Scheme No. : BN-4Q-R002 Version No. : VG-01

Product Name : **SunCat MTA** Revision Date : 2016-06-17

SunCat MTA

Safe and efficient chemical sunscreen dispersion

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Introduction

The trial prototypes of the SunCat series of sunscreen products were launched in parts of the international market in 2005. Since then, the convenience, safety, and high performance of this next generation UV filter dispersion has received enthusiastic praise and appreciation from formulators, manufacturers and customers.

We are now proud to announce the launch of SunCat MTA in response to our customer demands, and also recognizing latest trends in the preferred organic UV absorbers and in compliance with latest safety regulations such as REACH, Europe.

SunCat MTA incorporates 3 globally approved organic UV filters, namely Ethylhexyl Methoxycinnamate (OMC), Octocrylene (OTC), and Butyl Methoxydibenzoylmethane (AVOBENZONE). SunCat MTA has been produced using a specially developed proprietary enwrapping technique to stabilize the chemical sunscreens and to ensure high performance with prolonged and consistent SPF values. The aqueous encapsulated sunscreen of SunCat MTA allows for ease of use. Non-irritant and not absorbed into the skin, SunCat MTA can also provide a longer skin surface residence time as well as reproducible SPF values with broad spectrum protection in minimum sunscreen concentration. The performance in terms of SPF and SPA ratios are far beyond the conventional levels.

It is noted that further SunCat formulation options are being developed to stay abreast of changing market preferences and further optimizing safety and performance/cost ratios.

Encapsulated Sunscreen of the next generation

W/O/W double sphere enwrapping

- Pre-solubilized mixture of both liquid and powder chemical sunscreen
- Through a proprietary, high pressure, and high shear process
- Micronized sunscreen enwrapped in double-layered sphere
- Negatively charged outer sphere.
- Prevent aggregation

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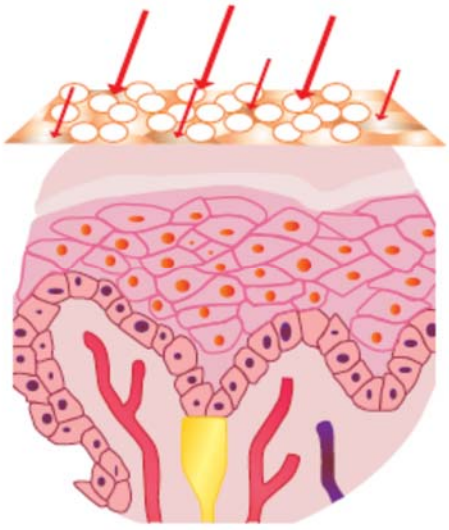
Sunscreen of the next generation

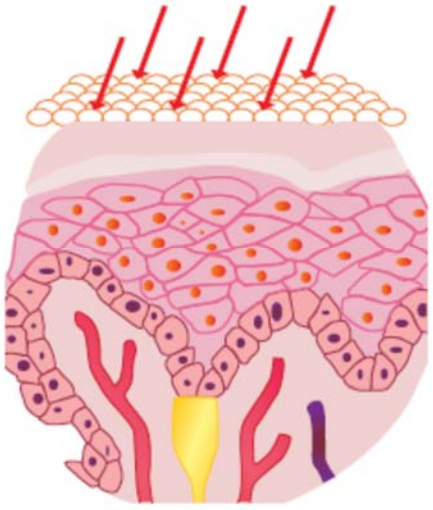
- Enwrapped form for even protection
- The enwrapped spheres do not tend to aggregate
- Greatly enhanced performance from tried & trusted active ingredients
- The enwrapping inhibits inter-reaction of active components
- Lower dosage for higher SPF
- No guesswork to achieve desired SPF in finished sunscreen formulation
- Balanced pre-mix ensures wide spectrum UVA+UVB protection
- Safer and more even covering on the skin
- Non-absorption into the skin leads to longer period of high protection
- No skin irritation/sensitization from the sunscreen active ingredients
- Comfortable refreshing skin wear allowing skin to breathe
- Easy and versatile formulation
- Readily water dispersible

