




# **CHEMICAL FILTER FREE SUN CARE with Higher SPF**

June 8<sup>th</sup> 2010

**Sung-HO LEE**  
**SUNJIN CHEMICAL**  
**IMPAG**



# ABEND-EVENT UND KOSMETIKSEMINAR 2010

## PROGRAMM AM 07. JUNI

18:30 Uhr	Weinprobe mit Klosterbesichtigung (Treffpunkt vor dem Hotel)
20:00 Uhr	Gemeinsames Abendessen in der Klosterschänke (Legere Kleidung)
	Übernachtung im Hotel Kloster Eberbach



## PROGRAMM AM 08. JUNI

09:30 Uhr	Begrüßung im Bibliotheksaal
09:35 - 10:00 Uhr	Vortrag: Quillaja saponaria – das erste Biotensid aus nachhaltigem Anbau Dr. Regina Walther (PERA GmbH) (Vortragssprache: Deutsch)
10:00 - 10:30 Uhr	Vortrag: „Änderungen und Trends in der Kosmetikdirektive“ Dr. Reto Hess (IMPAG AG) (Vortragssprache: Deutsch)
10:30 - 11:00 Uhr	Vortrag: „Natural Texture-Additives & Chemical Filter-free Sun Care Solution with high SPF“ Sung-ho Lee (SUNJIN) (Vortragssprache: Englisch)

11:00 - 11:30 Uhr	PAUSE
11:30 - 12:00 Uhr	Vortrag: „Innovation trifft Emotion – Anforderungen an Kosmetikprodukte für die Zielgruppe 50+“ Renate Arndt (GIM - Gesellschaft für innovative Marktforschung mbH) (Vortragssprache: Deutsch)
12:00 - 12:30 Uhr	Vortrag: „Green Chemistry by Soliance“ Olivier Garet (Soliance S.A.) (Vortragssprache: Englisch)
12:30 - 13:30 Uhr	STEHLUNCH
13:30 - 14:00 Uhr	Vortrag: „A New Naturally Active Approach to Anti-Aging: Slowdown intrinsic & extrinsic aging, boost natural defense and relief challenged skin“ Dr. Liki von Oppen-Bezael (IBR Ltd.) (Vortragssprache: Englisch)
14:00 - 14:30 Uhr	Vortrag: „MicroSilver BG™ – ein neuer innovativer Wirkstoff für die Pflege der Haut“ Dr. Marcel Langenauer (BioEpiderm GmbH) (Vortragssprache: Deutsch)
14:30 - 15:30 Uhr	Interaktive Ausstellung / Offene Diskussion / Kaffee mit dem Vortragenden und dem IMPAG Kosmetik-Team



**Willkommen im Kloster Eberbach,  
D-65346 Eltville im Rheingau**  
[www.kloster-eberbach.de](http://www.kloster-eberbach.de)

**MELDEN SIE SICH GLEICH AN UND SICHERN  
SIE SICH IHREN PLATZ: [kosmetik@impag.de](mailto:kosmetik@impag.de)**

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**SEIEN SIE UNSER GAST** bei einem zweitägigen **EVENT und KOSMETIKSEMINAR** im romantischen Kloster Eberbach am **07. und 08. Juni 2010**



Am 07.06. genießen Sie ab 18:30 Uhr eine Weinprobe mit Klosterbesichtigung (Treffp. vor dem Hotel).



...ein gemütliches Abendessen in der Klosterschänke ab 20:00 Uhr.



...und eine Übernachtung im Hotel des Klosters Eberbach.



Am 08.06. findet unser Seminar im Bibliotheks-saal des Klosters statt (9:30 - 15:30 Uhr).

# CONTENT

1

**CHEMICAL FILTER FREE**

2

**ZINC OXIDE ONLY**

3

**EMULSIFIER FREE**

4

**KEY INGREDIENTS**



# CONTENT

1

## CHEMICAL FILTER FREE

Chemical Filter Free,  
High SPF & PA  
SUN CARE Solution

Chemical Filter Free

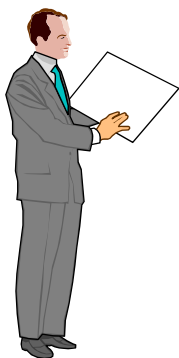


# User Requirements to make “Chemical Filter Free”

Target Performance	<ol style="list-style-type: none"><li>1. In vivo SPF50</li><li>2. PA EU-recommendation of 1/3 UVA protection</li></ol>
Formula Restriction	<ol style="list-style-type: none"><li>1. Chemical Filter Free</li><li>2. Nano TiO<sub>2</sub> Allowed</li><li>3. Nano ZnO is not allowed but Non nano ZnO OK</li><li>4. Silicone oil should be used less than 1%</li><li>5. No D5</li><li>6. Emulsifier with EO or PO not allowed</li></ol>
Formula Cost	> 15\$/kg



Formula  
Proposal



SUNJIN will propose **in vivo** tested formula during seminar

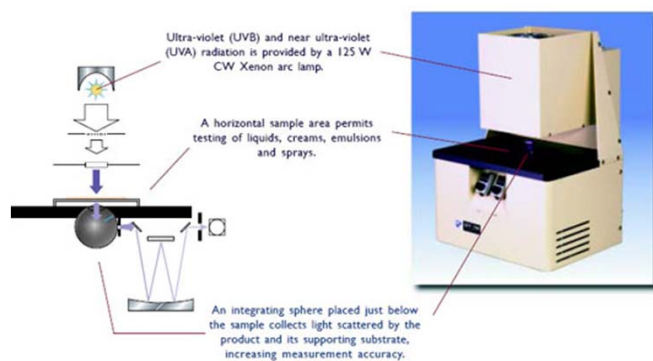
# SUNJIN's Capability





## SUNJIN owns in vivo & in vitro SPF & PA test capabilities

### In vitro SPF & PA test



Optometrics 290  
Installed at SUNJIN in 2001

### In vivo SPF & PA test



SPF Testing 601-300W Multiport UV Solar Simulator  
Installed at SUNJIN in 2009



# SUNJIN's Proposal



# Formula with co-emulsifier

## Mineral Sunscreen-W/O

Phase	Ingredients	INCI Name	%
A	Water	Aqua	29.0
	NaCl	Sodium chloride	1.0
	1.3 BG	Butylene glycol	5.0
B	Dehymuls PGPH	Polyglyceryl-2 Dipolyhydroxystearate	2.0
	Lameform TGI	Polyglyceryl-3 Diisostearate	2.0
	DC 200F-10cs	Dimethicone	1.0
	<b>SUNCLEAR-T50AB</b>	<b>C12-15 Alkylbenzoate based TiO2 dispersion</b>	<b>25.0</b>
C	Cetiol Sensoft	Propylheptyl Caprylate	15.0
	<b>SUNSIL-Tin50</b>	<b>Silica &amp; Titanium dioxide</b>	<b>3.0</b>
	<b>SOFTITAN85</b>	<b>Titanium dioxide &amp; Silica &amp; Tri-ethoxycaprylylsilane</b>	<b>5.0</b>
	<b>SUNZnO-SA</b>	<b>Zinc Oxide &amp; Stearic Acid</b>	<b>10.0</b>
	SUNPMMA-COCO170	Methylmethacrylate Crosspolymer	2.0

