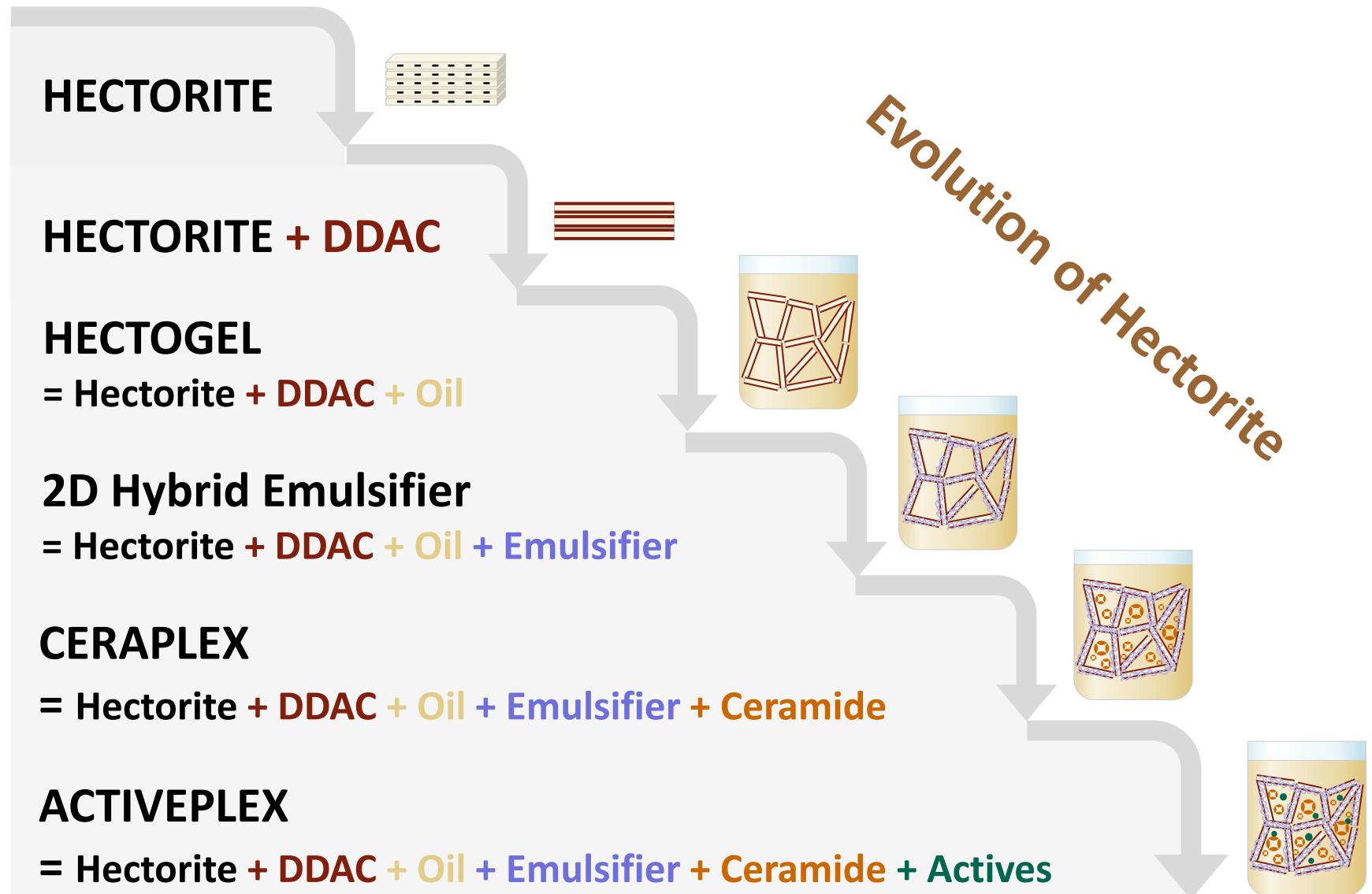


2020 Update

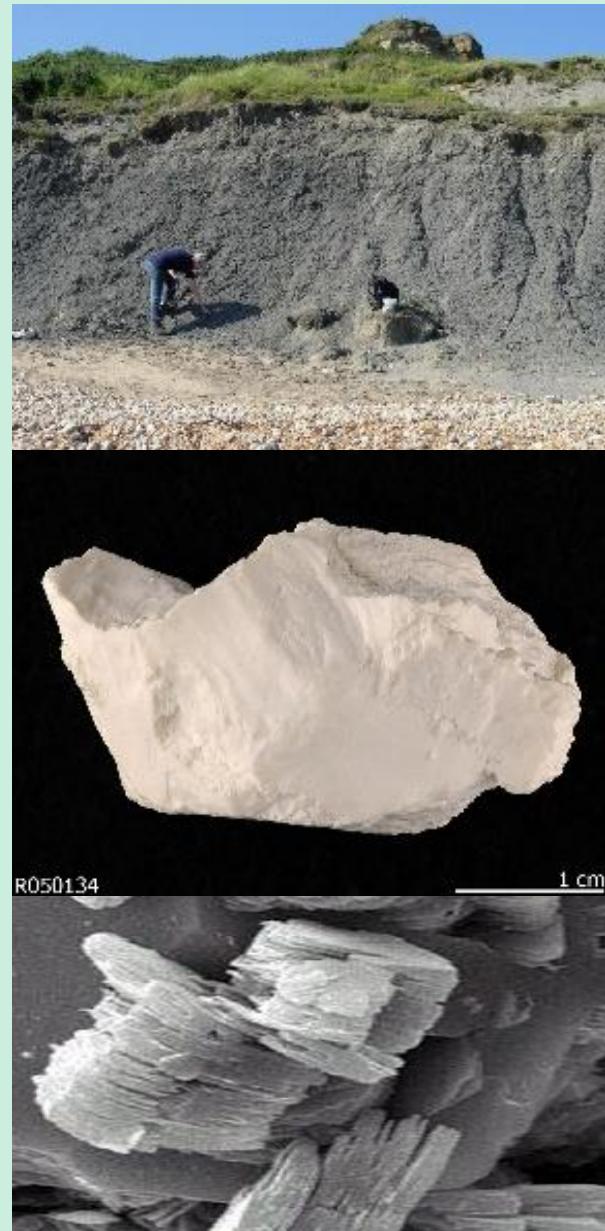
# Hectorite Technologies

**SUNJIN BEAUTY SCIENCE  
May. 2020  
Ver 3.5**

# Hectorite Technologies



# 1. Hectorite



# Hectorite

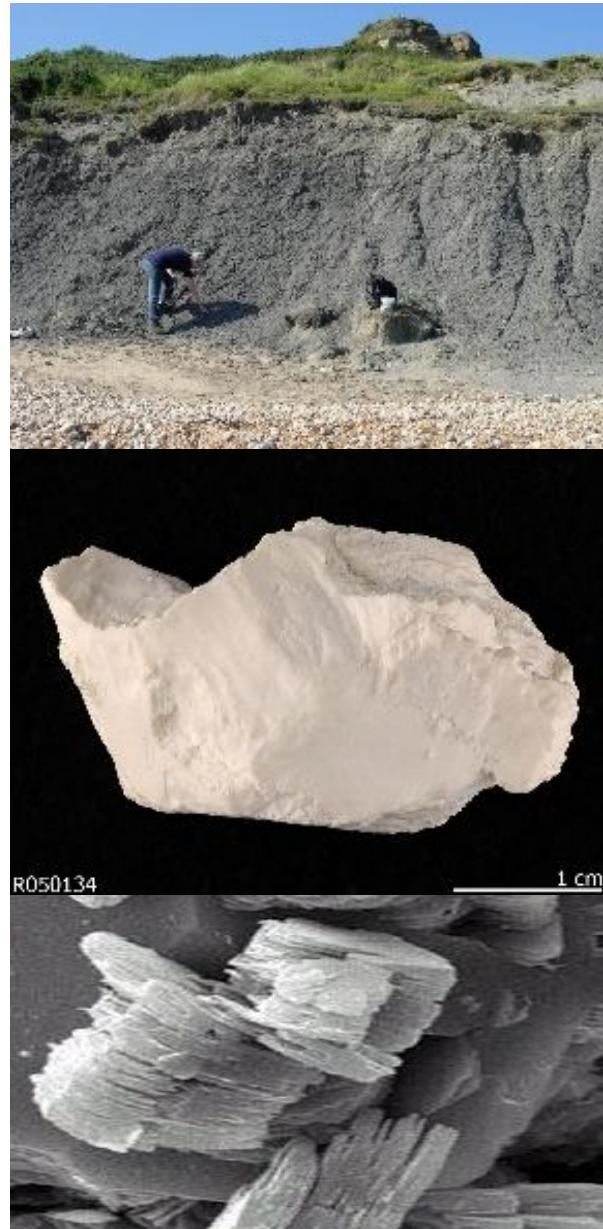
## Hectorite

From Wikipedia, the free encyclopedia

**Hectorite** is a rare soft, greasy, white clay mineral with a chemical formula of  $\text{Na}_{0.3}(\text{Mg},\text{Li})_3\text{Si}_4\text{O}_{10}(\text{OH})_2$ .<sup>[1]</sup>

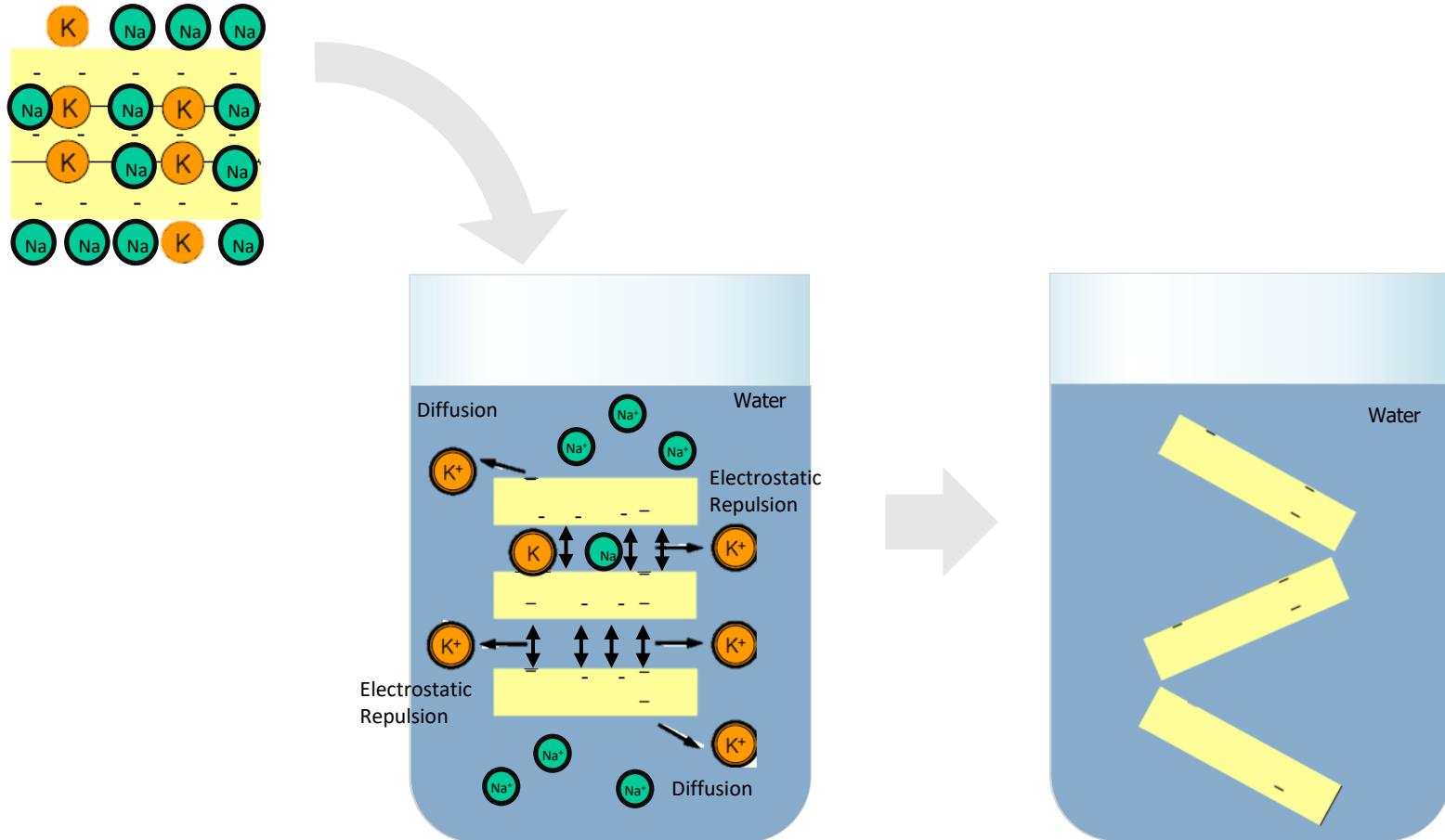
Hectorite was first described in 1941 and named for an occurrence in the United States near Hector (in [San Bernardino County, California](#),<sup>[3]</sup> 30 miles east of [Barstow](#).) Hectorite occurs with bentonite as an alteration product of [clinoptilolite](#) from [volcanic ash](#) and [tuff](#) with a high glass content.<sup>[1]</sup> Hectorite is also found in the beige/brown clay [ghassoul](#), mined in the [Atlas Mountains in Morocco](#).<sup>[4]</sup>

Despite its rarity, it is economically viable as the Hector mine sits over a large deposit of the mineral. Hectorite is mostly used in making cosmetics, but has uses in chemical and other industrial applications, and is a mineral source for refined [lithium](#) metal.<sup>[5]</sup>



# Hectorite in Aqueous Phase

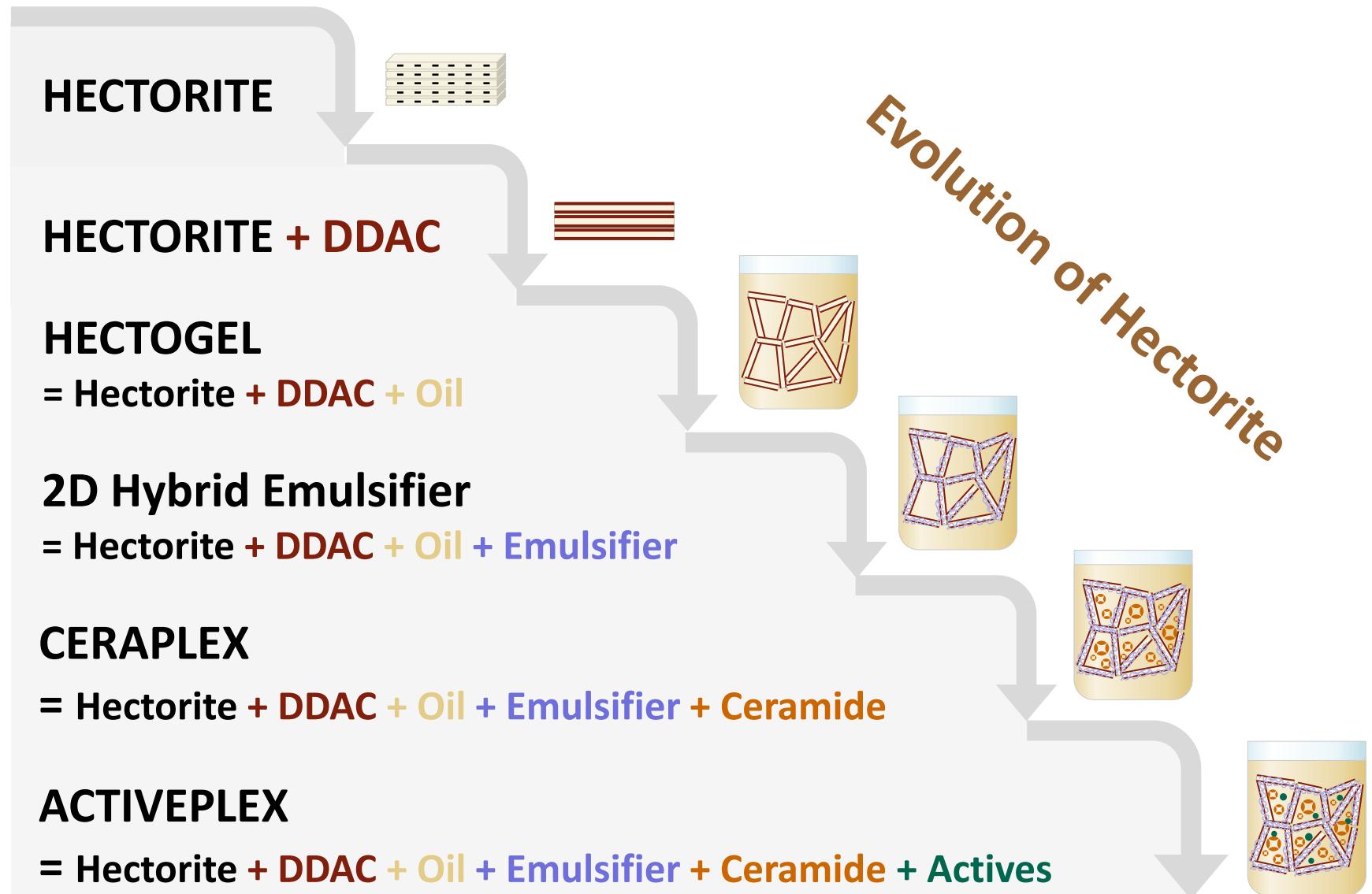
## Desorption and Dissolving of Hectorite