----------Makes the impossible, possible ----------

Evenly spread to provide uniform protection



Traditional chemical sunscreen with uneven protection



Evenly spread protection of SunCat

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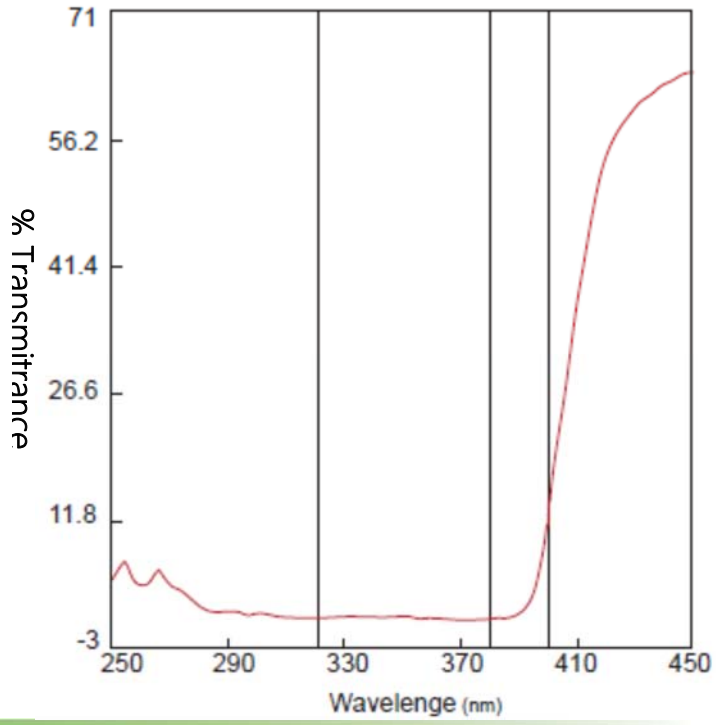
UV transmission test [Critical Wavelength]

- Sample: 20% SunCat MTA cream
- Protection range: 280nm~400nm
- 97% UV light can be screened



A synergistic performance booster - Nestdry ST-2000

This is another remarkable invention from the laboratory of Bio-Nest Biochemical Technology Co. Ltd. A separate updated Product Data Sheet (PDS) and SDS are in preparation. In summary, the core product of the Nestdry ST-2000 is rutile 'no-nano' titanium dioxide (70 to 75%), asbestos free talc 20 to 25%, dimethicone and cyclopentasiloxane . The average size of the free-flowing solid particulates is from ca. 200 to 500 nm.

This product was designed to be used in conjunction with SunCat series. In the case of SunCat MTA a combination of 3% SunCat MTA and 3% Nestdry ST-2000 in a cream base results in a truly remarkable SPF 50 sunscreen cream (with 4+SPA). A remarkable feature is that the chemical sunscreen enwrapping prevents the inter-reaction of titanium dioxide and avobenzone (a well known fact in conventional sunscreens).

In the next section of this Product Data Sheet (PDS), results of using 3% Nestdry ST-2000 in cream base, along with a range of levels of SunCat MTA up to 20%, illustrate this point.

IMPORTANT NOTE : It is not permitted to introduce to the USA market any sunscreen containing a combination of avobenzone and titanium dioxide. No other exceptions are known at this time.

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Concentration of SunCat MTA and SPF / UVA Protection Yielded

SunCat MTA wt.%	0 %	3 %	5 %	8 %	10 %	13 %	15 %	17 %	20 %
Cream Base	1.63 -	21.26 ***	32.53 ****	41.10 ****	46.04 ****	46.82 ****	48.26 ****	51.89 ****	53.15 ****
Gel Base	1.57 -	13.39 ***	22.54 ****	44.12 ****	51.66 ****	52.00 ****	54.02 ****	57.26 ****	72.98 ****
Cream Base + 3 % Nestdry ST-2000	4.88 ****	55.12 ****	61.34 ****	66.47 ****	68.49 ****	73.86 ****	76.23 ****	76.64 ****	80.43 ****

Results: These results can be followed by formulators to easily develop new sunscreen formula with their desired sun protection factor in the most efficient way.
SunCat MTA can provide the maximum UVA protection when used in more than 5%

Photo Stability SPF test in vitro test

- The lot used for this test is different from the one for above-mentioned table considering different concentration and formulation type. Therefore, the SPFs before sun exposure were re-measured for consistency.

Photo Stability Test	Cream Base		Gel Base		Cream Base + 3 % ST-2000 (TiO_2)	
SunCat MTA wt.%	5 %	17 %	8 %	10 %	3 %	5 %
SPF, before sun exposure	31.86	51.36	42.60	48.39	57.36	63.50
SPF, after 2 hrs. exposure	36.35	46.81	45.59	51.39	63.91	73.11
SPF, after 4hrs. exposure	34.70	46.41	42.92	48.71	67.46	70.17
SPF, after 6hrs. exposure	36.52	47.34	46.08	51.69	70.18	72.82

Results: The photostability of SunCat MTA has been proved to effectively provide perfect sun protection even after continuous sun exposure for 6 hours.