### Procedure

- 1) Mix all materials in Phase A at 70 °C
- 2) Treat 3 roll mill in Phase C
- 3) After 3roll mill treatment of Phase C, mix it Phase B & heat by 70 °C
- 4) Slowly add Phase A into 3) with homogenizer(2500rpm)



# Key Ingredients

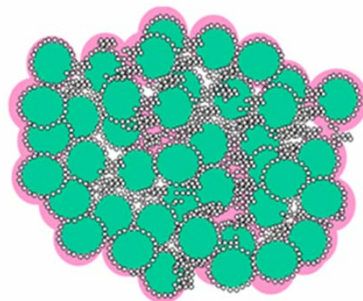


# TiO<sub>2</sub> & ZnO in Ester Oil dispersion

Grade	ZnO crystal size /content/surface treatment	Media	Dispersant	
SUNCLEAR T40ABX	15nm TiO <sub>2</sub> 30~36% / alkyl silane	<b>C<sub>12-15</sub> Alkyl Benzoate</b>	PEG-30 Dipolyhydroxy stearate	
SUNCLEAR Z50ABX	40nm ZnO 45~50% / alkyl silane	<b>C<sub>12-15</sub> Alkyl Benzoate</b>	PEG-30 Dipolyhydroxy stearate	
TD50-AB	15nm TiO <sub>2</sub> 35~40% / Al(OH) <sub>3</sub> & stearic acid	<b>C<sub>12-15</sub> Alkyl Benzoate</b>	Polyhydroxystearic Acid Aluminium Stearate	High solid, Most transparent
ZD60-AB	35nm ZnO 55~60% / Dimethicone/MethiconeCopolymer	<b>C<sub>12-15</sub> Alkyl Benzoate</b>	Polyhydroxystearic Acid Aluminium Stearate	Good Compatibility with Chemical UV-Filters

# SOFTITAN 60, truly non-nano, ECOCERT TiO2

## Nano TiO2



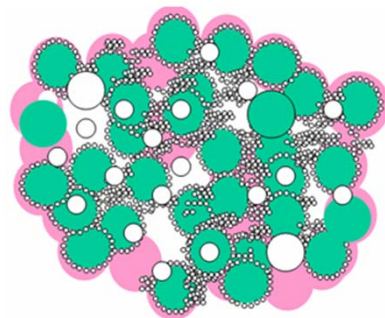
### SOFTITAN 85

TiO2	83%
SiO2	12%
Alkyl Silane	5%

### *Good Spread & Skin Feel*

*As compared to conventional Nano TiO2  
With Excellent UV protection efficacy*

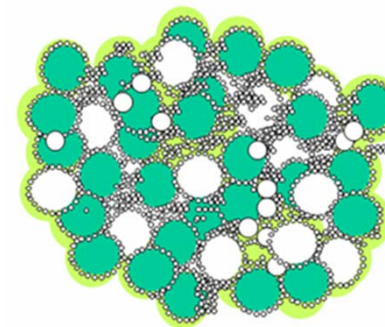
## Non-Nano TiO2



### 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%

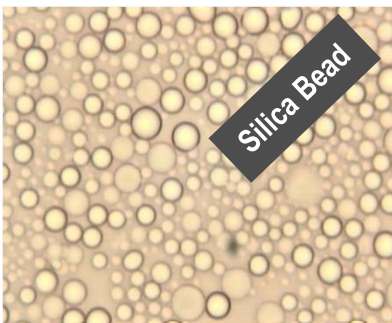
*No single particles less than 100nm  
Plus natural surface treatment  
ECOCERT grade*

- Silica
- TiO2
- Alkyl Silane
- Lauroyl Lysine

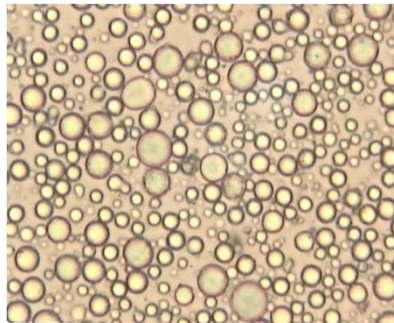


# SUNSIL T<sup>in</sup>50 is TiO<sub>2</sub> Encapsulated Silica Bead

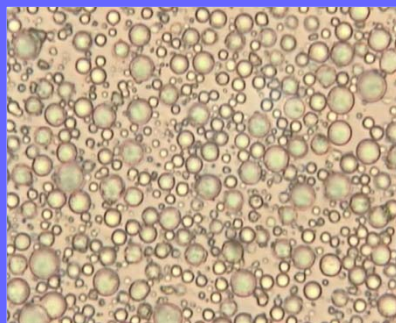
SUNSIL 130



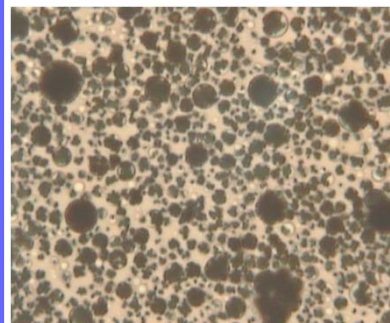
SH 219



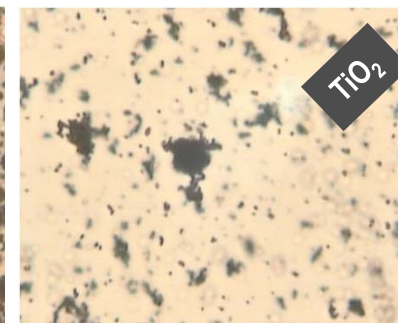
SUNSIL T<sup>in</sup>50



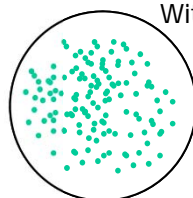
SUNSIL T<sup>in</sup> NaturalWhite



TiO<sub>2</sub>



*no nano particle visible*



5um Silica Bead  
With 12nm TiO<sub>2</sub>

Grade	Descriptions	Crystal size of TiO <sub>2</sub>	Size of silica bead (μm)
SUNSIL-T <sup>in</sup> 50	TiO <sub>2</sub> 42% & Silica 56%	12 nm	2~7
SUNSIL-T <sup>in</sup> 50-AS	TiO <sub>2</sub> 41% & Silica 55% Alkyl Silane 2%	12 nm	2~7

SUNSIL T<sup>in</sup>50 is a TiO<sub>2</sub> composite which is...