# **2. Hectorite + DDAC**

**= HECTO 38V**

# Hectorite Technologies



# Gelling agent for Oil Phase

## OLEOGEL

Self-Assembly  
Oleogel

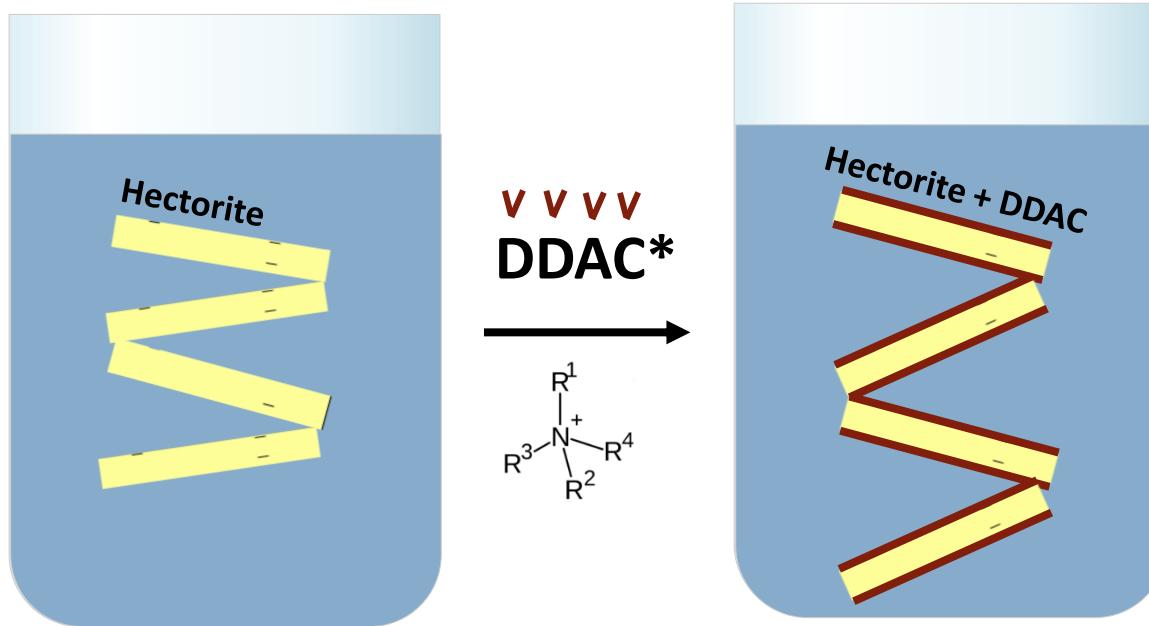
- Ceramide
- Lecithin
- Sorbitan Stearate
- Monoacylglycerol
- Modified Silicone Polymer: Silicone Gel
- Fumed Silica
- Organo Clay: Hectorite + DDAC**

Crystal Particle  
Suspension  
Oleogel

- Fatty Acids
- Hydroxy Fatty Acids
- Fatty Alcohols
- Wax Esters
- High-melting Triacylglycerols
- Carnauba Wax
- Rice bran Wax

# Hectorite + DDAC

Organo Hectorite Powder



Hectorite is now modified by exchanging the original interlayer cations for organo cations (typically quaternary alkylammonium ions) to become organoclays.

\*Dimethyl Di-hydrogenated alkyl Ammonium Chloride

# Hectorite + DDAC

Organo Hectorite Powder

Grade	INCI NAME
<b>HECTO 38V</b>	Disteardimonium Hectorite



Manufactured by **SUNJIN**

**Naturally Surface Treated**  
**COSMOS** grade Organo  
Hectorite will come soon



# HECTO 38V vs. Product 'B'

## Organo Hectorite Powder

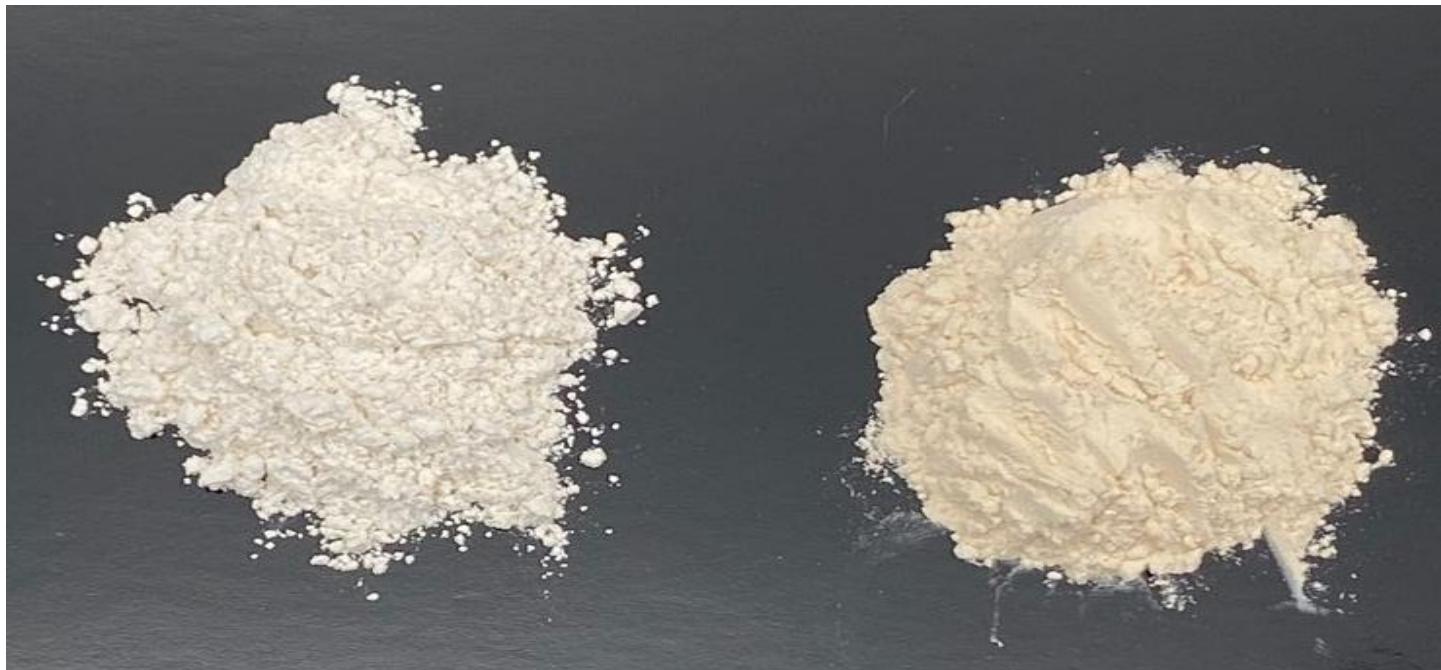
	HECTO 38V	Product 'B'	Test method
Company	Sunjin	Company 'E'	
Lot no			
Surface Treatment/ (%)	36%	36-38%	
Loss on drying (%)	1.38	1.43	130 °C 30 min
Loss on ignition (%)	38.83	37.48	600 °C 2h
Particle Size ( $\mu\text{m}$ )	13.70	20.85	DLS
Yellow index	11.83	25.13	Colorimeter
L*	91.86	86.32	Colorimeter
Hydrophobicity	3	3	600 rpm 30sec
D5 Gel viscosity (cp)	1446000 $\pm$ 40000	1484000 $\pm$ 40000	Brookfield (T-96 2.5 rpm 20 °C)
EcoDrop Gel viscosity (cp)	456000 $\pm$ 40000	444000 $\pm$ 40000	Brookfield (T-96 2.5 rpm 20 °C)

### Gel Viscosity Test condition

- Powder 20+ Activator 5 + Oil 75
- Manufactured by Hipressure



# Organo Hectorite Powder

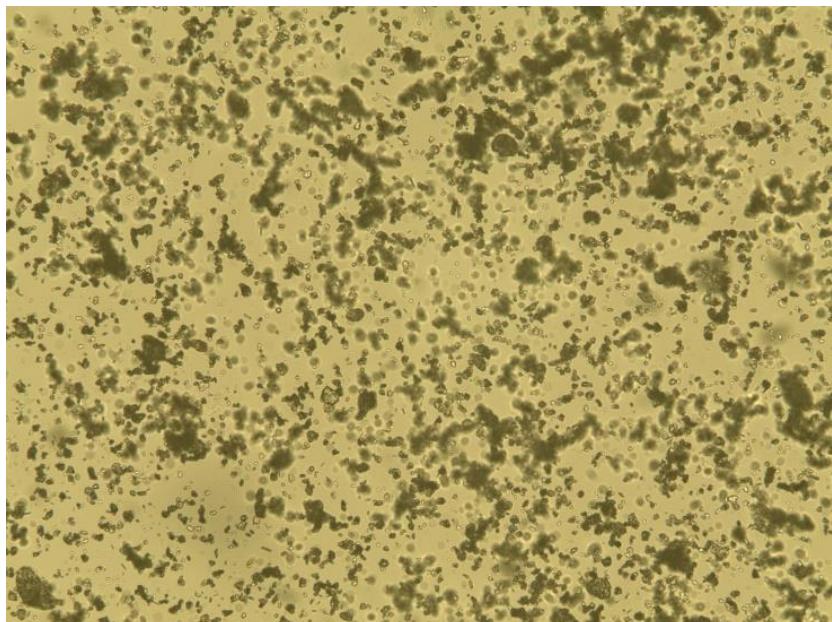


HECTO 38V  
SUNJIN

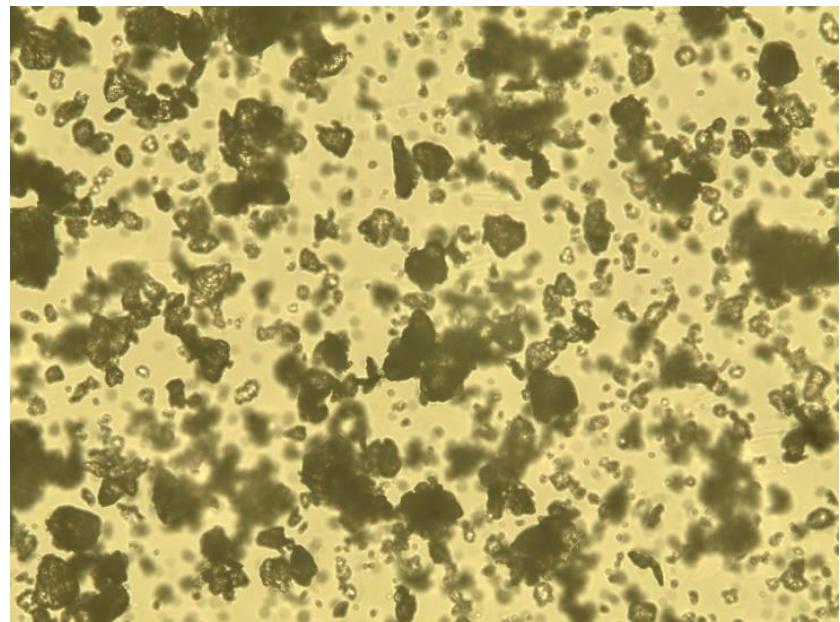
Product 'B'  
Company 'E'

# Organo Hectorite Powder

Optical Image at 20 K



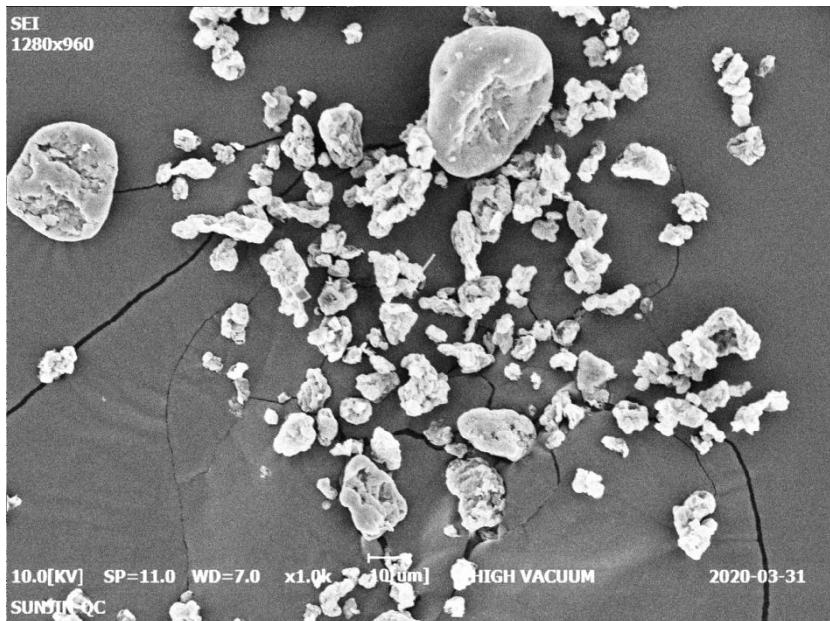
HECTO 38V  
SUNJIN



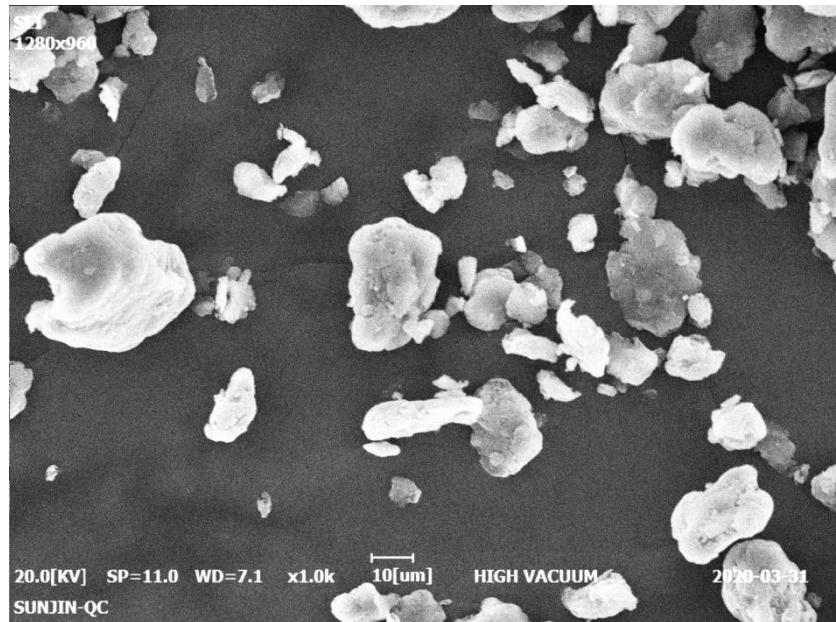
Product 'B'  
Company 'E'

# Organo Hectorite Powder

SEM Image at 1 K



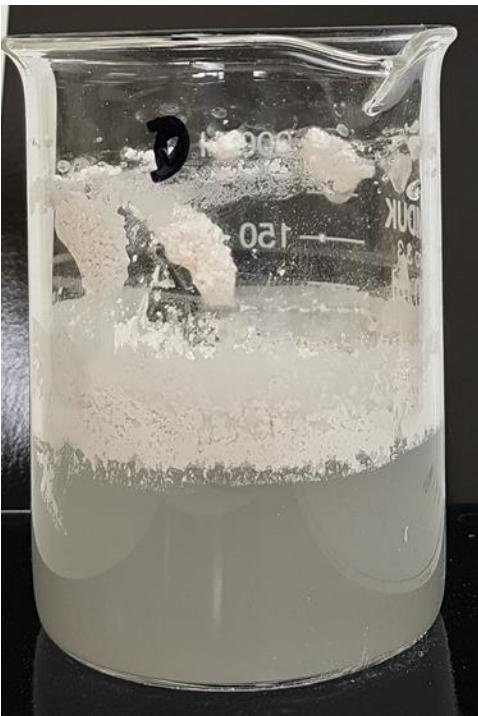
HECTO 38V  
SUNJIN



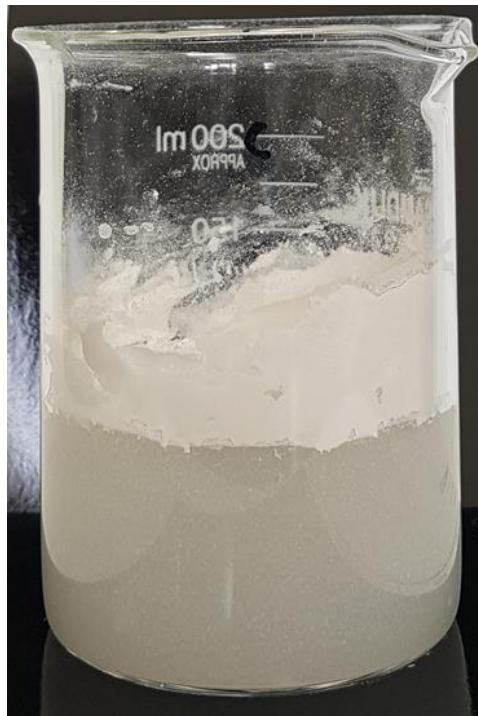
Product 'B'  
Company 'E'