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SPF results In vivo test

- 3 subjects enrolled panel in skin type Ⅱ
- Tests performed by AMA Lab.
- The lot for this test is the same as the one for photo stability test.

In vitro / In vivo Test	Cream Base		Gel Base		Cream Base + 3 % ST-2000 (TiO_2)	
SunCat MTA wt.%	5 %	17 %	8 %	10 %	3 %	5 %
SPF, In vitro test	31.86	51.36	42.60	48.39	57.36	63.50
SPF, In vivo test	35.7	56.2	39.3	62.9	57.2	68.3

Results: Similar in vivo SPF results are obtained comparing to in vitro ones.

UVA PF results In vivo test

- 30 subjects enrolled panel in skin type Ⅰ, Ⅱ/Ⅲ
- Tests performed by AMA Lab.
- All testing will be performed in accordance with the Declaration of Helsinki and national regulations regarding human studies as described by the International Standard ISO 24442 — Cosmetics - Sun protection test methods - In vivo determination of sunscreen UVA protection.

In vivo UVA-PF	Cream Base	Gel Base	Cream Base + 3 % ST-2000 (TiO_2)
SunCat MTA wt.%	5 %	10 %	3 %
UVA PF, In vivo test	17.9	18.3	19.2
PA rating	PA ++++	PA ++++	PA ++++

Results: The results show that in vivo UVA-PFs of sunscreen products containing SunCat-MTA are consistent with in vitro ones.

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Repeat Insult Patch Test (RIPT) In vivo test

- SunCat MTA 100% Raw Material
- Repeat Insult Patch Test (RIPT) is performed for human skin irritation/sensitization evaluation.
- Tests performed by AMA Lab

Population Demographics:

Number of subjects enrolled		52
Subjects completing study		50
Age Range		20-67
Sex	Male	9
	Female	43
Race	Caucasian	43
	Hispanic	8
	Asian	1

Results :

- **No adverse reactions of any kind were noted during the course of this study**
- **All 52 Subjects - LEVEL 0 (No evidence of any effect)**

Scoring Scale and Definition of Symbols Shown in Table

0 - No evidence of any effect
? - (Barely perceptible) minimal faint (light pink) uniform of spotty erythema
1 - (Mild) pink uniform erythema covering most of contact site
2 - (Moderate) pink\red erythema visibly uniform in entire contact area
3 - (Marked) bright red erythema with accompanying edema, petechiae or papules
4 - (Severe) deep red erythema with vesiculation or weeping with or without dema
D - Patch eliminated due to reaction
Dc- Discontinued due to absence of subject on application date
M - Patch applied to an adjacent site after strong test reaction
N/A-Score is not caluculated for subjects discontiuned before challenge
S - Skin stained from pigment in product
T – Tan

Safer on the skin

Comfortable and refreshing safer wear

- Non-absorption into the skin leads to longer period of high protection
- No skin irritation/sensitization from the sunscreen active ingredients (even for people normally sensitive to chemical sunscreens on the skin)
- No excess oily formulation needed
- Longer and safer skin residence time
- Forms a thin layer of water resistant protective shield upon skin

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Suggested applications

- Allows the skin to breathe freely
- Skin care
  Toner, lotion, cream, foundation, sunscreen spray, sunscreen wipe, etc.
- Hair care
  Sunscreen toner spray

Composition of SunCat MTA

INCI Name	CAS No.	EC No.	Amount, wt.%
Water	7732-18-5	231-791-2	38.9 %
Butyl Methoxydibenzoylmethane	70356-09-1	274-581-6	20.0 %
Ethylhexyl Methoxycinnamate	5466-77-3	226-775-7	20.0 %
Octocrylene	6197-30-4	228-250-8	10.0 %
Butylene Glycol	107-88-0	203-529-7	10.0 %
Lecithin	8002-43-5	232-307-2	1.0 %
Phenoxyethanol	122-99-6	204-589-7	0.1 %

Easier Formulation

- A specific ratio of sunscreens premixed and solubilized.
- No guess work needed to achieve desired SPF.
- Aqueous dispersion suitable for almost every cosmetic formulation.
- Compatible with both “cold process” and “hot process” formulation.
- SunCat MTA added slowly in final stage after temp. drops below 45°C
- No pre-emulsion process is needed comparing to conventional UV filters.