- ⇒ ECOCERT approved Natural UV filter
- ⇒ Spherical so good spread & feel
- ⇒ Extremely Transparent
- ⇒ Non-nano TiO<sub>2</sub>

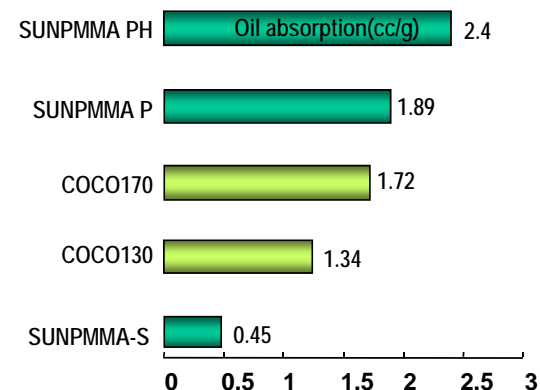
# Nano & Non-Nano Zinc Oxides, for UVA protection

Zinc Oxide meet so called  
 "1/3 rule" of EU  
 recommendation: Level of  
 UVA protection (measured by  
 in vivo or in vitro methods) at  
 least 1/3 of labelled SPF

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.	<b>Non-Nano, ECOCERT, Natural UV Filter</b>
SUNZNO-SA	Stearic Acid	150	n.a.	<b>Non-nano, ECOCERT, Natural UV Filter</b>

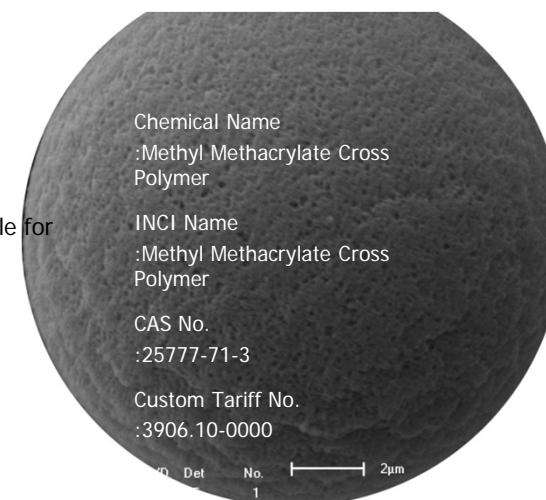
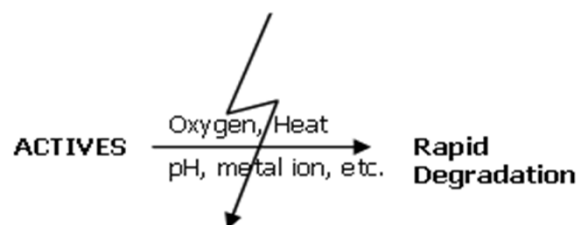
# Porous PMMA Beads can entrap a wide variety of substances

Grade	INCI	Avg. Particle size( $\mu\text{m}$ )	Oil Absorption (cc/g)
SUNPMMA-COCO130	Methyl Methacrylate Cross Polymer	8	1.2~1.4
SUNPMMA-COCO170	Methyl Methacrylate Cross Polymer	8	1.6~1.8
SUNPMMA-P	Methyl Methacrylate Cross Polymer	8	1.7~2.1
SUNPMMA-PH	Methyl Methacrylate Cross Polymer	8	2.1~2.4



## Why Porous PMMA is better than Porous Silica as an active carrier?

- Porous Silica is inorganic so has metal ions inside
- Porous PMMA is a kind of plastic so has no metals or ions inside
- Thus porous PMMA is an inert carrier for actives or fragrances which are susceptible for chemical degradation catalyzed by metallic ions





# Evaluation



# in vivo Test Result back data

## SJF-Mineral Sunscreen-W/O-ver1.0

<MPPDu – 무도포 MED>



<MPPDp – 도포 MED>



### 각 PORT의 광의 세기

1 : 1.04 med/min	2 : 1.20 med/min
3 : 1.39 med/min	4 : 1.60 med/min
5 : 1.84 med/min	6 : 2.11 med/min

#### MPPDu

: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
\* 1min/60sec = 32mj/cm<sup>2</sup>

#### MPPDp

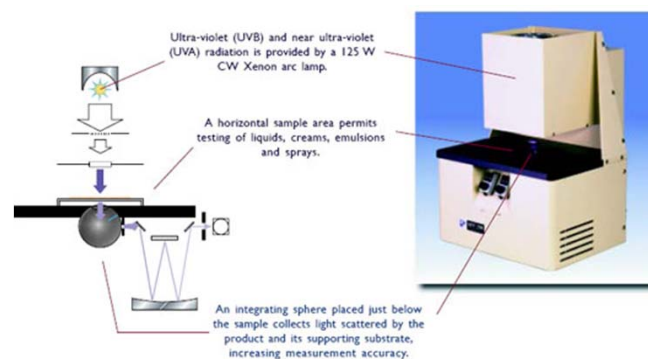
: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
\* 1min/60sec \* 50spf = 1610 mj/cm<sup>2</sup> \* spf

결과 산출 계산식 : MPPDp / MPPDu  
: 1610 mj/cm<sup>2</sup> \* spf / 32mj/cm<sup>2</sup>  
= 50 SPF