# Organo Hectorite Powder

## Hydrophobicity

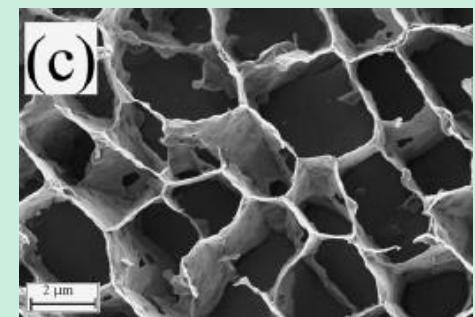


HECTO 38V  
SUNJIN

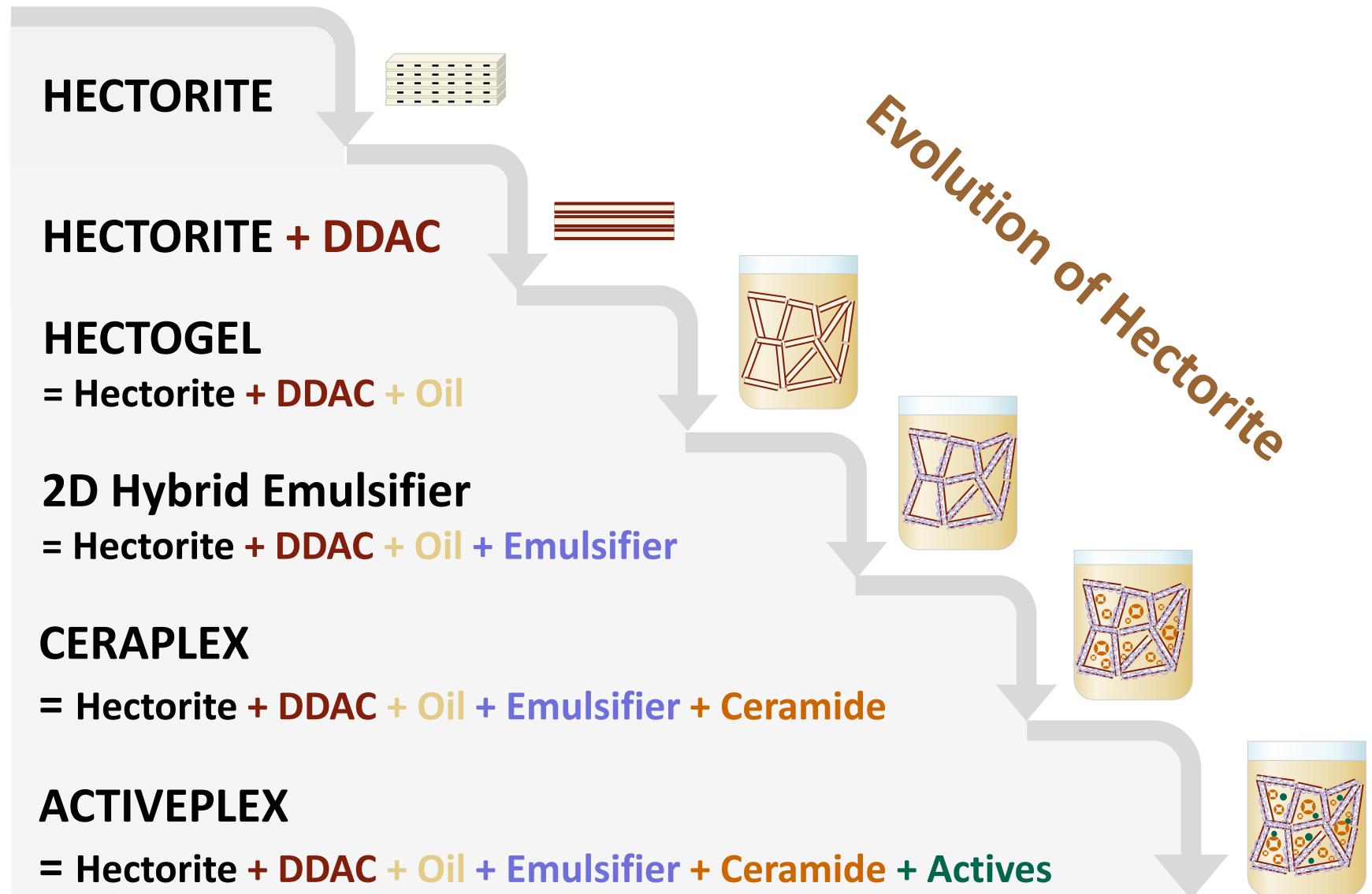


Product 'B'  
Company 'E'

# 3. Hectorite Gel



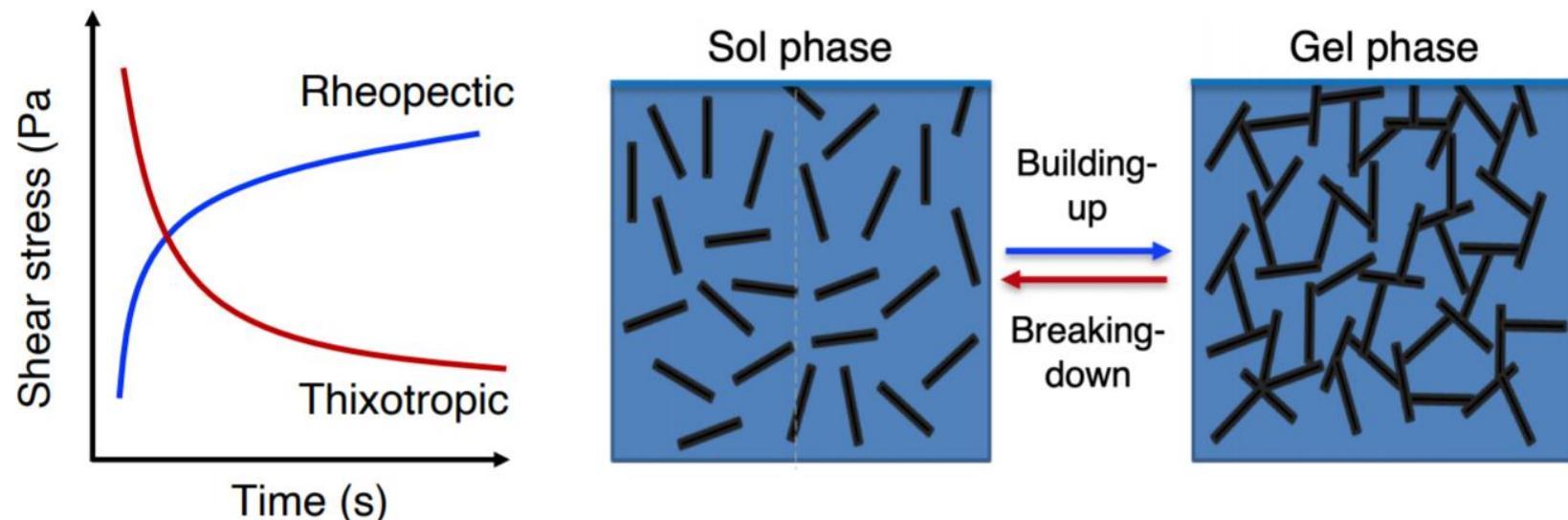
# Hectorite Technologies



# Sol-gel transitions

Transition by time (hysteresis)

- Thixotropy: at constant shear rate, viscosity decrease as time goes  
Ex) Polymer solutions, paints, yogurt, clays...
- Rheopecty (rheopexy): at constant shear rate, viscosity increase as time goes  
Steady shear stress packs granular materials, thus solidifying the system  
Ex) tooth paste, some lubricants, ...



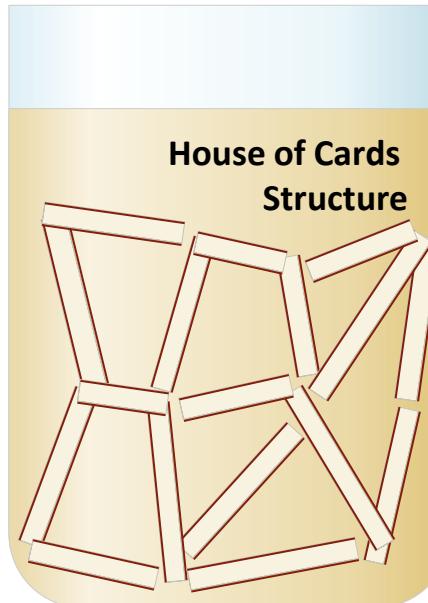
# Hectorite Gel

Hecto 38V



Milling  
Oil, Activator

Hectorite Gel



Hectogel forms thixotropic gels by developing hydrogen bond bridges between the edges of adjacent platelets

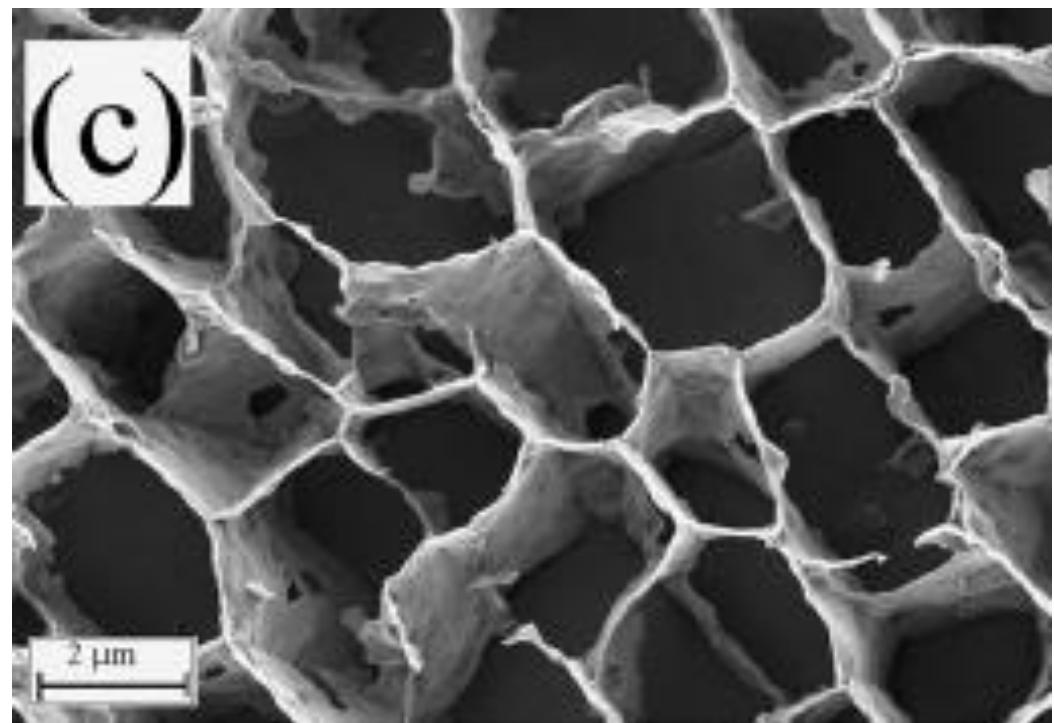
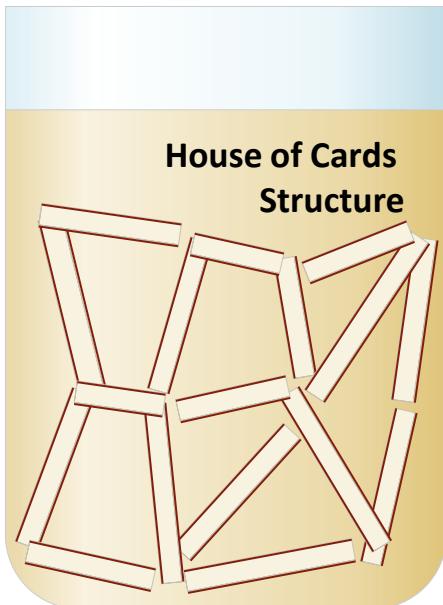
Efficiently dispersed using high-shear equipment and then to be activated with the optimum level of a chemical activator, such as propylene carbonate



\*Dimethyl Di-hydrogenated alkyl Ammonium Chloride

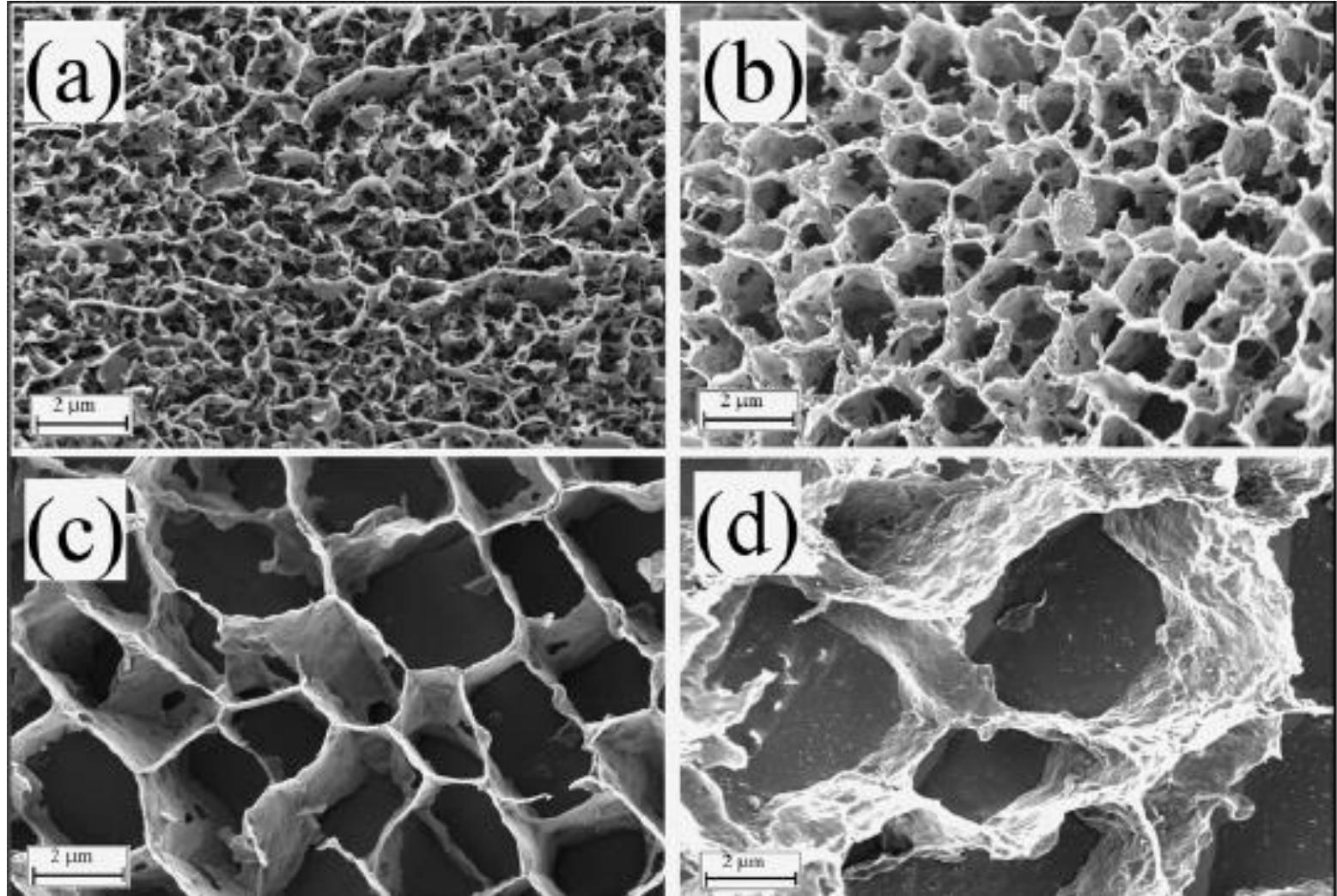
# Hectorite Gel

Hectorite Gel



# House of Cards

Structure of Hectorite Gel



# HECTOGEL Series

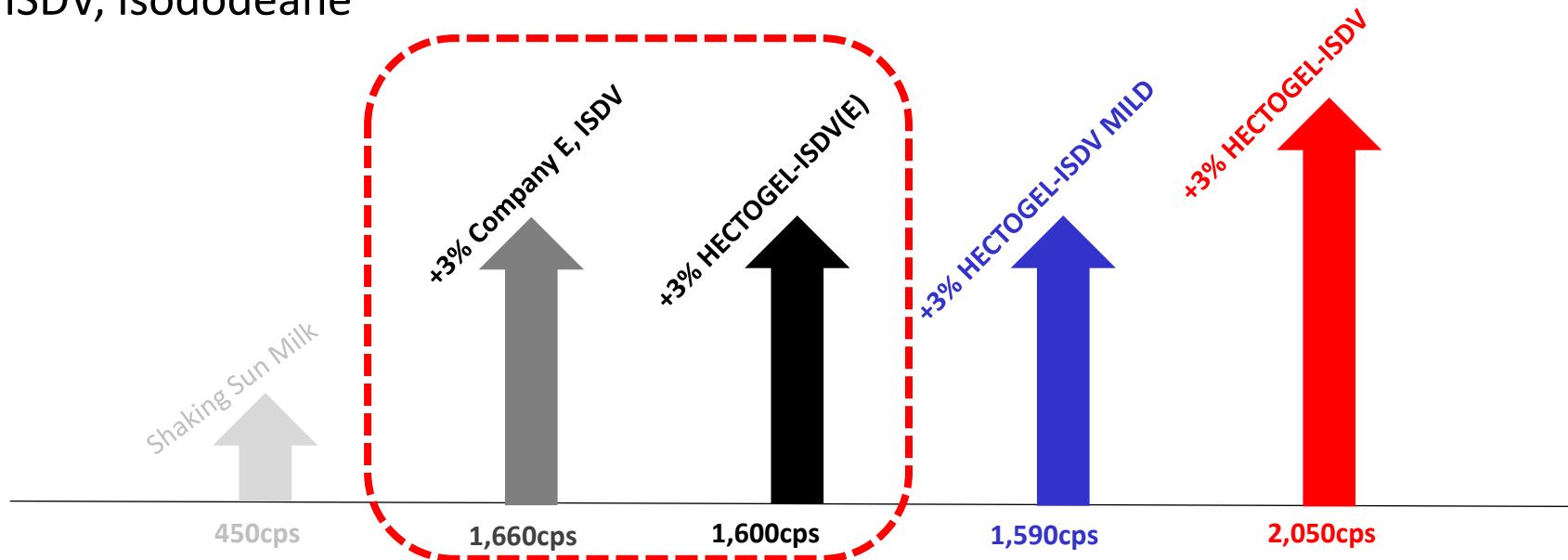
= Hectorite + DDAC + Oil

Grade	INCI NAME
HECTOGEL-ISDV	Isododeane, Disteardimonium Hectorite, Propylene Carbonate
<b>HECTOGEL-ISDV(E)</b>	
HECTOGEL-D5	Cyclopentasiloxane, Disteardimonium Hectorite, Propylene Carbonate
<b>HECTOGEL-D5(E)</b>	
HECTOGEL-CCTG	Caprylic/Capric Triglyceride, Disteardimonium Hectorite, Propylene Carbonate
<b>HECTOGEL-CCTG(E)</b>	
HECTOGEL-D	Dimethicone, Disteardimonium Hectorite, Propylene Carbonate
<b>HECTOGEL-AK</b>	C <sub>15-19</sub> Alkane, Disteardimonium Hectorite, Propylene Carbonate
HECTOGEL-HSQ	C <sub>13-16</sub> Isoparaffin, Disteardimonium Hectorite, Propylene Carbonate

