicone based formula
- While Hybrid PMMA that contains BMDBM can be easily incorporated into silicone oils by simple mixing
- Can be easily incorporated into water phase so very useful for O/W formula
- Stable in the broad pH range, i.e. in a pH of approximately pH 1.0 – 14.0.

(4) Improved photo-stability

- BMDBM is segregated, immobilized inside solid PMMA matrix so the contacts between UV filters and skin are avoided completely- the cause of instability and odor problems can be ruled out entirely

(5) Physically stable

- Unlike to conventional encapsulated products, Hybrid PMMA is physically unbreakable
- Physical shape of PMMA hybrid bead maintained during high shear stress test or by topical pressure after in vivo application

(6) Long Lasting UV protection like physical filter

- Unlike chemical sunscreens that sink into the skin and absorb radiation as it hits, these ingredients sit on top of your skin, forming an almost invisible physical barrier against UV rays.

Recommended for

O/W skin care
Daily UV protection

Make-up
UV protection

W/Si formula

Sun Care
W/Si, O/W

Hybrid PMMA Beads are Photo-stable. Test results & Theory

Test Results

	# 1	# 2	# 3	# 4	# 5
HYBRID ABOMC	-	-	-	10	-
HYBRID ABOS	-	-	-	-	10
BMDBM	3	3	3	-	-
Octocrylene	-	-	3	-	-
Octyl Methoxy Cinnamate	7	-	7	6.5	6.5
Octyl Salicylate	-	7	-	-	-
PMMA-S	10	10	10	-	-
C12-15 Alkyl Benzoate	30	30	27	33.5	33.5
Vaseline	50	50	50	50	50

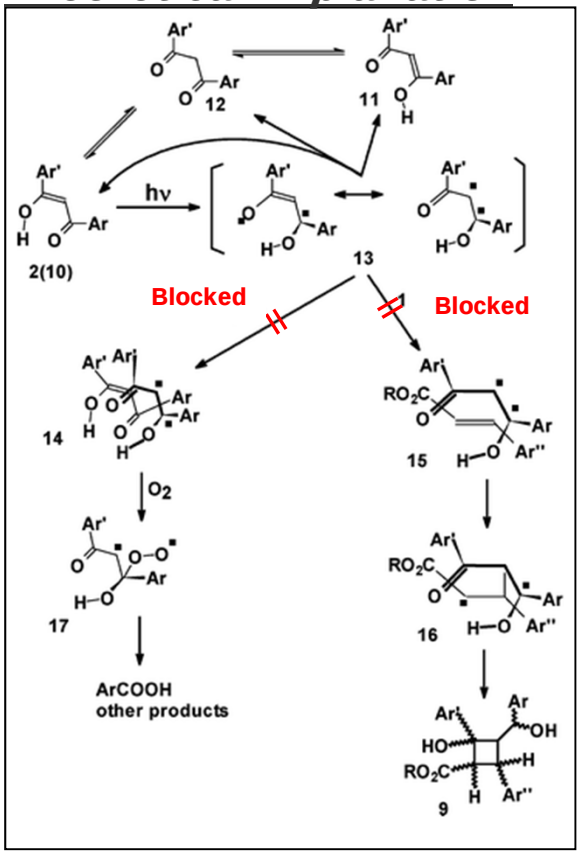
SPF (before → after 85.7MED)	20.1 → 10.4	14.9 -> 18.3	26.1 -> 25.3	19.4 -> 20.2	19.6 -> 23.4
UVA/UVB ratio	0.86 → 0.94	0.98 -> 0.97	0.84 -> 0.86	0.88 -> 0.87	0.83 -> 0.78
Boots Star Rating	4 → 5	5 -> 5	4 -> 4	4 -> 4	4 -> 3
Average UVA PF	17.6 → 10.6	17.8 -> 23.3	27.1 -> 22.6	18.8 -> 20.2	16.7 -> 17.1
Critical Wavelength	378 → 380	379 -> 378	376	379 -> 379	378 -> 377
	Not photo-stable	Photo-stable	Photo-stable	Photo-stable	Photo-stable

Vs.