# PA EU-recommendation of 1/3 UVA protection

Tested by in vitro SPF analyzer at SUNJIN

## In vitro SPF & PA test



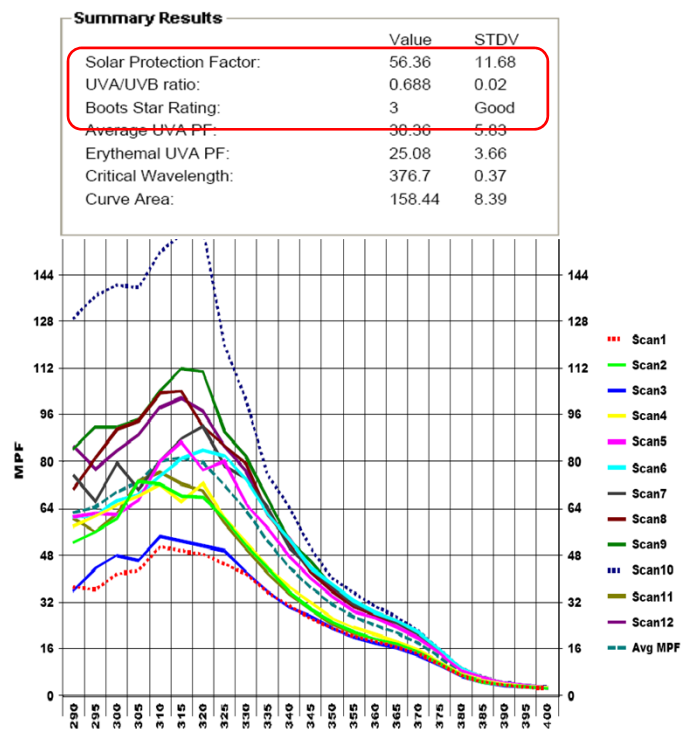
Optometrics 290

Installed at SUNJIN in 2001



# 1/3 UVA protection: Test Results

SUNJIN Formulation,  
SJF-1001-Mineral Sunscreen-W/O-ver1.0



$$\text{UVA/UVB} = 0.688/1$$

$$\text{UVA:UVAB} = 1:1/0.688 = 1:1.45$$

OK

# Transparency



# CONTENT

2

**ZINC OXIDE ONLY**

**SPF30, PA++  
Only Zinc Oxide  
SUN CREAM**

# Remarkable Product



## Agenda 2: Mineral Sunscreen Plus SPF30+ SUN CREAM

Remarkable Product



Product Name: **Mineral Sunscreen Plus SPF30+**

Manufacturer: Cancer Council, Australia

Type: W/O CREAM Type

Active Ingredient: 1. Only Zinc Oxide 20%



Why Remarkable?

**Zinc Oxide Only Formula**

Chemical filter free,

Fragrance free,

Paraben free

Evaluation:

**SPF 26.2, PA 7.2 (++)**

In vivo test result at  
SUNJIN Chemical

SPF Testing 601-300W Multiport UV Solar  
Simulator Installed at SUNJIN in 2009





# Remarkable “Only used ZnO in SUNSCREEN”



- Zinc Oxide is the Sole Mineral filter that can block UV-A & UV-B together.
- Zinc oxide has a long history of safe use in personal care even for very sensitive and/or impaired skin

Ingredients:

ACTIVE : Zinc Oxide

Preservatives : Phenoxy ethanol, Benzyl Alcohol, Sorbic Acid

# Proposal from SUNJIN



# Only ZnO formula: UVA • UVB BROAD SPECTRUM

## SJF-1004-Mineral (ZnO) Sunscreen-W/O-ver1.0

Phase	Ingredients	%	INCI Name
A	Water	38.0	Aqua
	NaCl	0.5	Sodium chloride
	1.3-BG	2.0	Butylene glycol
	Glycerin 98%	3.0	Glycerin
	Phenoxy ethanol	0.5	Phenoxy ethanol
B	Salacos 99	6.0	Isononyl Isononanoate
	Abil EM-90	3.0	Cetyl PEG/PPG-10/1 dimethicone
	KSG-16	3.0	Dimethicone/Vinyl Dimethicone cross polymer
C	KF-995	20.0	Cyclopentasiloxane
	ISOLAN GI 34	1.0	Polyglyceryl-4 Isostearate
	Bentone 38 V	1.0	Quaternium-18 hectorite
	SUNZnO-NCO	20.0	Zinc Oxide & Dimethicone/Methicone copolymer
	SUNPMMA-COCO170	2.0	Methylmethacrylate Crosspolymer



### Procedure

- 1) Mix all materials in Phase A at 70 °C
- 2) Treat 3 roll mill in Phase C
- 3) After 3roll mill treatment of Phase C, mix it Phase B & heat by 70 °C
- 4) Slowly add Phase A into 3) with homogenizer(2500rpm)

# Evaluation



SPF 26.2  
PA 7.2 (++)



**SJF-1004-Mineral (ZnO)  
Sunscreen-W/O-ver1.0**

SPF 30  
PA 6.0 (++)

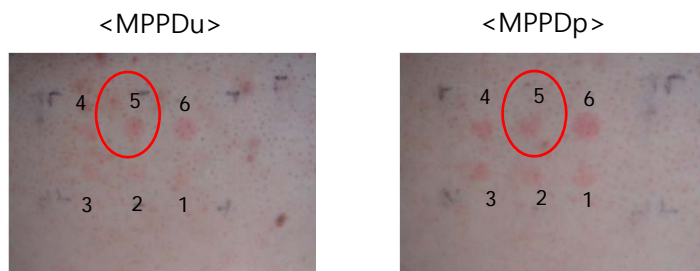
In vivo test data





# Back DATA\_In-Vivo SPF

## SJF-1004-Mineral (ZnO) Sunscreen-W/O-ver1.0



### PORT UV Powder

1 : 1.04 med/min      2 : 1.20 med/min  
 3 : 1.39 med/min      4 : 1.60 med/min  
 5 : 1.84 med/min      6 : 2.11 med/min

MPPDu : minimum erythema dose on unprotected skin

: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec = 32.2mj/cm<sup>2</sup>

MPPDp : minimum erythema dose on protected skin

: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec \* 30spf = 966mj/cm<sup>2</sup> \* spf

SPF Result : MPPDp / MPPDu  
 : 966 mj/cm<sup>2</sup> \* spf / 32.2mj/cm<sup>2</sup>  
 = 30 SPF

## Mineral Sunscreen Plus SPF30+



### PORT UV Powder

1 : 1.04 med/min      2 : 1.20 med/min  
 3 : 1.39 med/min      4 : 1.60 med/min  
 5 : 1.84 med/min      6 : 2.11 med/min

MPPDu : minimum erythema dose on unprotected skin

: 2.11 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec = 36.9mj/cm<sup>2</sup>

MPPDp : minimum erythema dose on protected skin

: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec \* 30spf = 966 mj/cm<sup>2</sup> \* spf

SPF Result : MPPDp / MPPDu  
 : 966 mj/cm<sup>2</sup> \* spf / 36.9mj/cm<sup>2</sup>  
 = 26.2 SPF