(E) grade means **Equivalent grade**

# Viscosity Test Result:

ISDV, Isododecane



Brook Field Viscometer / Spindle No.3 12rpm

# HECTOGEL MILD Series

Grade	INCI NAME
HECTOGEL-ISDV <b>MILD</b>	Isododeane, Disteardimonium Hectorite, <b>2,3-Butanediol</b>
HECTOGEL-D5 <b>MILD</b>	Cyclopentasiloxane, Disteardimonium Hectorite, <b>2,3-Butanediol</b>
HECTOGEL-CCTG <b>MILD</b>	Caprylic/Capric Triglyceride, Disteardimonium Hectorite, <b>2,3-Butanediol</b>

**MILD grades have neither Propylene Carbonate nor EtOH as activator**

## PROPYLENE CARBONATE:

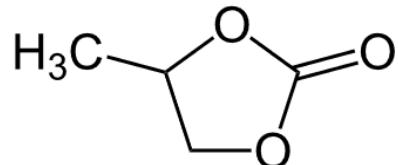
Skin Irritant

### Irritation (skin, eyes, or lungs)

Concern

Classified as irritant

Human irritant - strong evidence (only for products for use around the eyes, on the skin, or may be aerosolized (airborne))



Reference

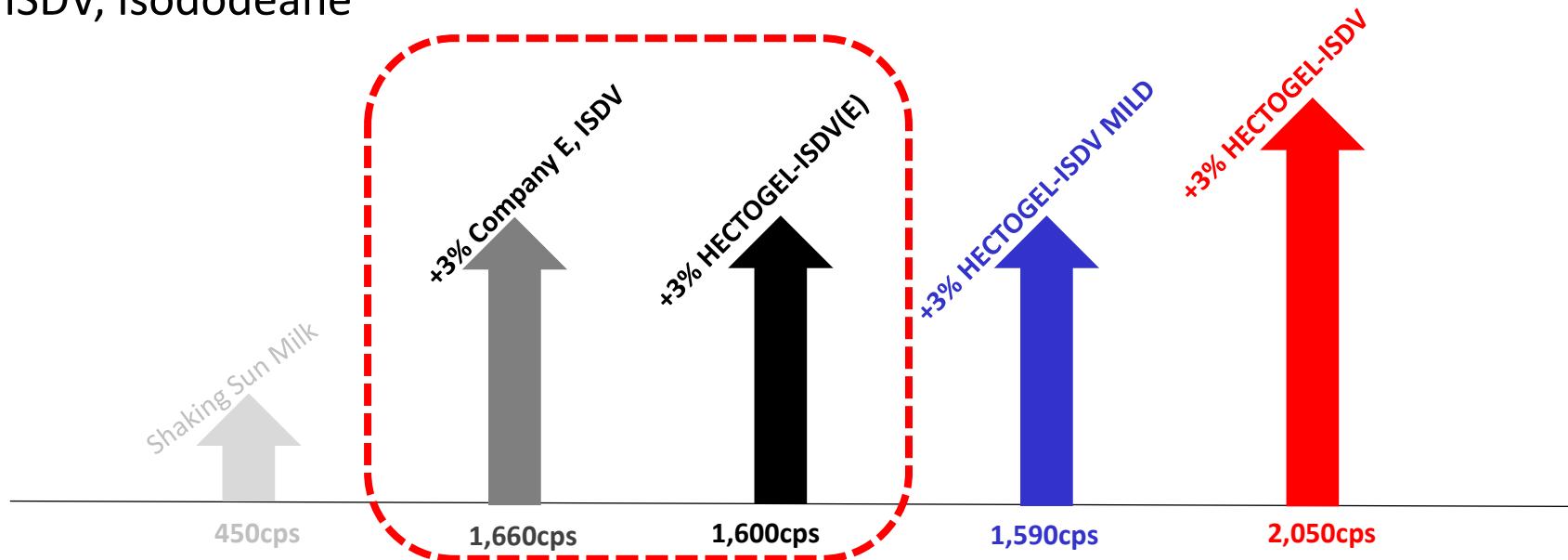
European Union - Classification & Labelling

Cosmetic Ingredient Review Assessments

<https://www.ewg.org/skindeep/ingredient/705314/PROPYLENE CARBONATE/#.WZu5W-QUmAg>

# Viscosity Test Result:

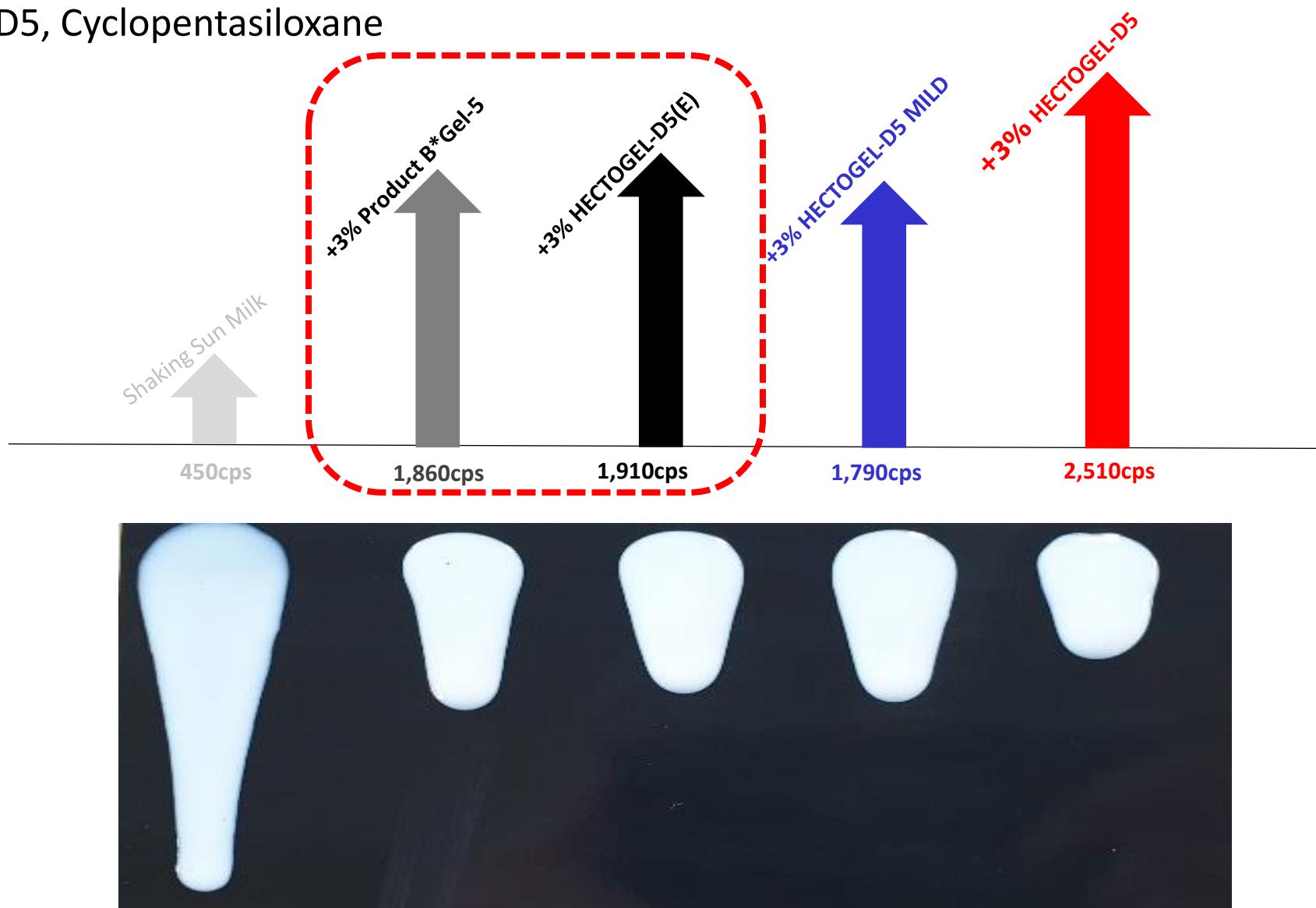
ISDV, Isododecane



Brook Field Viscometer / Spindle No.3 12rpm

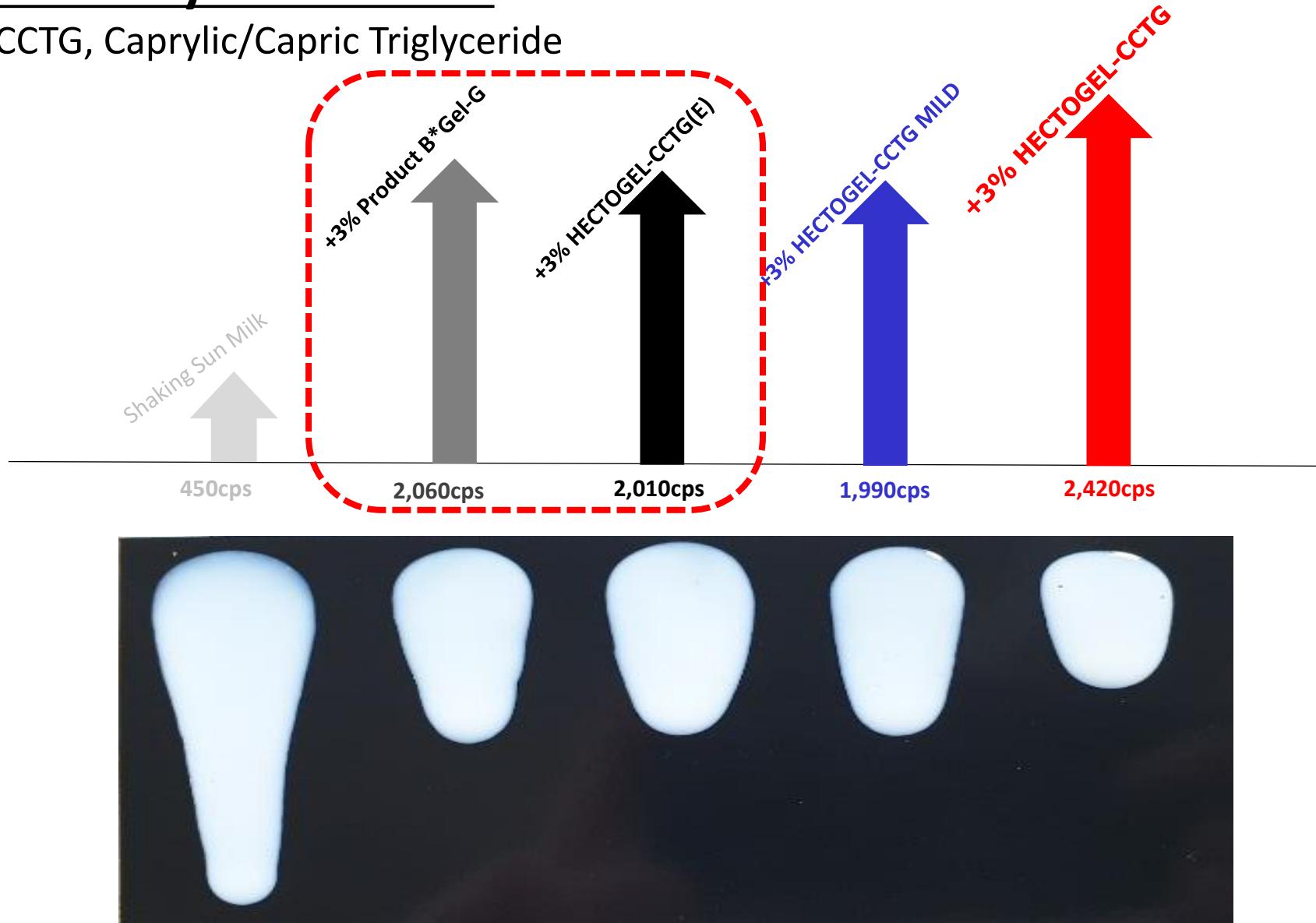
# Viscosity Test Result:

D5, Cyclopentasiloxane



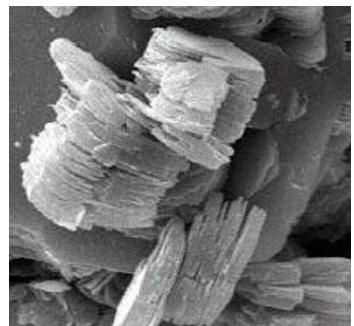
# Viscosity Test Result:

CCTG, Caprylic/Capric Triglyceride

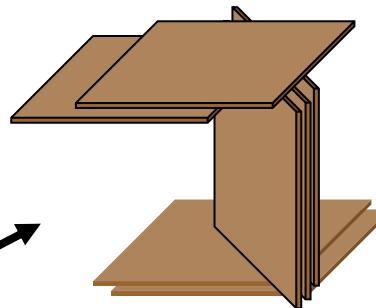
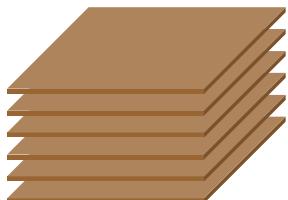


# Delamination of Hectorite:

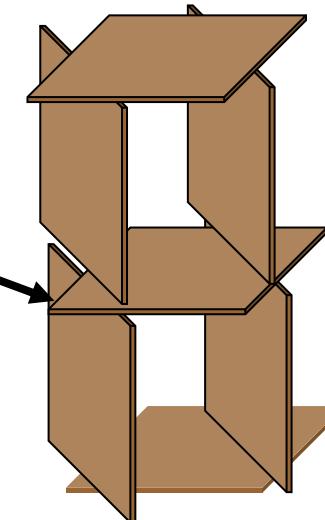
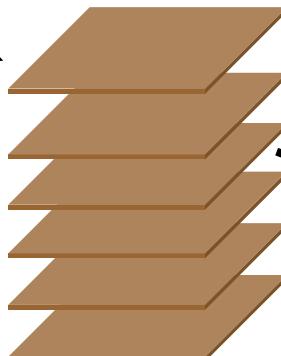
## Process Dependent