Prisoner, not allowed to move
→ Avobenzone in Hybrid PMMA

Free man, free to move
→ Avobenzone in liquid formula

Theoretical Explanation



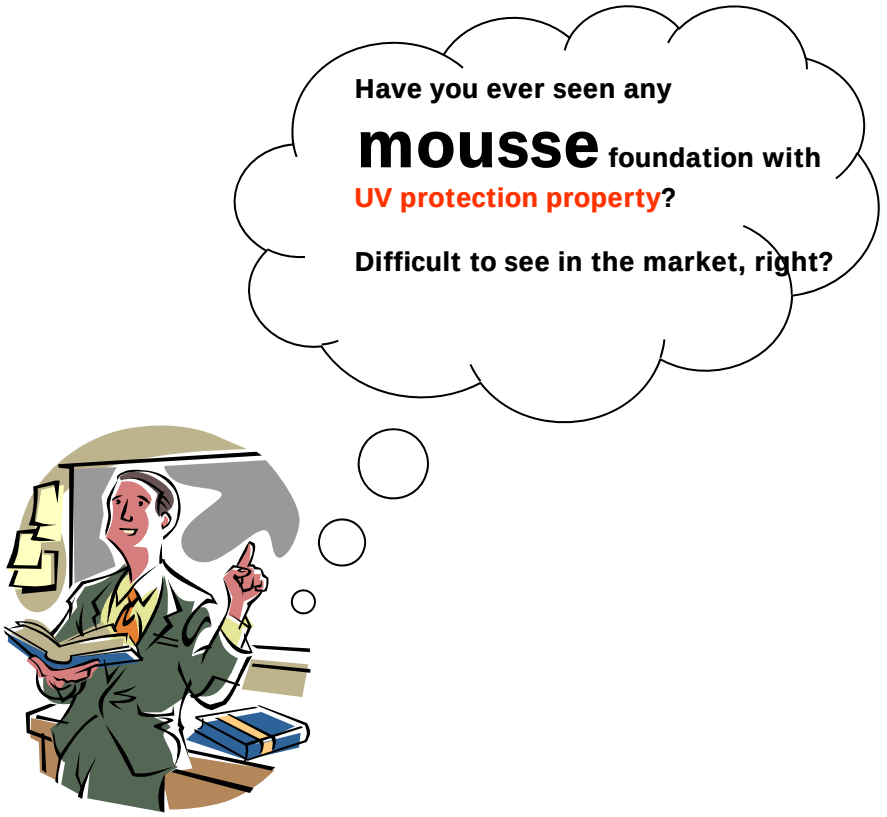
Photodegradation of Avobenzone can be **blocked** because nano sized Avobenzone crystals are **immobilized in solid PMMA matrix**

OMC/avobenzone combination is well known to be not amenable to photostabilization **unless segregated by some means such as encapsulation.**

Hybrid PMMA is strongly recommend for Silicone Based Formula with UV protection

	No.	Trade Name	CTFA Name	%
A	1	SUNTITAN-AS	Titanium dioxide/ Triethoxy caprylylsilane	7.00
	2	SUNSERI-AS	Sericite/ Triethoxy caprylylsilane	5.00
	3	SUNMICA-AS	Mica/ Triethoxy caprylylsilane	2.00
	4	SUNSIL-130HSC	Silica / Methicone	7.00
	5	SH219	Silica/ Titanium dioxide	1.50
	6	SUNTALC-AS	Talc/ Triethoxy caprylylsilane	5.00
	7	Hybrid ABOC	PMMA/Avobenzone/Octocrylene	5.00
	8	SUNIOR-AS	Iron oxide Red/ Triethoxy caprylylsilane	0.42
	9	SUNIOY-AS	Iron oxide Yellow/ Triethoxy caprylylsilane	0.84
	10	SUNIOB-AS	Iron oxide Black/ Triethoxy caprylylsilane	0.05
B	11	SALACOS 99	Isononyl isononanoate	10.00
	12	DC200-10CS	Dimethicone	5.00
	13	SQUALANE	Squalane	3.00
	14	IPP	Isopropyl Palmitate	2.00
	15	L.P	Liquid Paraffin	6.00
	16	NOMKORT HKG	Glyceryl Behenate / Elcosadioate	4.00
	17	JOJOBA OIL	Jojoba oil	1.00
	18	VIT.E ACETATE		0.20
	19	PARSOL MCX	Ethylhexyl Methxycinnamate	2.00
	20	GRAPE SEED OIL	Grape Seed Oil	3.00
C	21	SUNGEL-1145	Dimethicone/ Vinyl Dimethicone Cross Polymer	30.00
D	22	FRAGRANCE	FRAGRANCE	0.08