# Back DATA\_In-Vivo PFA

## SJF-1004-Mineral (ZnO) Sunscreen-W/O-ver1.0



### PORT UV Powder

1 : 18.81mw/cm<sup>^</sup>      2 : 22.62mw/cm<sup>^</sup>  
 3 : 27.14mw/cm<sup>^</sup>      4 : 32.62mw/cm<sup>^</sup>  
 5 : 39.29mw/cm<sup>^</sup>      6 : 47.14mw/cm<sup>^</sup>

MPPDu : minimum melanism dose on unprotected skin  
 : 39.29mw/cm<sup>^</sup> \* 420sec \* = 16501mw \* s/cm<sup>^</sup> = 16.5 j/cm<sup>^</sup>

MPPDp : minimum melanism dose on protected skin  
 : 39.29mw/cm<sup>^</sup> \* 420sec \* 6 = 99010 mw \* s/cm<sup>^</sup> = 99 j/cm<sup>^</sup>

PFA Result : MPPDp / MPPDu

: 99j/cm<sup>^</sup> / 16.5j/cm<sup>^</sup> = 6.0

## Mineral Sunscreen Plus SPF30+



### PORT UV Powder

1 : 18.81mw/cm<sup>^</sup>      2 : 22.62mw/cm<sup>^</sup>  
 3 : 27.14mw/cm<sup>^</sup>      4 : 32.62mw/cm<sup>^</sup>  
 5 : 39.29mw/cm<sup>^</sup>      6 : 47.14mw/cm<sup>^</sup>

MPPDu : minimum melanism dose on unprotected skin

: 39.29mw/cm<sup>^</sup> \* 420sec \* = 16501mw \* s/cm<sup>^</sup> = 16.5j/cm<sup>^</sup>

MPPDp : minimum melanism dose on protected skin

: 47.14mw/cm<sup>^</sup> \* 420sec \* 6 = 118793mw \* s/cm<sup>^</sup> = 118.8 j/cm<sup>^</sup>

PFA Result : MPPDp / MPPDu

: 118.8j/cm<sup>^</sup> / 16.5j/cm<sup>^</sup> = 7.2

# KEY INGREDIENTS



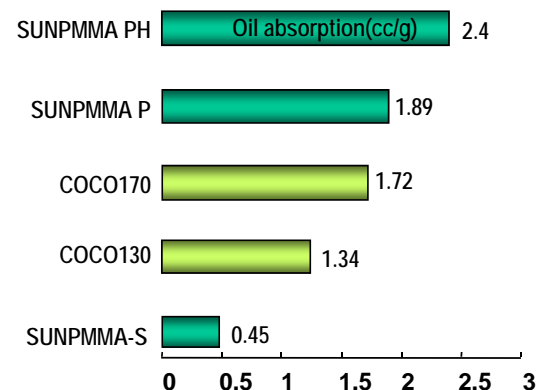
# Nano & Non-Nano Zinc Oxides, for UVA protection

Zinc Oxide meet so called  
 "1/3 rule" of EU  
 recommendation: Level of  
 UVA protection (measured by  
 in vivo or in vitro methods) at  
 least 1/3 of labelled SPF

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.	<b>Non-Nano, ECOCERT, Natural UV Filter</b>
SUNZNO-SA	Stearic Acid	150	n.a.	<b>Non-nano, ECOCERT, Natural UV Filter</b>

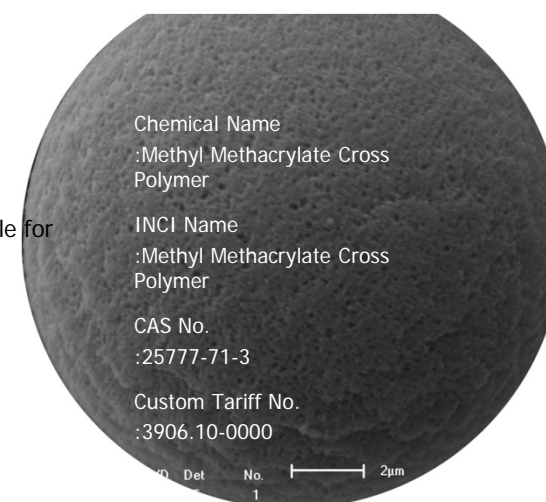
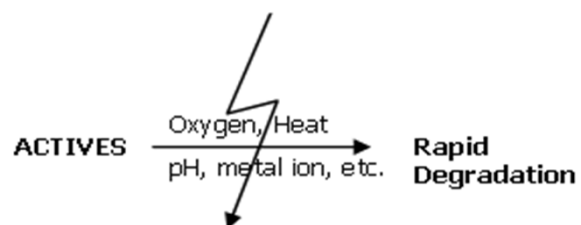
# Porous PMMA Beads can entrap a wide variety of substances

Grade	INCI	Avg. Particle size( $\mu\text{m}$ )	Oil Absorption (cc/g)
SUNPMMA-COCO130	Methyl Methacrylate Cross Polymer	8	1.2~1.4
SUNPMMA-COCO170	Methyl Methacrylate Cross Polymer	8	1.6~1.8
SUNPMMA-P	Methyl Methacrylate Cross Polymer	8	1.7~2.1
SUNPMMA-PH	Methyl Methacrylate Cross Polymer	8	2.1~2.4



## Why Porous PMMA is better than Porous Silica as an active carrier?

- Porous Silica is inorganic so has metal ions inside
- Porous PMMA is a kind of plastic so has no metals or ions inside
- Thus porous PMMA is an inert carrier for actives or fragrances which are susceptible for chemical degradation catalyzed by metallic ions