Poorly Delaminated



Fully Delaminated



Fully Card-House  
Structure developed

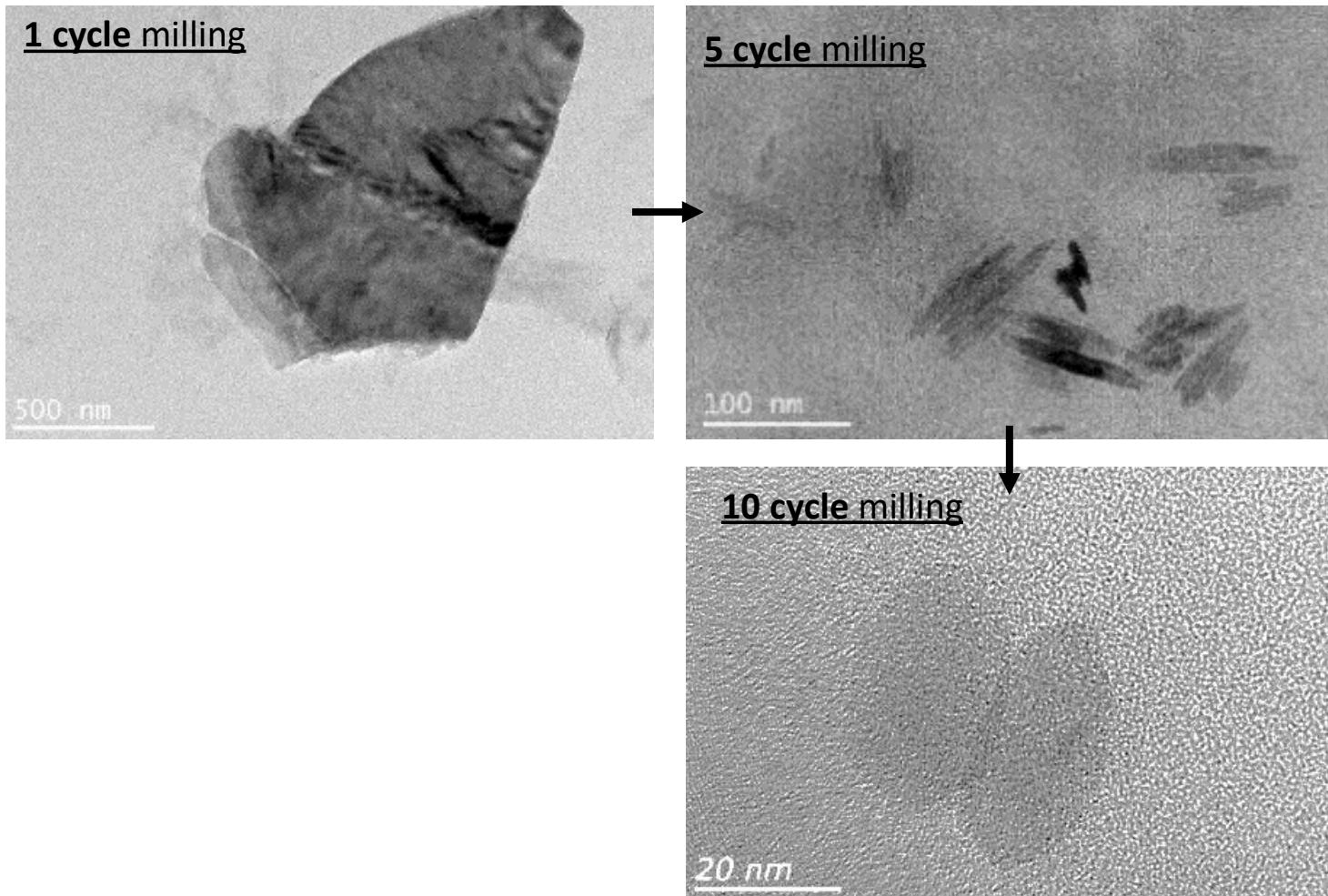
### Hectorite

- Careful shearing and activation required
- Lower viscosity
- Poor uniformity
- Inconsistent lot to lot viscosity

### HECTOGEL®

- High viscosity
- Excellent lot to lot consistent
- Highest reproducibility
- No need for careful shearing and activation.
- Save time and save labor cost

## More milling, smaller particle size



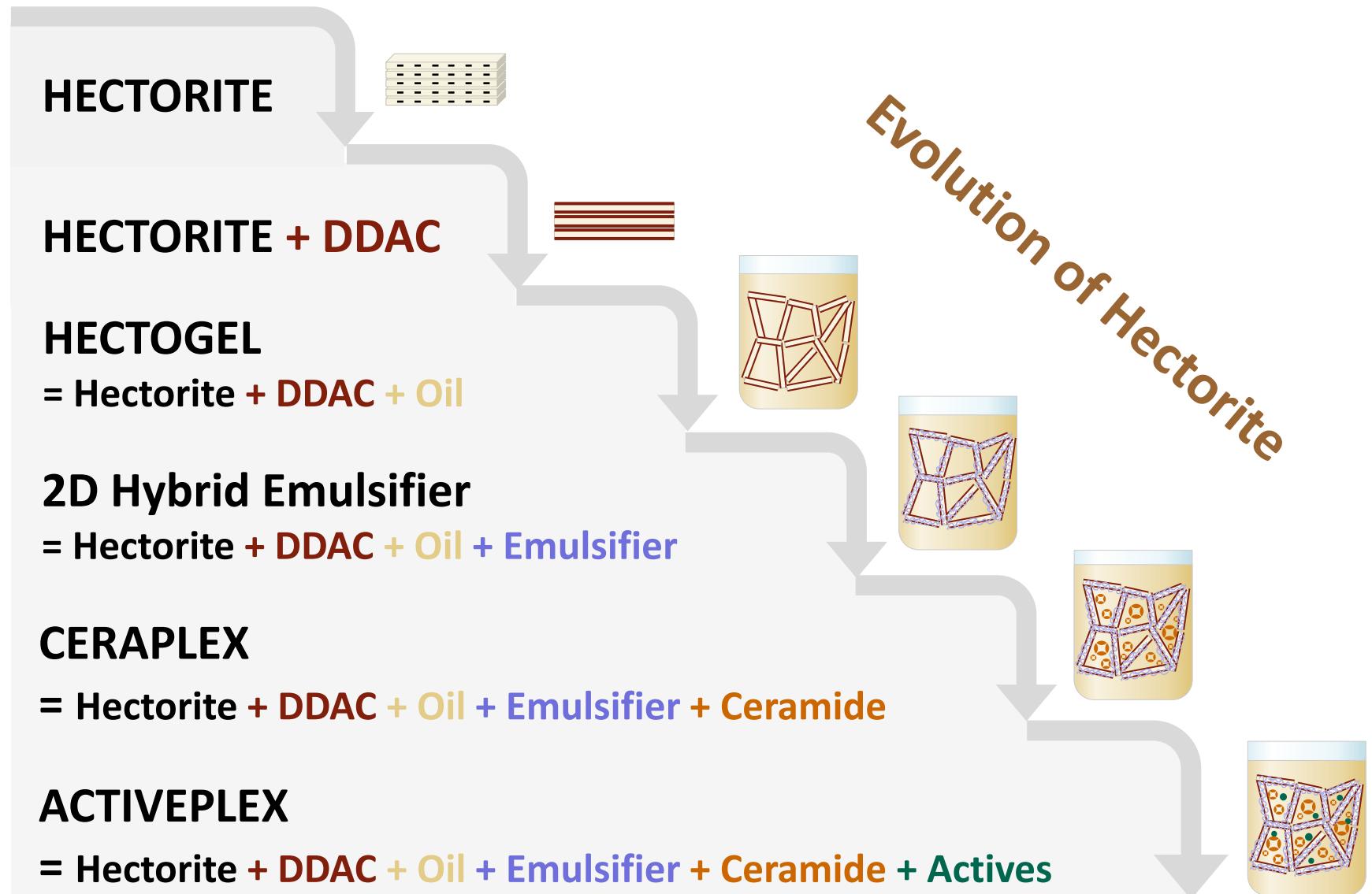
# **2D Hybrid Emulsifier:**

**W/O Skin Care**

**Water Drop**

## **ECODROPGEL**

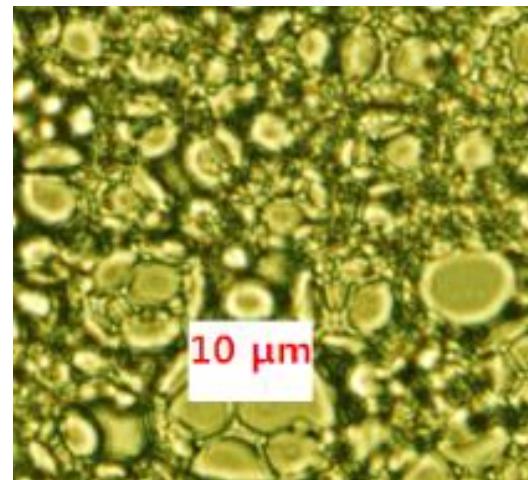
# Hectorite Technologies



## 2D Hybrid Emulsifier:

= Hectorite + DDAC + Oil + Emulsifier

Grade	INCI	Remark
ECODROP GEL	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite	For Silicone Free Water Drop
MLB	Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite	For stable W/O emulsions with good textures
MLB-SD	Dimethicone & Disteardimonium Hectorite & PEG-10 Dimethicone	Non D5



# CERAPLEX Water Bomb Cream 2020

Ceramide 2500ppm

Silicone free water drop



## Ingredients

Water, Coco-Caprylate/Caprate, Squalane, Glycerin, Polyglyceryl-4 Isostearate, 2,3-Butanediol, Butyrospermum Parkii Butter, Glycosyl Trehalose, 1,2-Hexanediol, Hydrogenated Starch Hydrolysate, Sodium chloride, Disteardimonium Hectorite, Ceramide NP(2,500ppm), Butylene Glycol, Phytosterol(1,250ppm), Stearic Acid(1,250ppm), Paeonia Albiflora Flower Extract, Magnolia Liliflora Flower Extract, Lilium Candidum Flower Extract, Fragrance, Phenoxyethanol

## Key ingredients

### CeraPLEX

INCI : CoCo-Caprylate/Caprate,  
Polyglyceryl-4 Isostearate,  
Disteardimonium Hectorite, Ceramide NP

### EcoDropGel

INCI : Polyglyceryl-4 Isostearate,  
Coco-Caprylate/Caprate, Disteardimonium Hectorite

# Water Drop?



**Water Drop** = Water-releasing = Quick Breaking

**Shearing forces** generated by the rubbing in or application of the cosmetic composition cause the water-in-oil type emulsion to rupture, thereby causing the internal aqueous phase to emerge in the form of droplets

**Macro emulsion** by Minimized use of emulsifier and increased inner phase % causes Water Drop Effect

# Have you heard of “Silicone Free w/O Water Drop” system?

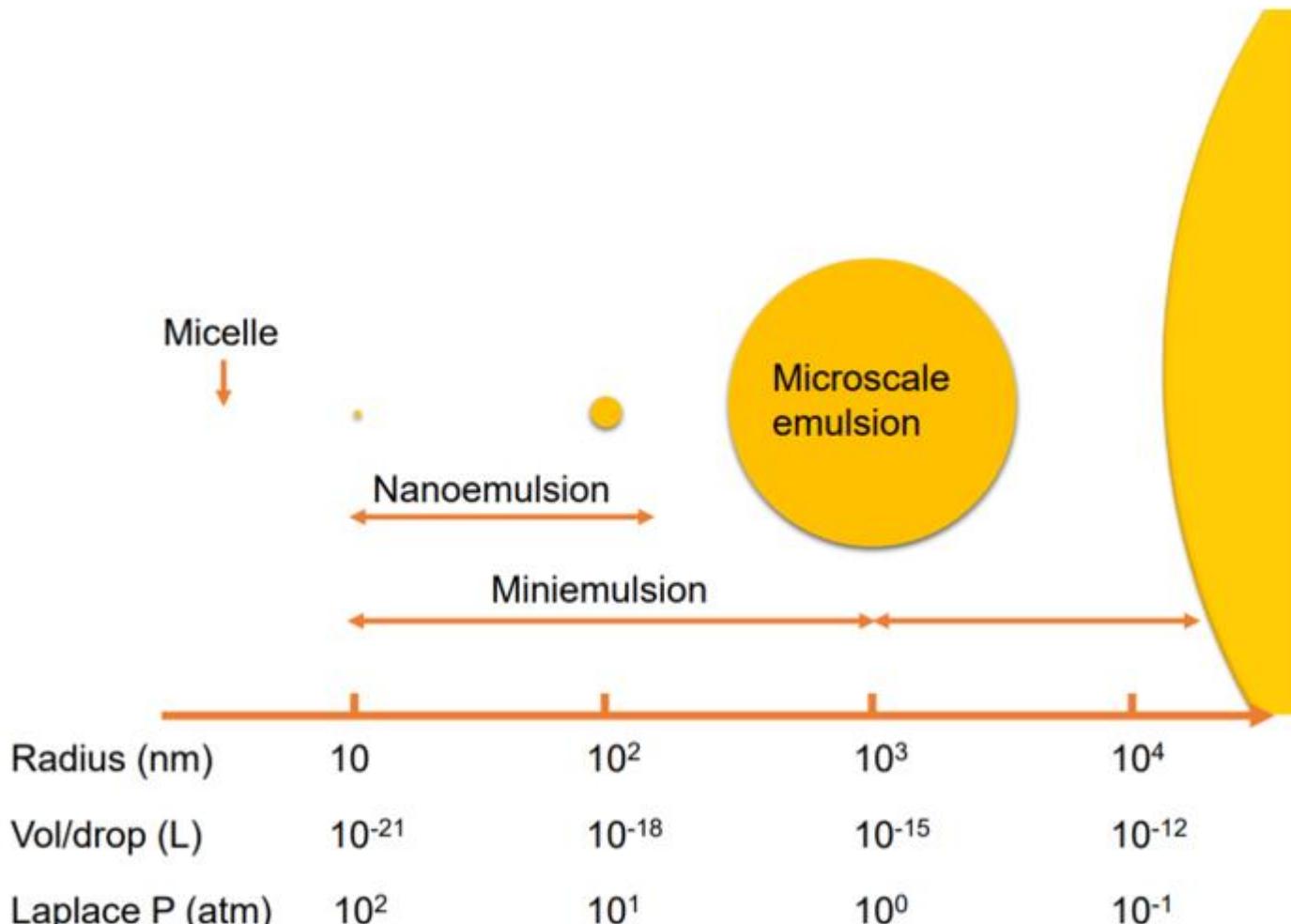


**Not really, right?**

# **Key factors to make water drop system**

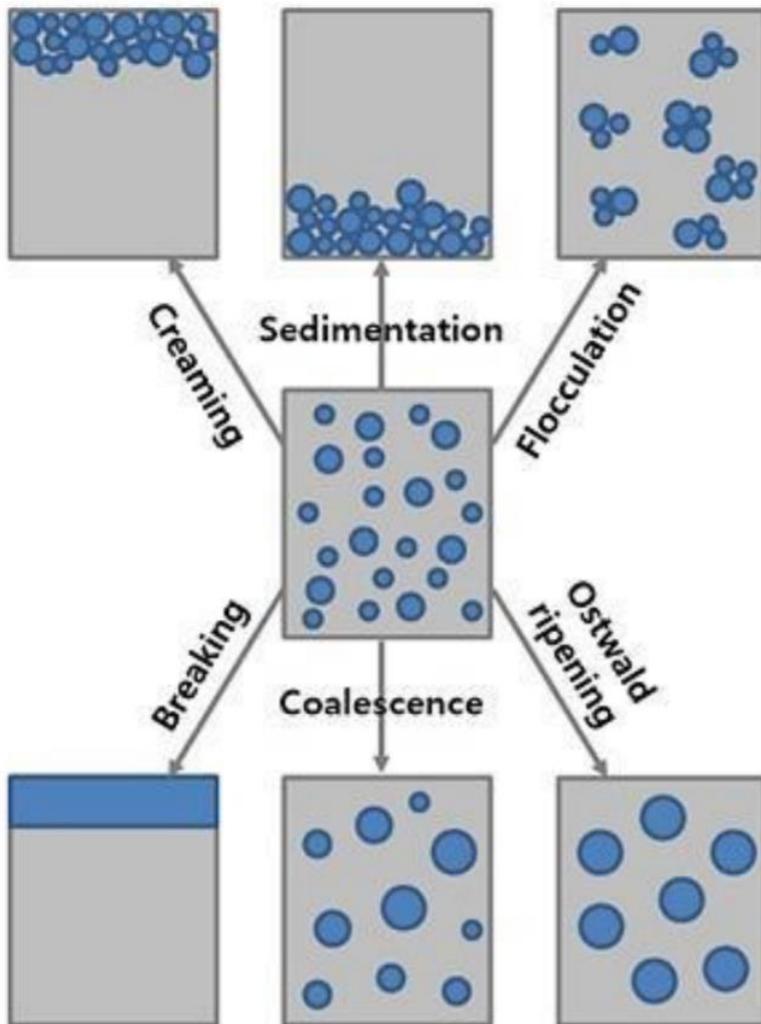
1. Inner(Water) Phase %
2. Oil Phase polarity:
3. Emulsion Droplet Size
  - Emulsifier %
  - Shear Force(RPM)