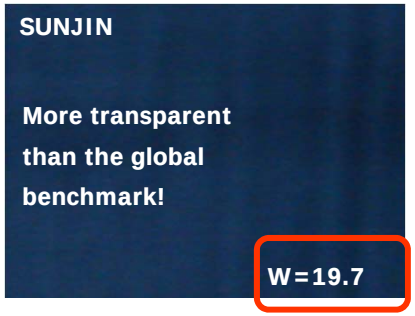
Guideline Formula: SJF-0806-Mousse Foundation:
SPF25, PA++(estimated)

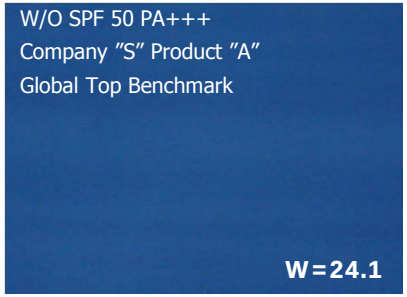


SUNJIN CHEMICAL

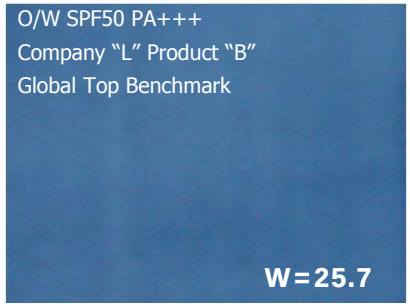
Hybrid PMMA is good for Transparent and Good Sensorial High SPF, PA sun care

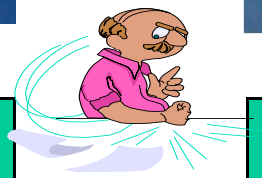
W/O formula





O/W formula





	SUNJIN formula W/O	Company "S" Product "A" (W/O)
In vivo claim	SPF50, PA+++ (estimated)	SPF 50, PA+++
In vitro measurement SPF PA UVA/UVB Critical Wavelength	 SPF 39.3 25.19 0.771=1:1.29 378.7	 SPF 33 22.59 0.677=1:1.477 370.3
Transparency (White Index)	19.7	24.1
Active Ingredients	Ethylhexyl methoxycinnamate: 7.0% Ethylhexyl Salicylate: 5% Hybrid ABOMC: 6.0% SUNSIL-Tin40: 5.0% SUNZNO-NAS: 3.5%	Ethylhexyl methoxycinnamate Octocrylene Zinc oxide BMDBM Ethylhexyl TRIAZONE

Excellent Transparency & Feel with High SPF & PA

	SUNJIN formula O/W	Company "L" Product "BH" (O/W)
In vivo claim	SPF50, PA+++	SPF 50, PA+++
In vitro measurement SPF PA UVA/UVB Critical Wavelength	 SPF 37.97 18.84 0.71=1:1.41 380.1	 SPF 38.78 22.22 0.71=1:1.41 376.8
Transparency (White Index)	29.8	25.7
Active Ingredients	Ethylhexyl methoxycinnamate: 6.5% Ethylhexyl Salicylate:5% Hybrid ABOMC: 9.0% SUNSIL-Tin40: 5.0% SUNZNO-NAS: 3.5%	Terephthalylidene dicamphorsulfonic Acid Ethylhexyl methoxycinnamate Drometrizole trisiloxane Titanium dioxide Benzophenone-3 Phenylbenzimidazole sulfonic Acid

In vivo Tested

Globally patented

Korean Patent applied
No. 10-2007-0083469

US Patent Application No. 11/872,456
"POLYMER COMPOSITE PARTICLES CONTAINING SUNSCREEN AGENT AND MANUFACTURING METHOD THEREOF"

Japanese Patent Application 特願 2007-272539

Chinese Patent Application

맺음말

유/무기 자외선 차단 복합 소재