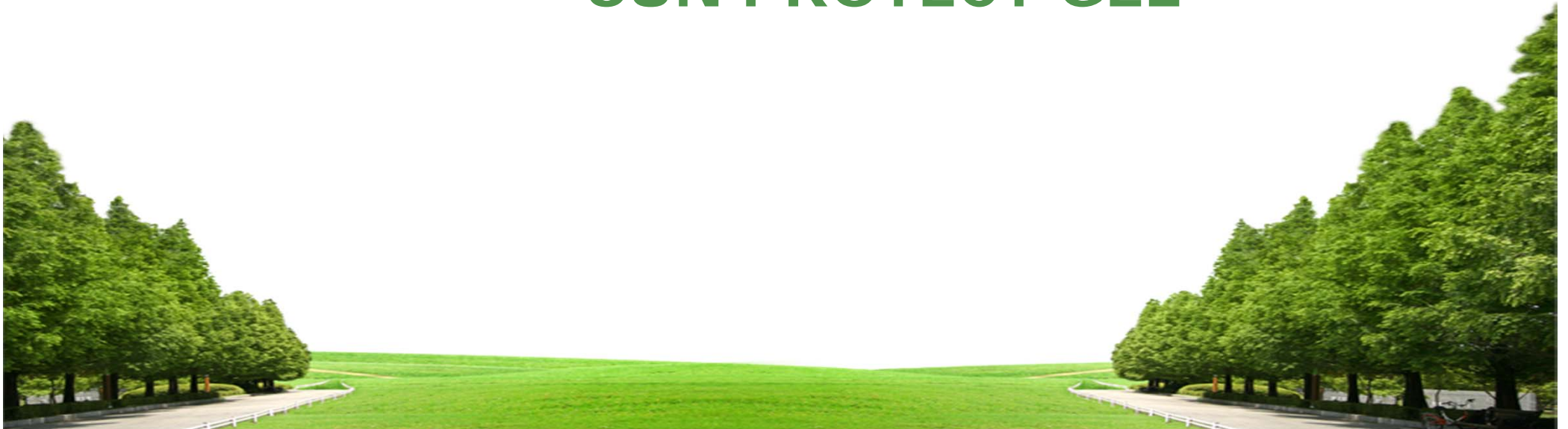


# CONTENT

3

**EMULSIFIER FREE**

**Super-light  
Emulsifier Free  
SUN PROTECT GEL**



# Remarkable Product



# Remarkable “Daily Sun Protect Gel”

Remarkable Product



Product Name: **BIORE UV DAILY CARE GEL SPF 25, PA++**

Manufacturer: KAO, JAPAN

Type: Water Phase Gel Type

Active Ingredients:

1. Ethylhexyl methoxycinnamate
2. Ethylhexyl Dimethoxybenzylidene Dioxoimidazolidine Propionate(Exclusive to Kao)

Why Remarkable?

Daily care Sun screen For Body Sun Protection

**Super light**

**Not sticky, no white cast**

Evaluation:

**SPF 19.0, PA 4.2 (++)**

In vivo test result at  
SUNJIN Chemical

SPF Testing 601-300W Multiport UV Solar  
Simulator Installed at SUNJIN in 2009



# Remarkable “Daily Sun Protect Gel”



- Once the white gel is spread on the skin, it becomes transparent very quickly and practically feels like nothing at all except for a gentle cooling sensation
- The gel is very lightweight and easy to spread.... The sunscreen left no sticky feeling or even white casts that many sun screens usually would.
- It's not sticky at all so after like 3 minutes I totally forget that I am even wearing sunscreen!
- Fresh translucent gel is light and spreads easily on skin. Dries quickly and does not leave and uncomfortable feeling.
- This is definitely an ideal sunscreen for makeup wearers or peeps with really oily skin or just very afraid of oiliness and stickiness



See? Can't see? Exactly!

No shine,

No white casts,

No oiliness,

No stickiness, nothing!

# Proposal from SUNJIN



# Formula Proposal from SUNJIN

## SJF-0905-SUN PROTECT GEL-ver1.0

**No  
emulsifier  
No emulsion  
Process**



**Super light,  
Very translucent**

**Aristoflex AVC  
used to thicken  
water phase**

	No.	Trade Name	INCI Name	%
A	1	PARSOL EHS	Ethylhexyl Salicylate	3.0
	2	PARSOL MCX	Ethylhexyl Methoxy cinnamate	3.6
B	3	FP-OMC	Methylmethacrylate Crosspolymer & Ethylhexyl Methoxy cinnamate	6.0
	4	HYBRID ABOC	Polymethyl Methacrylate / Avo Benzene / Octocrylene	3.0
	5	1,3-B.G.	1,3-Butylene Glycol	10.0
C	6	D.I. WATER	Water	To 100
	7	ARISTIFLEX AVC	Ammonium Acryloyldimethyltaurate / VP Copolymer	0.4
D	8	FRAGRANCE	Fragrance	0.15

### Procedure

- 1) Mix all materials in Phase C with homomixer. (1,500 rpm)
- 2) Mix all materials in Phase B with homomixer (1,000 rpm)
- 3) Add Phase A into Phase C with homomixer. (2,500 rpm)
- 4) Add Phase B into Phase C with homomixer. (2,500 rpm)
- 5) Add phase D into 4) with homomixer. (2,500 rpm)

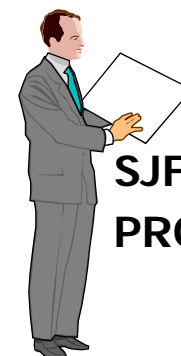
**In vivo  
SPF 21.8  
PA 5.0 (++)**



# Evaluation



SPF 19.0  
PA 4.2 (++)



**SJF-0905-SUN  
PROTECT GEL-ver1.0**

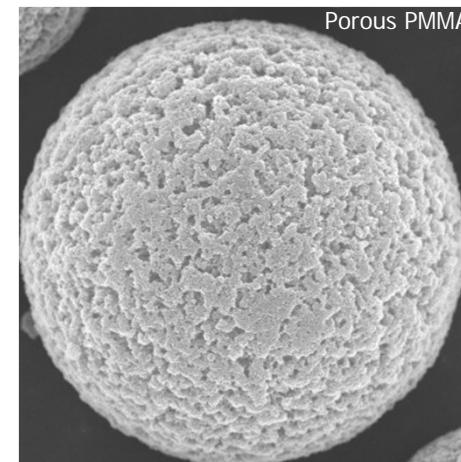
SPF 21.8  
PA 5.0 (++)

# KEY INGREDIENTS



# FP OMC is Porous PMMA containing OMC inside

Grade	INCI Name & composition	Avg. Particle size( $\mu\text{m}$ )	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