# Size scales of Emulsions



\* $\sigma=10\text{ dyne/cm}$ ,  $\eta_c=1\text{ cP}$

# Issues on emulsion stability



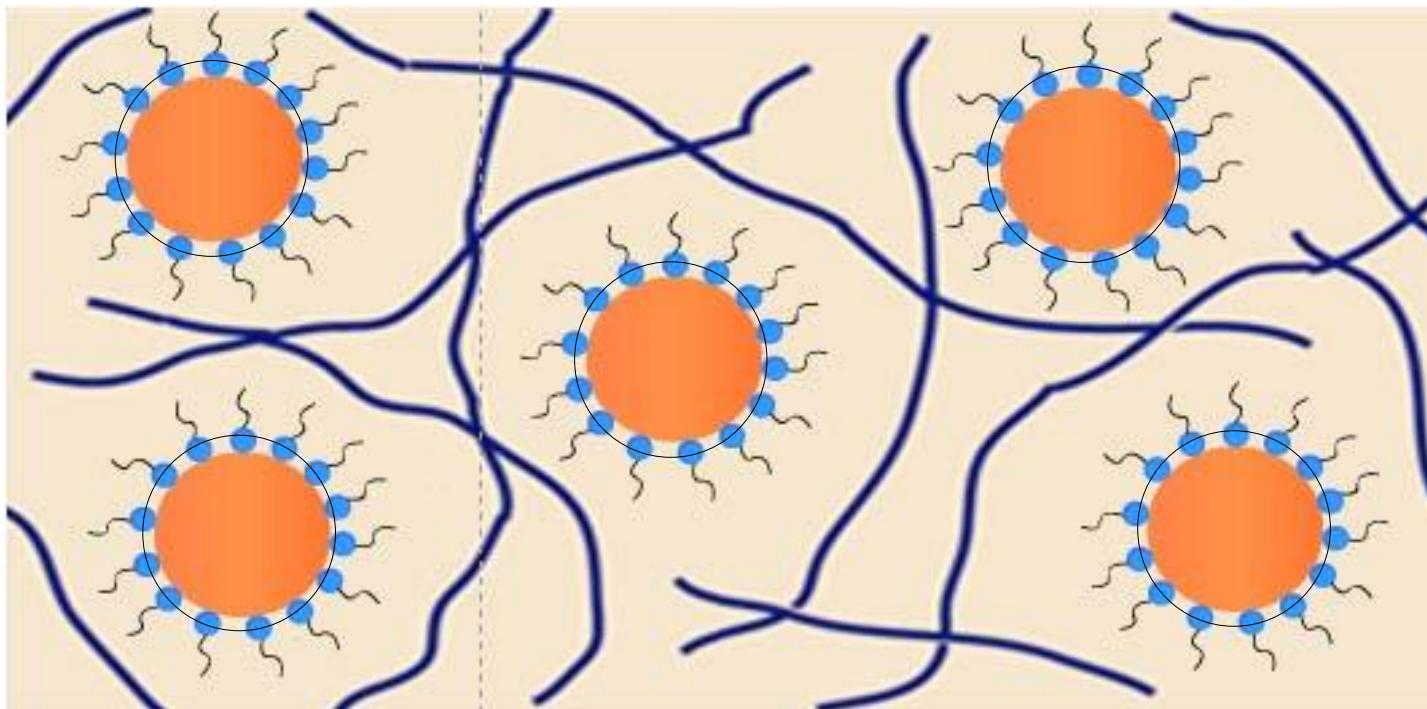
Stokes-Einstein eq.;

$$D = \frac{k_B T}{6\pi\eta a}$$

Separation rate;

$$\nu \sim \frac{\Delta\rho g a^2}{\eta} (1 - \phi)^{5.5}$$

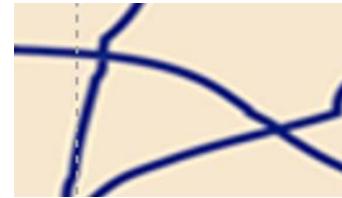
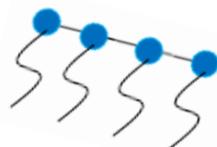
# W/S Water Drop System



Silicone Oil

Silicone Emulsifier

Silicone Gel



# Silicone Free Water Drop

Title	2016	2017	2019	New ! 2020
<b>Chef's Selection Skin Care</b>	D5 Non D5	Non silicone	Ceramide UV Filter	<b>Ceramide +Phytosterol +Fatty Acid</b>
<b>1. Skin Care</b>				
▪ Berry Balm / Lemon Balm	V	V	V	V
▪ Ice Sherbet Cooling Cream	V	V		
▪ Ice Cream	V	V		
▪ Custard Cream	V	V	V	
▪ Whipping Cream				
▪ Ricotta Cheese Whitening Cream				
▪ Marsh Mallow Tone Up Cream	V	V		
▪ Water Drop Facial Cream	V	V	V	V
▪ Milk Drop Facial Cream	V	V		
▪ Green Tea Drop Facial Cream				



**Have you ever heard of Silicone Free Water Drop?**

# W/O Skin care Proposals

## from SUNJIN



SJF-2001  
Ceraplex Water bolm  
**facial cream**

SJF-2081  
Ceramide 1000PPM  
**Body lotion**



SJF-2082  
Ceramide 2000PPM  
**Hand Cream**



SJF-2083  
Ceramide 1000PPM  
**Hair Essence**

New in 2020

# W/O Skin care & body care



Phase	Trade Name	INCI	SJF-2001	SJF-2081	SJF-2082
A	EcoDropGel	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium Hectorite	1.5	6	6
	CeraPLEX	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2.5	1	2
	Cetiol C5C	Coco-Caprylate/Caprate	6	8	9
	Bergacare SB	Butyrospermum Parkii Butter	1		
	Cetiol Ultimate	Undecane, Tridecane		7	5
	Thixin R PC	Trihydroxystearin		0.3	0.6
	Neossance Squalane	Squalane	4	2	3
B	Water	Water	76.57	65.55	63.25
	NaCl	Sodium chloride	0.5	1	1
	Glycerin	Glycerin	3	3	6
	2.3-BDO	2,3-Butanediol	1.7	5	3
	1,2-Hexanediol	1,2-Hexanediol	0.7	1	1
	Tornare	Glycosyl Trehalose, Hydrogenated Starch Hydrolysate, Water	2		
	Sensivia SC50	Ethylhexylglycerin	0.5	0.1	0.1
	Fragrance	Fragrance	0.03	0.05	0.05
			<b>NET CERAMIDE</b>	<b>2500</b>	<b>1000</b>
					<b>2000</b>

# CERAPLEX Water Bomb Cream 2020

## Ingredients



Water, Coco-Caprylate/Caprate, Squalane, Glycerin, Polyglyceryl-4 Isostearate, 2,3-Butanediol, Butyrospermum Parkii Butter, Glycosyl Trehalose, 1,2-Hexanediol, Hydrogenated Starch Hydrolysate, Sodium chloride, Disteardimonium Hectorite, Ceramide NP(2,500ppm), Butylene Glycol, Phytosterol(1,250ppm), Stearic Acid(1,250ppm), Paeonia Albiflora Flower Extract, Magnolia Liliflora Flower Extract, Lilium Candidum Flower Extract, Fragrance, Phenoxyethanol

## Key ingredients

### CeraPLEX

INCI : CoCo-Caprylate/Caprate,  
Polyglyceryl-4 Isostearate,  
Disteardimonium Hectorite, Ceramide NP

### EcoDropGel

INCI : Polyglyceryl-4 Isostearate,  
Coco-Caprylate/Caprate, Disteardimonium Hectorite

# iRECIPE CERAPLEX Water Bolm Cream

SJF-2001 W/O Moisturizing Cream with ceraPLEX

New in 2020

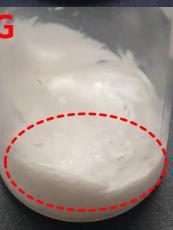
Phase	Trade Name	INCI	%	Maker
A	EcoDropGel	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium Hectorite	1.5	SUNJIN
	CeraPLEX	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2.5	SUNJIN
	Cetiol C5C	Coco-Caprylate/Caprate	6	
	Bergacare SB	Butyrospermum Parkii Butter	1	
	Neossance Squalane	Squalane	4	
B	Water	Water	76.57	
	NaCl	Sodium chloride	0.5	
	Glycerin	Glycerin	3	
	2,3-BDO	2,3-Butanediol	1.7	G.S Caltex
	1,2-Hexanediol	1,2-Hexanediol	0.7	
	Tornare	Glycosyl Trehalose, Hydrogenated Starch Hydrolysate, Water	2	
	White Flower Complex	Butylene Glycol, Paeonia Albiflora Flower Extract, Lilium Candidum Flower Extract, Magnolia Liliflora Flower Extract, Phenoxyethanol	0.5	
	Fragrance	Fragrance	0.03	



# i+RECIPE CERAPLEX Water Bomb Cream

## stability test

SJF-2001\_W/O Moisturizing Cream with ceraPLEX

	1 week	2 week	4 week	6 week	8 week	10 week
	2020.01.15	2020.01.22	2020.02.05	2020.02.19	2020.03.04	2020.03.28
Room Temperature	OK	OK	OK	OK	OK	OK
50°C	OK	OK	OK	OK	OK	OK
0~5°C	OK	OK	OK	OK	OK	OK
Cycling -10°C 12H → 15°C 12H → 25°C 12H → 50°C 12H	NG 	After 1 Cycle, emulsion break				



# Ceramide Body Lotion

SJF-2081\_Ceramide 1000PPM W/O Body lotion



Phase	Ingredients	INCI Name	%	Maker
A	<b>ECODROP GEL</b>	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium, Hectorite	6	SUNJIN
	Cetiol C5C	Coco-Caprylate / Caprate	8	
	Squalane	Squalane	2	
	Cetiol Ultimate	Undecane, Tridecane	7	
	<b>CeraPLEX</b>	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	1	SUNJIN
	Thixin R PC	Trihydroxystearin	0.3	
B	Water	Water	65.55	
	2,3-BDO	2,3-Butanediol	5	G.S Caltex
	Glycerin	Glycerin	3	
	1,2-Hexanediol	1,2-Hexanediol	1	
	NaCl	Sodium chloride	1	
C	Fragrance	Liberty Number CSN024754	0.05	KIMEX
	Sensivia SC50	Ethylhexylglycerin	0.1	

# Ceramide hand cream

SJF-2082\_Ceramide 2000PPM W/O Hand Cream

Phase	Ingredients	INCI Name	%	Maker
A	<b>ECODROP GEL</b>	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium, Hectorite	6	SUNJIN
	Cetiol C5C	Coco-Caprylate / Caprate	9	
	Squalane	Squalane	3	
	Cetiol Ultimate	Undecane, Tridecane	5	
	<b>CeraPLEX</b>	Polyglyceryl-4 Isostearate, Squalane, Disteardimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2	SUNJIN
	Thixin R PC	Trihydroxystearin	0.6	
B	Water	Water	63.25	
	2,3-BDO	2,3-Butanediol	3	G.S Caltex
	Glycerin	Glycerin	6	
	1,2-Hexanediol	1,2-Hexanediol	1	
	NaCl	Sodium chloride	1	
C	Fragrance	Liberty Number CSN024754	0.05	KIMEX
	Sensivia SC50	Ethylhexylglycerin	0.1	



# Berry Balm 2019

## Silicone Free Ceramide (5000ppm)

Water, CoCo-Caprylate/Caprate, Glycerin, Ozokerite, Dicaprylyl Carbonate, Polyglyceryl-4 Isostearate, Propanediol, Stearyl Heptanoate, 1,2-Hexanediol, Disteardimonium Hectorite, Ceramide NP(5,000 ppm), Sodium Chloride, Stearyl Caprylate, Butylene Glycol, Tocopherol, Fragrance, Rubus Fruticosus(Blackberry) Fruit Extract, Ribes Nigrum(Black Currant) Fuit Extract, Vaccinium Angustifolium(Blueberry) Fruit Extract, Euterpe Oleracea Fruit Extract, Rubus Idaeus(Raspberry) Fruit Extract, Extract, CI 17200



### Key ingredients

### CeraPLEX

INCI : CoCo-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite, Ceramide NP

- ✓ 20% Ceramide inside
- ✓ Stable in formulation

## Berry Balm 2016

## Berry Balm 2019

	Trade Name	INCI	SJF-1646 D5	SJF-1646 D5 Free	SJF-1702 Silicone free	SJF-1901 Silicone free + Ceramide
A	WaterDropSil	Dimethicone & Cyclopentasiloxane & Dimethicone/Vinyl Dimethicone Crosspolymer & PEG-10 Dimethicone	3	-	-	-
	WaterDropSil-D	Dimethicone & Dimethicone/Vinyl Dimethicone Crosspolymer & PEG-10 Dimethicone	-	3	-	-
	EcoDropGel	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium, Hectorite	-	-	4.5	4
	CeraPLEX	Caprylic/capric triglyceride & Ceramide NP & Disteardimonium Hectorite	-	-	-	2.5
	KF-995	Cyclopentasiloxane	5	-	-	-
	Xiameter PMX 200/2cs	Dimethicone	-	5	-	-
	Cetiol C5 C	Coco-Caprylate/Caprate	-	-	6.0	9
	Cetiol CC	Dicaprylyl Carbonate	2	2	2	4
	Tegosoft SH	Stearyl Heptanoate	3.5	3.5	1.5	1.5
	Ozokerite Wax	Ozokerite Wax	3	3	5.5	4.5
B	Water	Water	70.7	70.7	67.17	62.17
	NaCl	Sodium chloride	0.5	0.5	0.5	0.5
	Glycerin	Glycerin	9	9	9	9
	1,3 Propanediol	Propanediol	2	2	1.7	1.7
	Phenoxyethanol	Phenoxyethanol	0.4	0.4	-	-
	White Flower Complex	Paeonia Albiflora Flower Extract, Lilium Candidum Flower Extract, Magnolia Liliiflora Flower Extract	0.5	0.5	0.5	-
	1,2-Hexanediol	Hexanediol	-	-	0.7	0.7
	Fragrance	Fragrance	0.03	0.03	0.03	0.03
	CI 16185 0.1% Sol.	CI 16185 0.1% Sol.	0.4	0.4	0.4	0.4
	Aronia Melanocarpa Fruit Extract	Aronia Melanocarpa Fruit Extract	0.5	0.5	0.5	-

# W/O Water Drop Emulsion instability?

## Usual suspects..

- Preservatives (ex. 1,2 Hexandiol)
- Active ingredients



## Formulation tips..

- Adding more ECODROPGEL
- or Using MLB



# ECODROPGEL

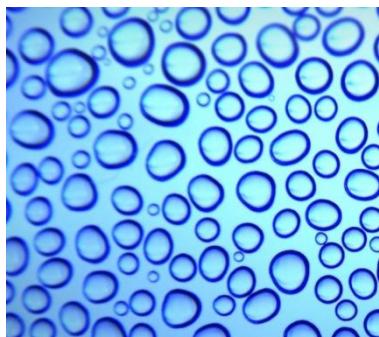
Non-Silicone version water-releasing effect raw material

**Non Silicone Base:** No Silicone oil, no silicone emulsifier, no silicone gel used

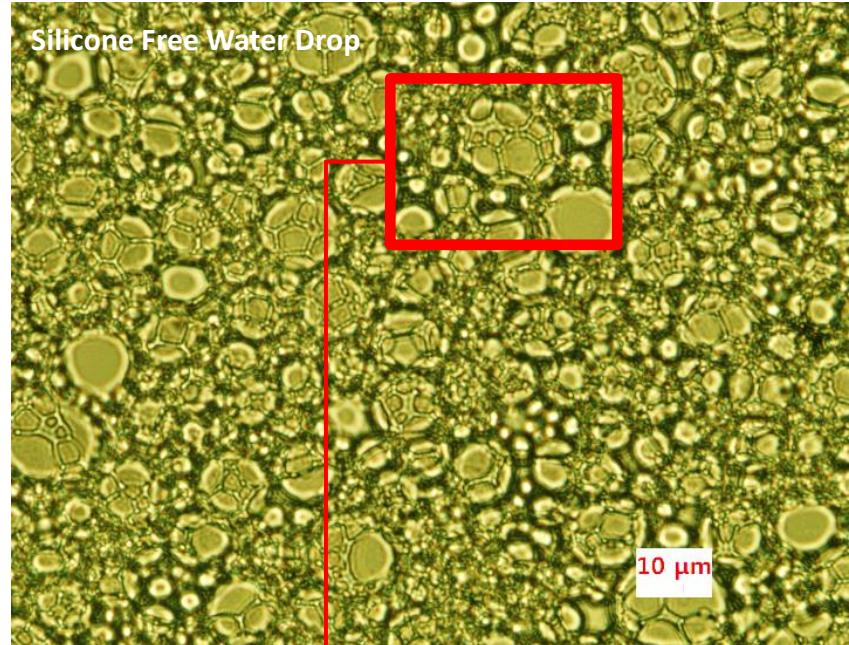
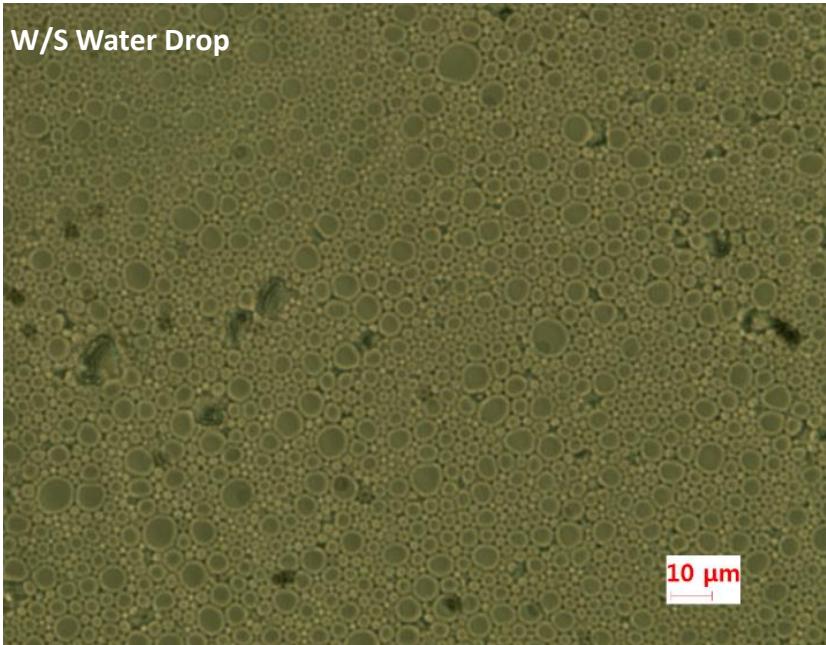
**Water-Releasing Effect** just like WaterDropSil