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Suitable for a wide range of formulation

- **Compatible with most ingredients used in personal care products**
- **Nonionic, anionic, or cationic emulsifying systems**
- **Safely used within a pH range of 5~7.5**
- **20% w/w will yield the maximum concentration allowed. (some countries 15%)**

RECAP - Why SunCat MTA

Aqueous form

- Easier formulation
- Prevent skin absorption
- Very comfortable wear

Proprietary Enwrapping procedure

- Prolong the protection capabilities of chemical sunscreen
- Prevent particle aggregation
- Even spread for better protection
- Fewer sunscreen actives and lower concentration used for higher SPF
- Simpler processing and logistics
- Add elegance to sunscreen wearing (not sticky/oily)
- Lower environmental impacts in production and use

Appendix I - Some Formulation Tips - SunCat MTA

Important points to keep in mind when formulating SunCat MTA skin care or Sunscreen products, from 4 different aspects as below.

1. Formulation base - SunCat MTA can be applied to the following base.
   - Aqua solution, includes gel system
   - O/W system
   - W/O system
     a. Adjusting surfactant HLB value.
     b. Avoid SunCat MTA joining emulsification by adding at the very last step of formulation.

2. Manufacturing process
   - SunCat MTA must be added at the very last step during formulation process, after
     a. Emulsifying is well done
     b. The temperature cools down below 45℃
     c. Add SunCat MTA
     d. Homogenize and mix completely to ensure SunCat MTA is well dispersed (3000 rpm is recommended)

3. Incompatible ingredients for SunCat MTA
   a. Heavy metal and Iron – concern: it may interact with AVO.
      (Please do not store SunCat MTA in metal container, not even stainless)
   b. Methanol – concern: it may break encapsulation
   c. Aluminum (all compounds) – concern: it may break encapsulation

4. SunCat MTA SPF booster – suggest to use Nestdry ST-2000 which is
   a. Uniformed larger particles (200-500nm)
   b. Silicone coated
   c. Aluminum free
      (Incorporate ST-2000 in oil phase of emulsion)

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Remarks:

1. **Please note that over 95% of TiO2 on the market contains aluminum, therefore please strongly urge suggest customer to use Nestdry ST-2000 if customer would like to use TiO2 for SPF boosting purpose (at least for his first trials to demonstrate the result and to compare)**
2. **All ZnO contains aluminum, that is why it can't be used as SPF booster for SunCat MTA.**
3. **SunCat MTA along can achieve desired SPF easily, we do not suggest or recommend to combine SunCat MTA with other chemical UV filters. No need to over-complicate. In addition, some UV boosters may not help boosting SPF for SunCat MTA system.**
4. **In vitro testing procedure – please refer to below you tube linkage, https://www.youtube.com/watch?v=tNPWog4t-HA**

NOTE: It is NOT ALLOWED to sell a sunscreen containing a mixture of Avobenzone and Titanium Dioxide (or Zinc Oxide) INTO USA.

PLEASE FEEL FREE TO CONTACT US IF YOU HAVE FORMULATION PROBLEMS.

APPENDIX II - Statement on Status of REACH Compliance

We hereby confirm that the above mixture product "SunCat MTA" is manufactured by the Bio-Nest Biochemical Technology Co. Ltd., Taiwan (Certified "International GMP ISO 22716)

This product is not a cosmetic sunscreen itself, but is a stable premix of components to provide the basis for preparing a wide range of 'new generation' high efficiency, low a.i. content of organic sunscreen finished end-products with broadband UVA/UVB properties.

REACH Regulation applies to registration of substances, not mixtures.

All individual component substances of the SunCat MTA with usage exceeding 1 MT per year have been REACH registered unless they are exempt from registration, and 'usage in cosmetics' is included within the registration. Further, usage volume must be accommodated within the supplier company registration tonnage band.

Bio-Nest has completed data collection, and all component substances to be incorporated in supply of SunCat MTA to Europe in 2016 comply with the above REACH requirements.