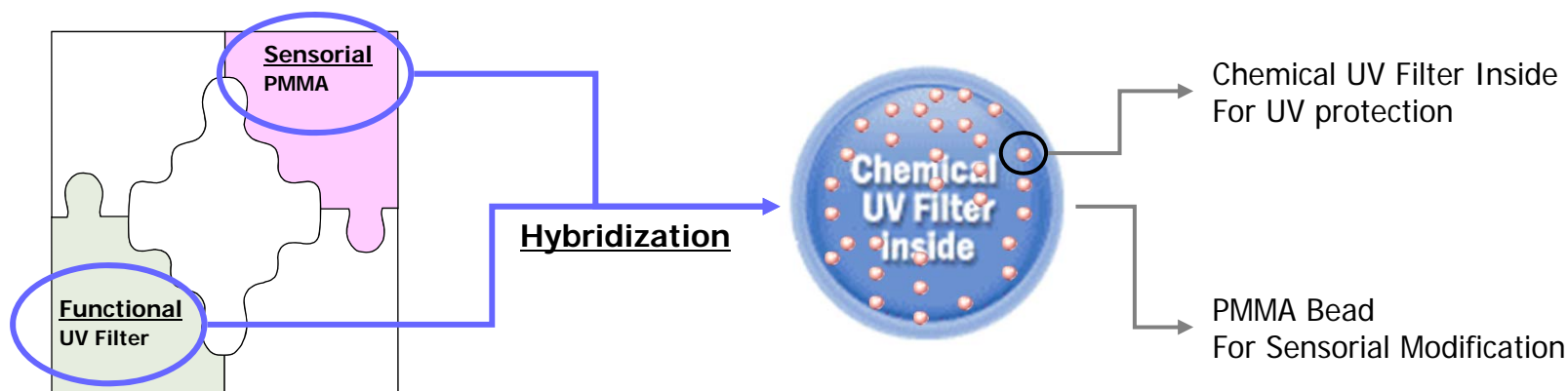
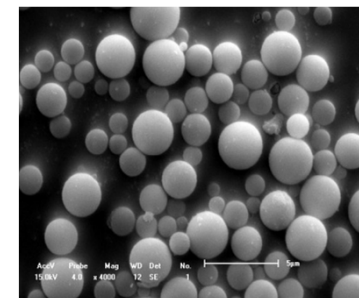
Phase	No.	Trade Name	%
	1	FP-OMC	12
	2	PARSOL EHS	3.0
	4	HYBRID ABOMC	3.0
	5	1,3-B.G.	10.0
	6	D.I. WATER	TO 100
	7	ARISTOFLEX AVC	0.4
	8	FRAGRANCE	0.15

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

# HYBRID PMMA is PMMA bead containing UV filters inside

Grade	Composition	Particle size(um)	Remark
Hybrid ABOC	BMDBM(Avo Benzene) 28~32% Octocrylene 5~8% PMMA 62~67%	2~7	UVA
Hybrid ABOS	BMDBM(Avo Benzene) 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



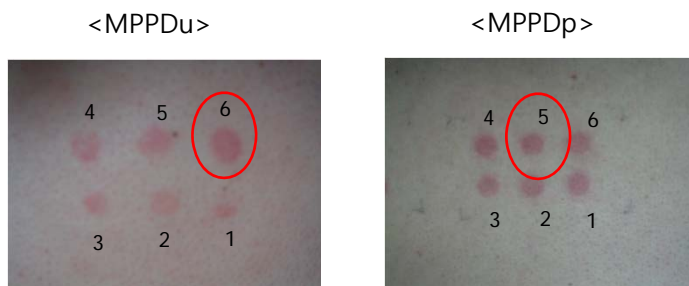
Hybrid PMMA = UV protection + Good Sensory + More

In vivo test data



# Back DATA: In-Vivo SPF

## SJF-0905-SUN PROTECT GEL



### PORT UV Powder

1 : 1.04 med/min      2 : 1.20 med/min  
 3 : 1.39 med/min      4 : 1.60 med/min  
 5 : 1.84 med/min      6 : 2.11 med/min

MPPDu : minimum erythral dose on unprotected skin

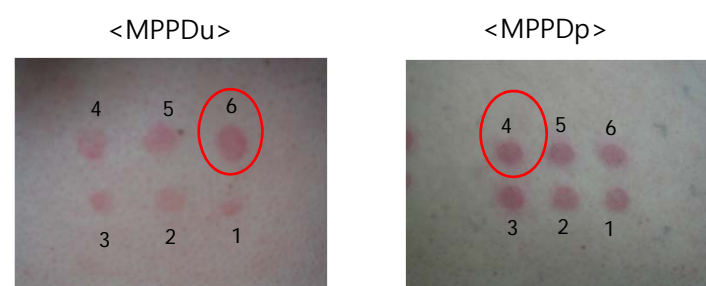
: 2.11 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec = 36.9mj/cm<sup>2</sup>

MPPDp : minimum erythral dose on protected skin

: 1.84 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec \* 25spf = 805mj/cm<sup>2</sup> \* spf

SPF Result : MPPDp / MPPDu  
 : 805 mj/cm<sup>2</sup> \* spf / 36.9mj/cm<sup>2</sup>  
 = 21.8 SPF

## BIORE UV DAILY CARE GEL



### PORT UV Powder

1 : 1.04 med/min      2 : 1.20 med/min  
 3 : 1.39 med/min      4 : 1.60 med/min  
 5 : 1.84 med/min      6 : 2.11 med/min

MPPDu : minimum erythral dose on unprotected skin

: 2.11 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec = 36.9mj/cm<sup>2</sup>

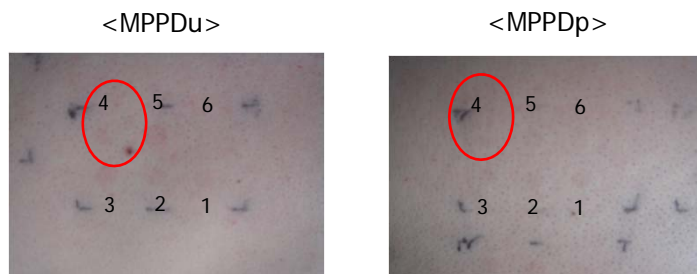
MPPDp : minimum erythral dose on protected skin

: 1.6 med/min \* 50sec \* 21mj/(cm<sup>2</sup> \* med)  
 \* 1min/60sec \* 25spf = 700 mj/cm<sup>2</sup> \* spf

SPF Result : MPPDp / MPPDu  
 : 700 mj/cm<sup>2</sup> \* spf / 36.9mj/cm<sup>2</sup>  
 = 19 SPF

# Back DATA: In-Vivo PFA

## SJF-0905-SUN PROTECT GEL



PORT UV Powder

1 : 18.81mw/cm<sup>^</sup>      2 : 22.62mw/cm<sup>^</sup>  
 3 : 27.14mw/cm<sup>^</sup>      4 : 32.62mw/cm<sup>^</sup>  
 5 : 39.29mw/cm<sup>^</sup>      6 : 47.14mw/cm<sup>^</sup>

MPPDu : minimum melanism dose on unprotected skin

: 32.62mw/cm<sup>^</sup> \* 420sec \* = 13700mw \* s/cm<sup>^</sup> = 13.7j/cm<sup>^</sup>