DATA SUMMARY

Trade Name for Mixture : SunCat MTA

SunCat MTA Components	REACH Registration / Pre-Registration Numbers
Water	Not required
Butyl Methoxydibenzoylmethane	01-2 119 967 408-25-xxxx
Ethylhexylmethoxycinnamate	01-2 119 471 476-31-xxxx
Octocrylene	01-2 119 457 637-27-xxxx
Butylene Glycol	01-2 119 455 875-25-xxxx
Lecithin	Not required - exempt
Phenoxyethanol	01-2 119 488 943-21-xxxx

These all comply with REACH requirements # Exempt per ECHA << Below 1 MT/year

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COMPOSITION

INCI Name	CAS No.	EC No.	Amount, wt.%
Water	7732-18-5	231-791-2	38.9 %
Butyl Methoxydibenzoylmethane	70356-09-1	274-581-6	20.0 %
Ethylhexyl Methoxycinnamate	5466-77-3	226-775-7	20.0 %
Octocrylene	6197-30-4	228-250-8	10.0 %
Butylene Glycol	107-88-0	203-529-7	10.0 %
Lecithin	8002-43-5	232-307-2	1.0 %
Phenoxyethanol	122-99-6	204-589-7	0.1 %

ADDITIONAL NOTES

Safety Assessment –

- as noted above, this product is not a cosmetic "as is". This means that a safety assessment is not mandatory per ECHA guidelines.
- However, a safety assessment is planned to be prepared by a consultant expert in order to provide formulators with additional information (toxicologist/pharmacist specialist).

APPENDIX III - Examples of typical formulations

A. o/w Cream with SunCat MTA 5 %

(SPF 31 ~ 36, PA + + + +)

Phase	Trade / INCI NAME		wt. %
I	**Water**		62.88 %
	Propylene Glycol		7 %
	Chcogum GMT [Bio-Nest]		5 %
	Euglena Gracilis Polysaccharide	1.5 %	
	Water	98.0 %	
	Phenoxyethanol	0.5 %	
	Phenoxyethanol		0.12 %
II	**Polyglyceryl-3 Methylglucose Distearate**		4.5 %
	Cetearyl Alcohol		1 %
	Squalane		14.5 %
III	**SunCat MTA [Bio-Nest]**		5 %
	Water	38.9 %	
	Butyl Methoxydibenzoylmethane	20.0 %	
	Ethylhexyl Methoxycinnamate	20.0 %	
	Octocrylene	10.0 %	
	Butylene Glycol	10.0 %	
	Lecithin	1.0 %	
	Phenoxyethanol	0.1 %	

Sequence of operation:

1. Mix phase I together.
2. Mix phase II together. When achieved desired viscosity, homogenize it for awhile.
3. Slowly add in Phase III in % suggested in product datasheet according to the desired SPF while stirring. Mix well for even dispersion.

B. o/w Cream with SunCat MTA 17 %

(SPF 46 ~ 51, PA + + + +)

Phase	Trade / INCI NAME		wt. %
I	**Water**		**50.88 %**
	Propylene Glycol		**7 %**
	Chcogum GMT [Bio-Nest]		**5 %**
	Euglena Gracilis Polysaccharide	1.5 %	
	Water	98.0 %	
	Phenoxyethanol	0.5 %	
	Phenoxyethanol		**0.12 %**
II	**Polyglyceryl-3 Methylglucose Distearate**		**4.5 %**
	Cetearyl Alcohol		**1 %**
	Squalane		**14.5 %**
III	**SunCat MTA [Bio-Nest]**		**17 %**
	Water	38.9 %	
	Butyl Methoxydibenzoylmethane	20.0 %	
	Ethylhexyl Methoxycinnamate	20.0 %	
	Octocrylene	10.0 %	
	Butylene Glycol	10.0 %	
	Lecithin	1.0 %	
	Phenoxyethanol	0.1 %	

Sequence of operation:

1. Mix phase I together.
2. Mix phase II together. When achieved desired viscosity, homogenize it for awhile.
3. Slowly add in Phase III in % suggested in product datasheet according to the desired SPF while stirring. Mix well for even dispersion.

C. Gel (Spray) with SunCat MTA 8 %

(SPF 41 ~ 46, PA + + + +)

Phase	Trade / INCI NAME	wt. %
I	**Water**	**71.87 %**
	Glycerin	**5 %**
	Carbomer 941 (2 %)	**15 %**
	Water	98.0 %
	Carbomer	2.0 %
	Phenoxyethanol	**0.1 %**
	Triethanolamine	**0.03 %**
II	**SunCat MTA [Bio-Nest]**	**8 %**
	Water	38.9 %
	Butyl Methoxydibenzoylmethane	20.0 %
	Ethylhexyl Methoxycinnamate	20.0 %
	Octocrylene	10.0 %
	Butylene Glycol	10.0 %
	Lecithin	1.0 %
	Phenoxyethanol	0.1 %

Sequence of operation:

1. Mix Phase I well.
2. Keep on stirring and add in Phase II in % suggested in product datasheet according to the desired SPF. Mix well for even dispersion.

D. Gel (Spray) with SunCat MTA 10 %

(SPF 48 ~ 51, PA + + + +)

Phase	Trade / INCI NAME	wt. %
I	**Water**	69.87 %
	Glycerin	5 %
	Carbomer 941 (2 %)	15 %
	Water	98.0 %
	Carbomer	2.0 %
	Phenoxyethanol	0.1 %
	Triethanolamine	0.03 %
II	**SunCat MTA [Bio-Nest]**	10 %
	Water	38.9 %
	Butyl Methoxydibenzoylmethane	20.0 %
	Ethylhexyl Methoxycinnamate	20.0 %
	Octocrylene	10.0 %
	Butylene Glycol	10.0 %
	Lecithin	1.0 %
	Phenoxyethanol	0.1 %

Sequence of operation:

1. Mix Phase I well.
2. Keep on stirring and add in Phase II in % suggested in product datasheet according to the desired SPF. Mix well for even dispersion.

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E. o/w cream with SunCat MTA 3 % +3 % Nestdry ST-2000

(SPF 57 ~ 70, PA + + + +)

Phase	Trade / INCI NAME	wt. %
I	**Water**	**61.88 %**
	Propylene Glycol	**7 %**
	Chcogum GMT [Bio-Nest]	**5 %**
	Euglena Gracilis Polysaccharide	1.5 %
	Water	98.0 %
	Phenoxyethanol	0.5 %
	Phenoxyethanol	**0.12 %**
II	**Polyglyceryl-3 Methylglucose Distearate**	**4.5**
	Cetearyl Alcohol	**1 %**
	Squalane	**14.5 %**
	Nestdry ST-2000 [Bio-Nest]	**3 %**
	Titanium Dioxide	75.0 %
	Talc	20.0 %
	Cyclopentasiloxane	3.5 %
	Dimethicone	1.5 %
III	**SunCat MTA [Bio-Nest]**	**3 %**
	Water	38.9 %
	Butyl Methoxydibenzoylmethane	20.0 %
	Ethylhexyl Methoxycinnamate	20.0 %
	Octocrylene	10.0 %
	Butylene Glycol	10.0 %
	Lecithin	1.0 %
	Phenoxyethanol	0.1 %

Sequence of operation:

1. Mix Nestdry ST-2000 with NeSol 2902B.
2. Pour in other ingredients in Phase I, mix together.
3. Phase I pour in Phase II, mix together. Homogenize it for awhile.
4. While stirring, pour in Phase III in % suggested in product datasheet according to the desired SPF. Mix well for even dispersion.

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F. o/w cream with SunCat MTA 5 % +3 % Nestdry ST-2000

(SPF 63 ~ 73, PA + + + +)

Phase	Trade / INCI NAME	wt. %
I	**Water**	59.88 %
	Propylene Glycol	7 %
	Chcogum GMT [Bio-Nest]	5 %
	Euglena Gracilis Polysaccharide	1.5 %
	Water	98.0 %
	Phenoxyethanol	0.5 %
	Phenoxyethanol	0.12 %
II	**Polyglyceryl-3 Methylglucose Distearate**	4.5
	Cetearyl Alcohol	1 %
	Squalane	14.5 %
	Nestdry ST-2000 [Bio-Nest]	3 %
	Titanium Dioxide	75.0 %
	Talc	20.0 %
	Cyclopentasiloxane	3.5 %
	Dimethicone	1.5 %
III	**SunCat MTA [Bio-Nest]**	5 %
	Water	38.9 %
	Butyl Methoxydibenzoylmethane	20.0 %
	Ethylhexyl Methoxycinnamate	20.0 %
	Octocrylene	10.0 %
	Butylene Glycol	10.0 %
	Lecithin	1.0 %
	Phenoxyethanol	0.1 %

Sequence of operation:

1. Mix Nestdry ST-2000 with NeSol 2902B.
2. Pour in other ingredients in Phase I, mix together.
3. Phase I pour in Phase II, mix together. Homogenize it for awhile.
4. While stirring, pour in Phase III in % suggested in product datasheet according to the desired SPF. Mix well for even dispersion.