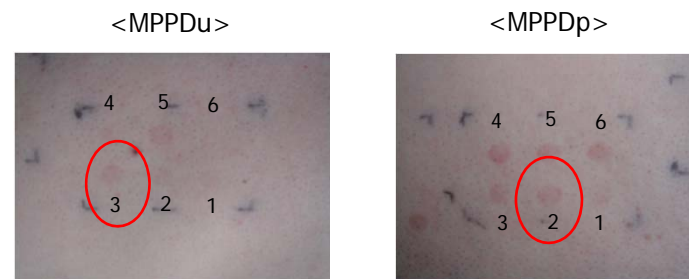
MPPDp : minimum melanism dose on protected skin

: 32.62mw/cm<sup>^</sup> \* 420sec \* 5 = 68502mw \* s/cm<sup>^</sup> = 68.5j/cm<sup>^</sup>

PFA Result : MPPDp / MPPDu

: 68.5j/cm<sup>^</sup> / 13.7j/cm<sup>^</sup> = 5

## BIORE UV DAILY CARE GEL



PORT UV Powder

1 : 18.81mw/cm<sup>^</sup>      2 : 22.62mw/cm<sup>^</sup>  
 3 : 27.14mw/cm<sup>^</sup>      4 : 32.62mw/cm<sup>^</sup>  
 5 : 39.29mw/cm<sup>^</sup>      6 : 47.14mw/cm<sup>^</sup>

MPPDu : minimum melanism dose on unprotected skin

: 27.14mw/cm<sup>^</sup> \* 420sec \* = 11399mw \* s/cm<sup>^</sup> = 11.4j/cm<sup>^</sup>

MPPDp : minimum melanism dose on protected skin

: 22.62mw/cm<sup>^</sup> \* 420sec \* 5 = 47502mw \* s/cm<sup>^</sup> = 47.5j/cm<sup>^</sup>

PFA Result : MPPDp / MPPDu

: 47.5j/cm<sup>^</sup> / 11.4j/cm<sup>^</sup> = 4.2

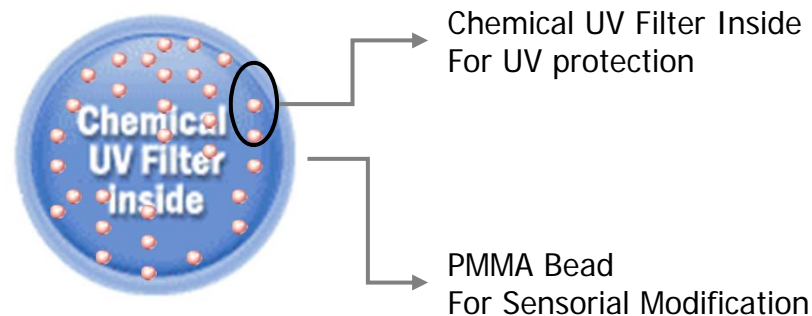
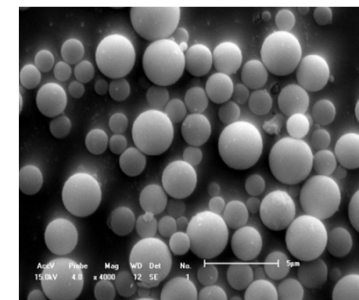


# Hybrid PMMA Bead



# HYBRID PMMA is PMMA bead containing UV filters inside

Grade	Composition	Particle size(um)	Remark
Hybrid ABOC	BMDBM(Avo Benzene) 28~32% Octocrylene 5~8% PMMA 62~67%	2~7	UVA
Hybrid ABOS	BMDBM(Avo Benzene) 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

# 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



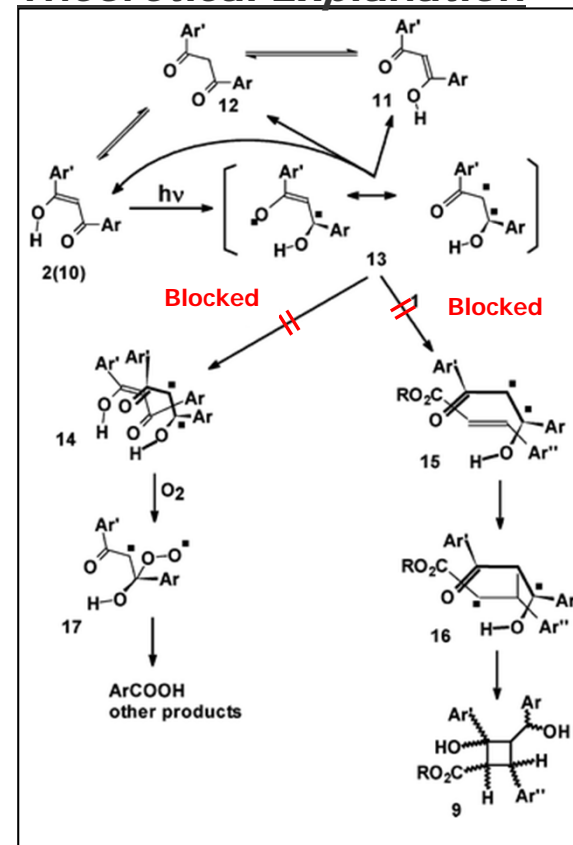
Prisoner, not allowed to move  
→ Avobenzone in Hybrid PMMA

Vs.



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)**

Have you ever seen any

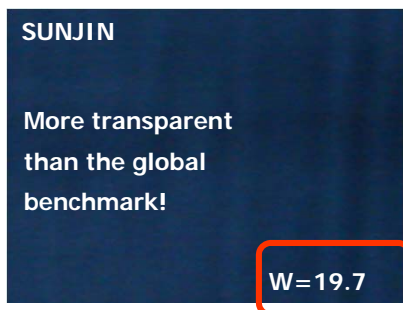
**mousse** foundation with  
**UV protection property?**

Difficult to see in the market, right?

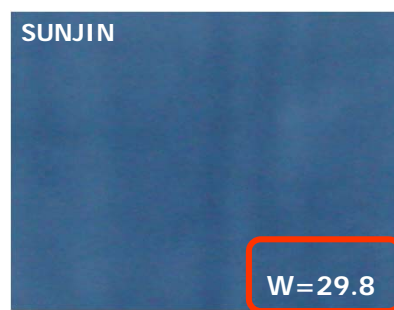


# Hybrid PMMA is good for Transparent and Good Sensorial High SPF, PA sun care

## 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	SPF 39.3	SPF 33
PA	25.19	22.59
UVA/UVB	0.771=1:1.29	0.677=1:1.477
Critical Wavelength	378.7	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	SPF 37.97	SPF 38.78
PA	18.84	22.22
UVA/UVB	0.71=1:1.41	0.71=1:1.41
Critical Wavelength	380.1	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**