**The First & The Only,** non silicone based water-releasing effect raw material

**Patent number :** 10-2091318



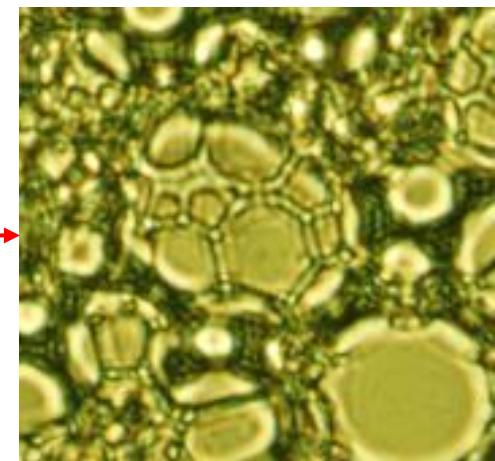
# Droplet under Microscope



**WATER DROPSIL-D**



**ECODROP GEL**

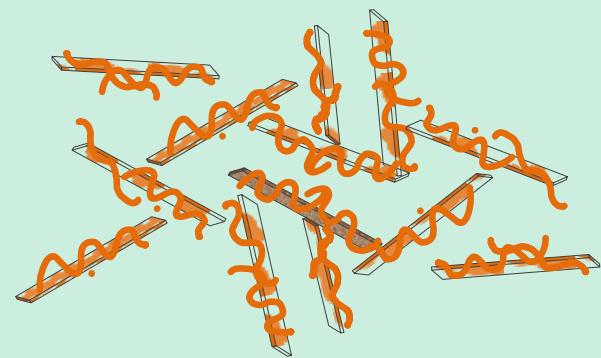


# 2D Hybrid Emulsifier:

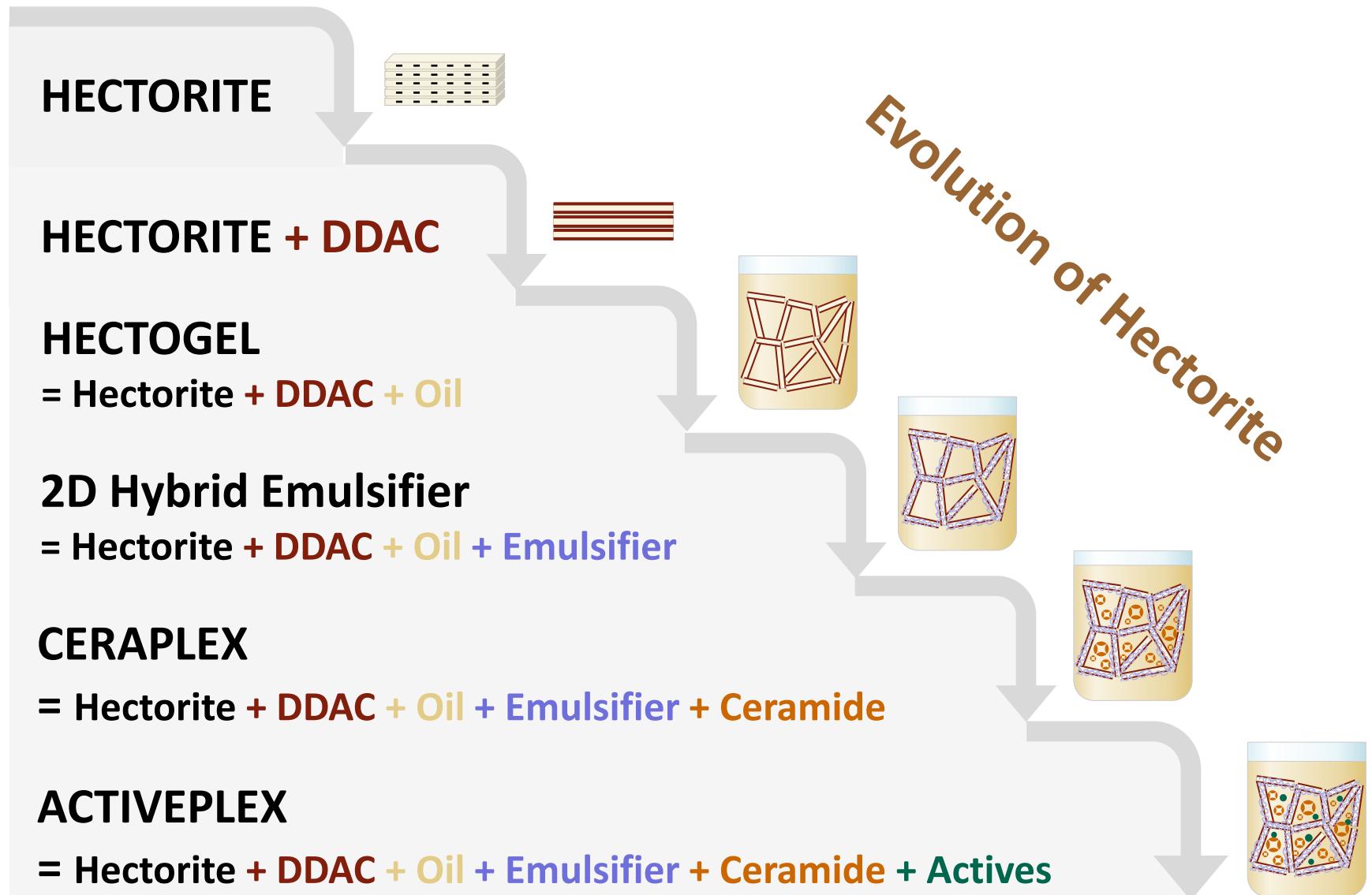
W/O Make up or Stick

Remarkably powerful emulsifier

## MLB



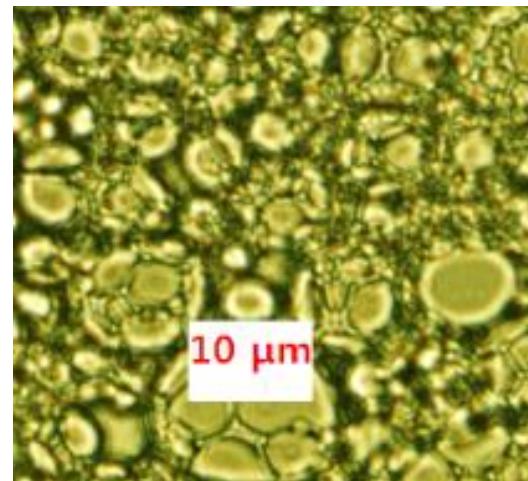
# Hectorite Technologies



# 2D Hybrid Emulsifier:

= Hectorite + DDAC + Oil + Emulsifier

Grade	INCI	Remark
ECODROPGEL	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite	For Silicone Free Water Drop
MLB	Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite	For stable W/O emulsions with good textures
MLB-SD	Dimethicone & Disteardimonium Hectorite & PEG-10 Dimethicone	Non D5



# Stability of emulsions

## Creaming/sedimentation

- Density matters

## Flocculation, coagulation

- Van der Waals force majorly matters

## Coalescence

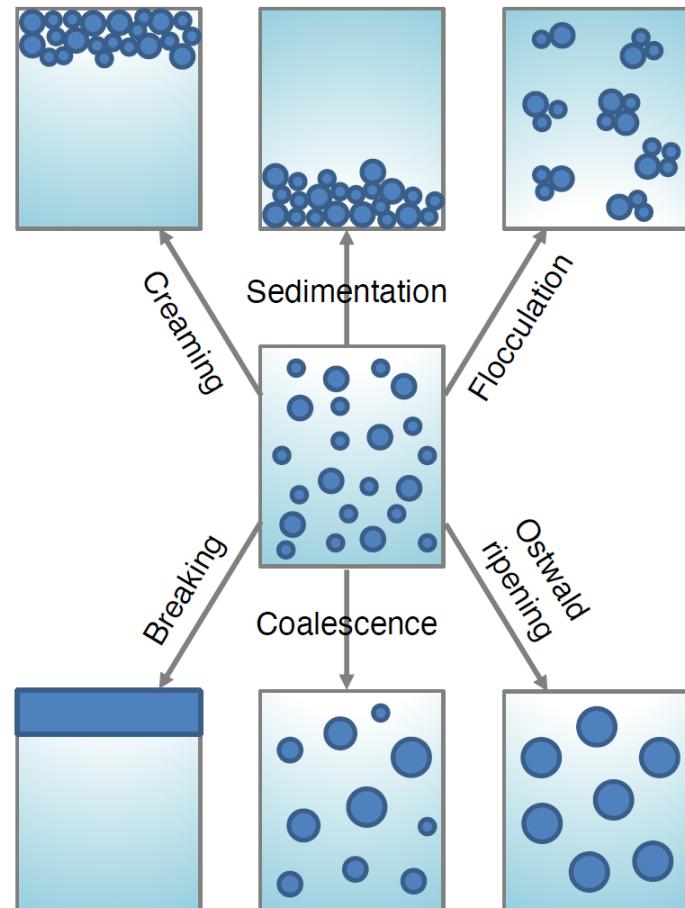
- Merging of two or more droplets into one larger droplet

## Ostwald ripening

- Small drops deposit onto larger drops

## Breaking

- Complete separation of oil and water



# Approaches to stabilize emulsions

## Creaming

- Density matching
- Increase in viscosity of continuous phase (Stoke's equation)

## Coagulation (and flocculation)

- Increase in zeta potential or lowering of ionic strength, thus enhancing EDL repulsion
- Increase in Debye length

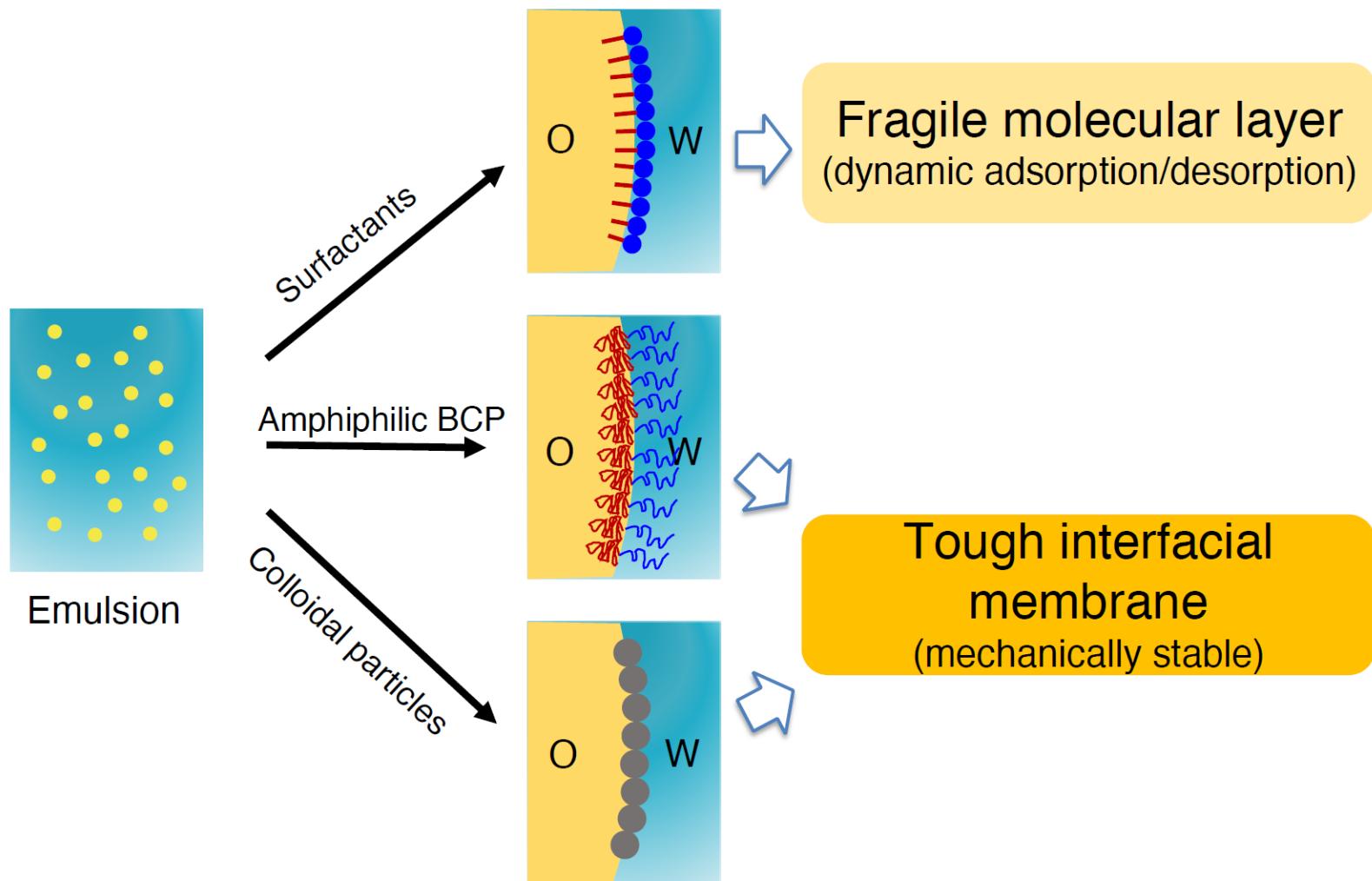
## Coalescence

- Adsorption of long hydrophilic chains, so increasing hydrodynamic radius
- Formation of rigid surfactant layer (combination of surfactants with proper HLB)
- Formation of viscoelastic interfaces (*i. e.*, use of polymeric surfactants)
- Solidification of interface with LC and gel structures

## Ostwald ripening

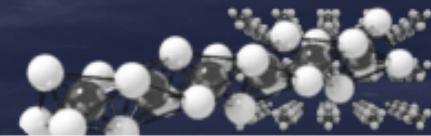
- Preparation of uniform-sized emulsion drops
- Use of oils with low solubility in water

# Design of emulsion interface

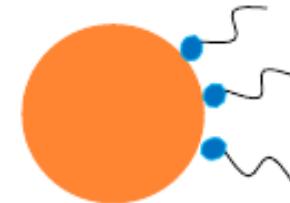
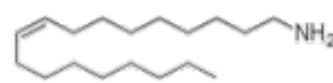


## DESIGN OF DISPERSION SYSTEM

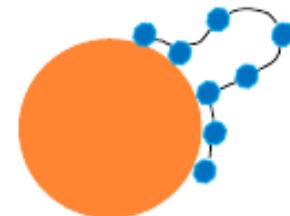
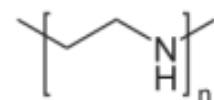
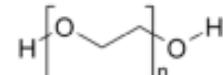
### Dispersant structure



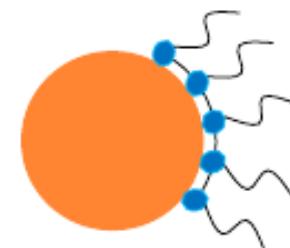
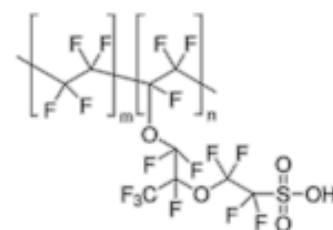
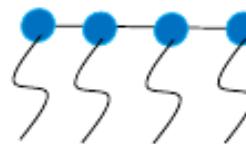
Single



Chain



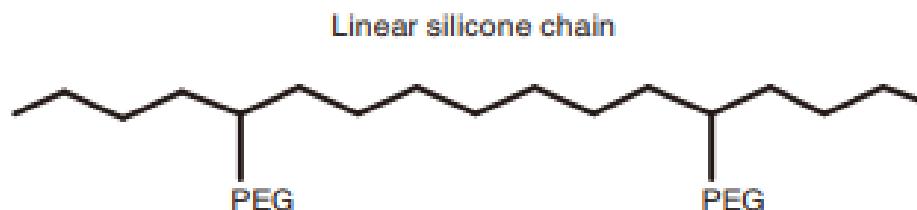
Comb



# Silicone Emulsifiers Comb-like

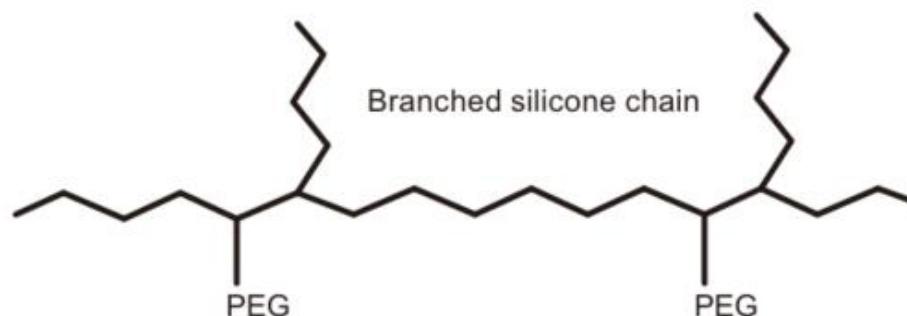
KF 6017:

PEG-10 Dimethicone



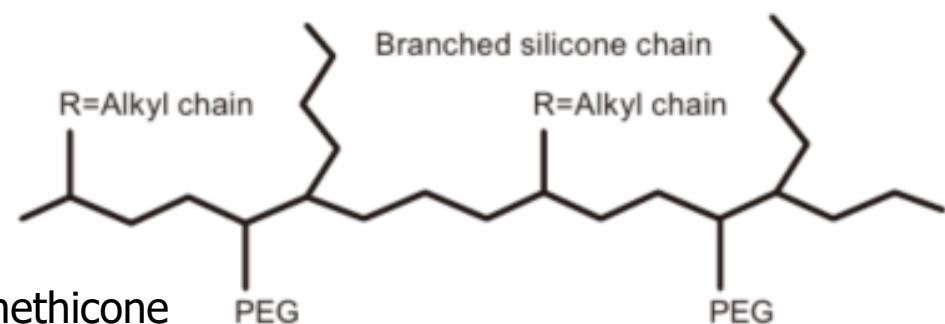
KF 6028:

PEG-9 Polydimethylsiloxyethyl Dimethicone

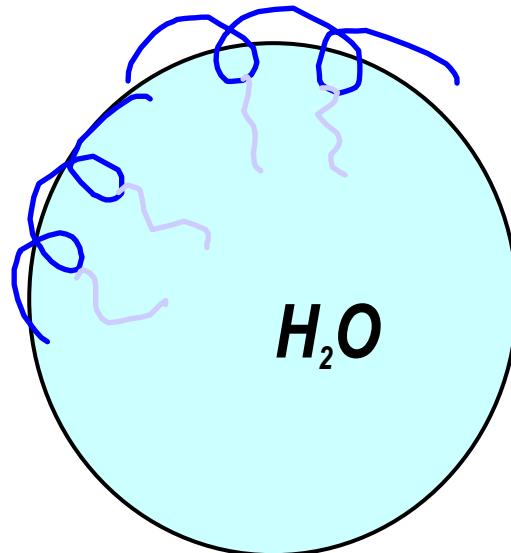


KF 6038:

Lauryl PEG-9 Polydimethylsiloxyethyl Dimethicone



# Silicone emulsifier, Comb-like

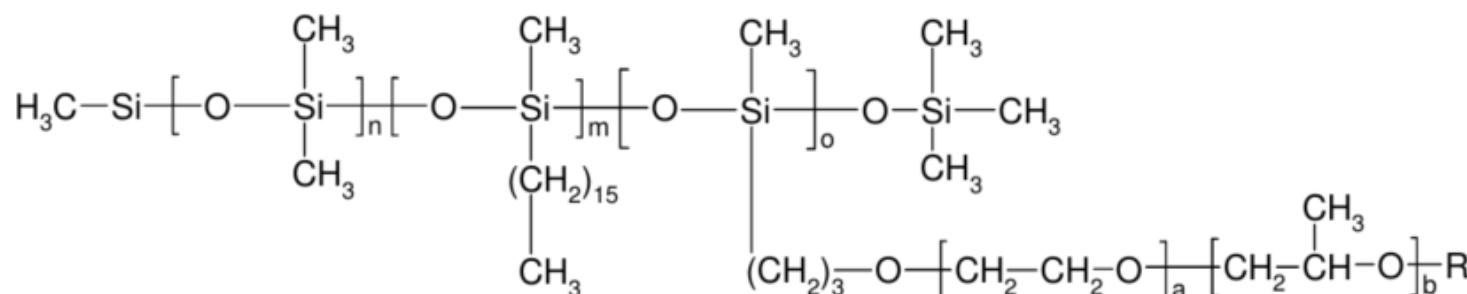


*Polyether:*

*Silicone:*

- Molecular structure allows optimal orientation at water/oil interface
- Emulsifier Lowers interfacial tension
- Forms boundary barrier, providing stability
- Smoothes out gradient between phases

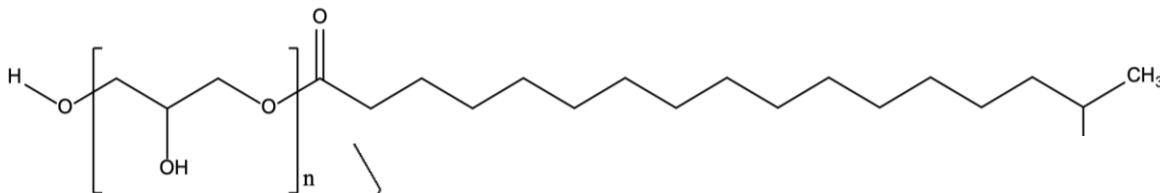
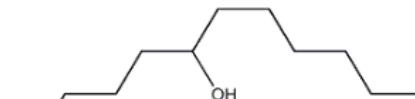
*Polymer structure allows stabilization  
at low emulsifier content*



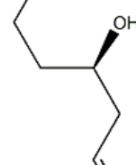
# Silicone Emulsifier Alternatives



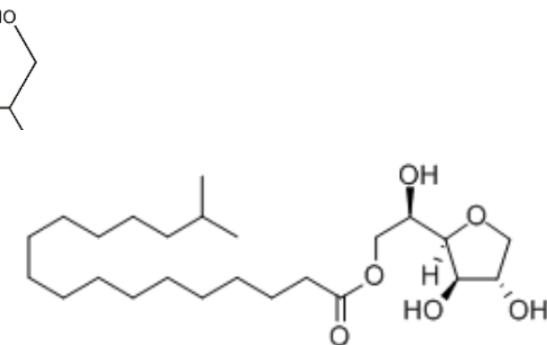
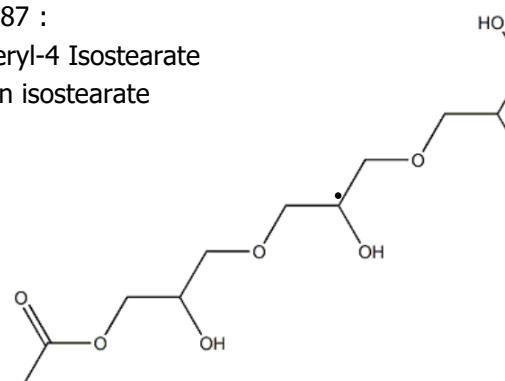
DEHYMULS PGPH :  
Polyglyceryl-2 Dipolyhydroxystearate  
BASF



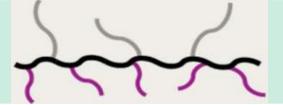
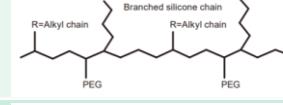
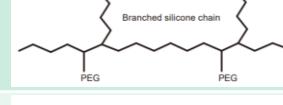
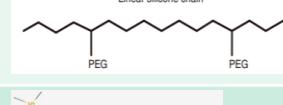
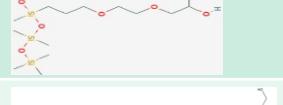
Isolan GI 34 :  
Polyglyceryl-4 Isostearate  
EVONIK



Radia 7887 :  
Polyglyceryl-4 Isostearate  
& Sorbitan isostearate  
OLEON



# W/O emulsifiers

	Emulsion Stability	Feel	INCI	
Product "A"	4	1	Cetyl PEG/PPG-10/1 Dimethicone	
Product "K"	3.5	3	Lauryl PEG-9 Polydimethylsiloxylmethylethyl Dimethicone	
Product "K"	3	3	PEG-9 Polydimethylsiloxylmethylethyl Dimethicone	
Product "K"	2.5	3	PEG-10 Dimethicone	
Product "D"	2	4	PEG/PPG-18/18 Dimethicone	
Product "I"	4	2	Polyglyceryl-4 Isostearate	

**Emulsion stability inversely proportional to Feel**

- 1 Very Bad
- 2 Bad
- 3 OK
- 4 Good
- 5 Excellent

# More emulsifiers, More sticky

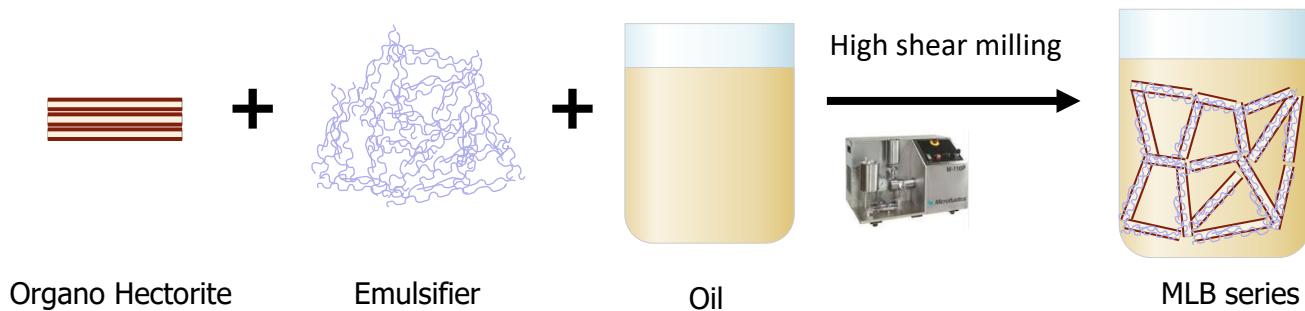


<https://youtu.be/OxgX6g1QzBQ>

# MLB : 2D Hybrid Emulsifier for W/O

= Hectorite + DDAC + Oil + Emulsifier

Grade	Emulsion Stability	Feel	INCI	Remark
MLB	5	5	Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite	For stable W/O emulsions with good textures
MLB-SD	5	5	Dimethicone & Disteardimonium Hectorite & PEG-10 Dimethicone	Non D5



- 1 Very Bad
- 2 Bad
- 3 OK
- 4 Good
- 5 Excellent

# MLB means..

## Less emulsifiers, Less sticky



<https://youtu.be/OxgX6g1QzBQ>

# Stability issue



**Separation & color pigments floating in low viscosity liquid foundation is commonly occurs**

# **How can we make Very Stable W/O formula?**



Add more emulsifier?

Add Auxiliary emulsifier?

Increase oil phase viscosity?

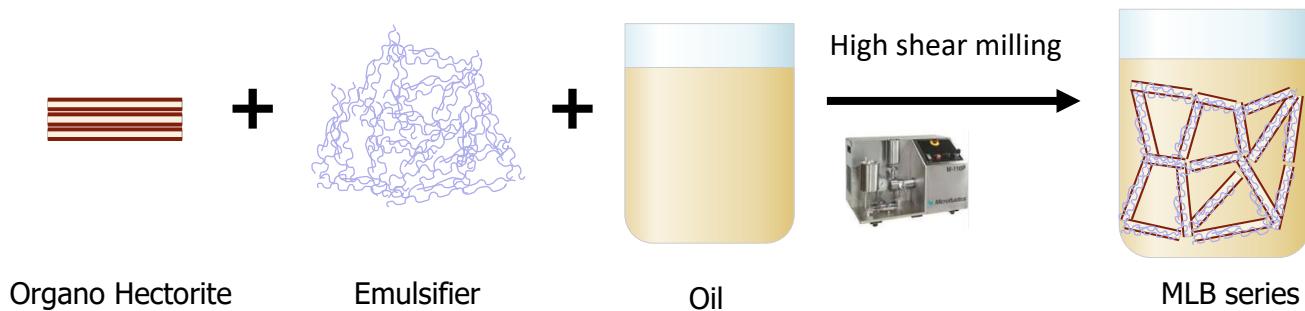
Lower water phase %?

Sponge cushion?

# MLB : 2D Hybrid Emulsifier for W/O

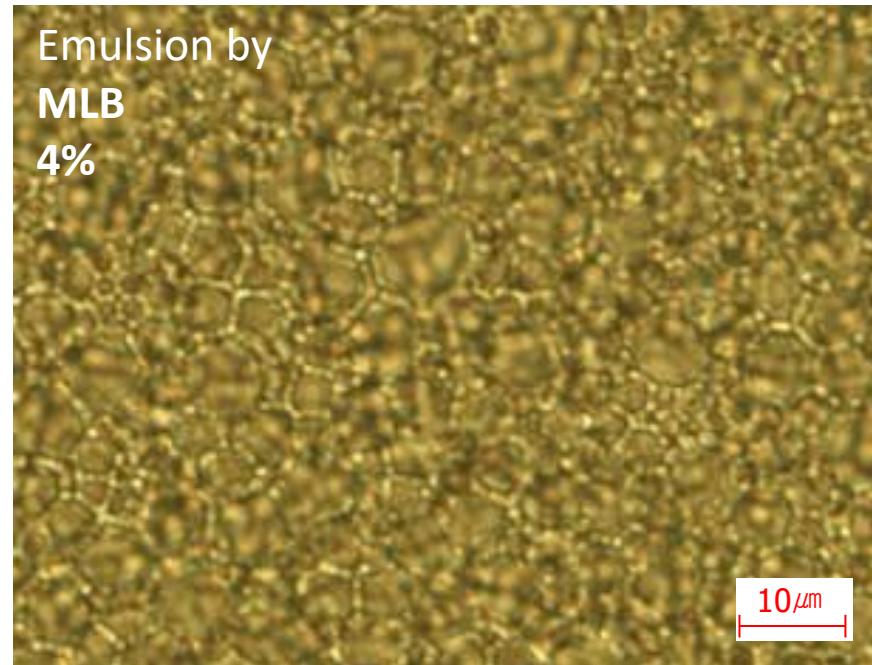
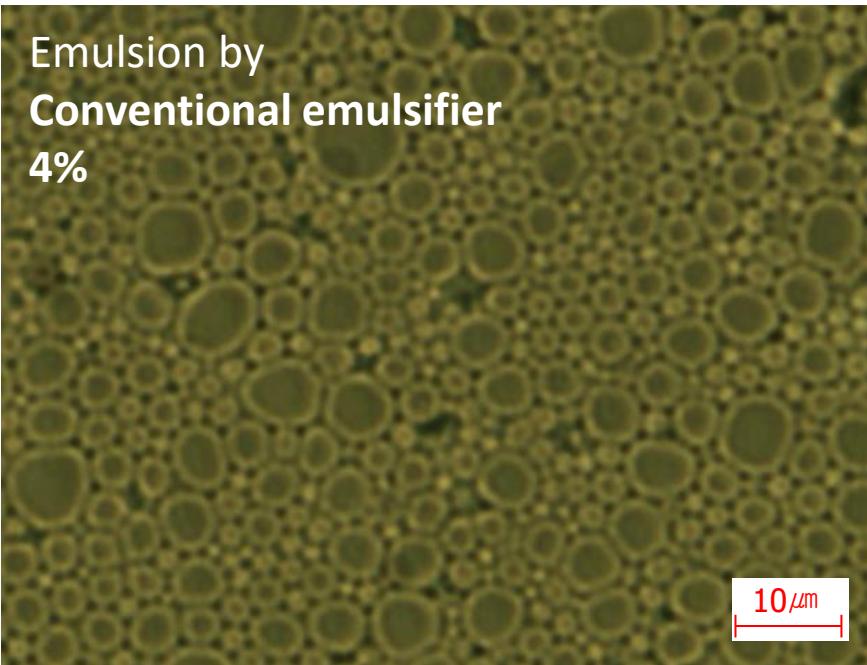
= Hectorite + DDAC + Oil + Emulsifier

Grade	Emulsion Stability	Feel	INCI	Remark
MLB	5	5	Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite	For stable W/O emulsions with good textures
MLB-SD	5	5	Dimethicone & Disteardimonium Hectorite & PEG-10 Dimethicone	Non D5



- 1 Very Bad
- 2 Bad
- 3 OK
- 4 Good
- 5 Excellent

# Emulsion droplet under microscope



**Multigonal** structure by  
MLB prevents flocculation of  
droplet

# Why do I need this mixture?

- Emulsifying test
- Separation test using less emulsifier
- Stickiness test

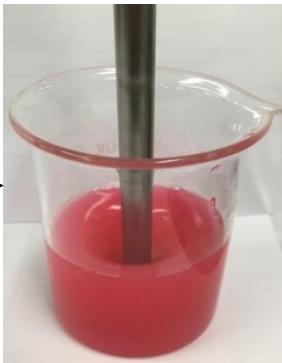
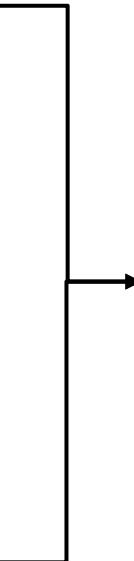


# Emulsifying Test Method

water phase:



60% of D.I. Water +CI 16185 0.1% sol. 0.4%



Oil phase

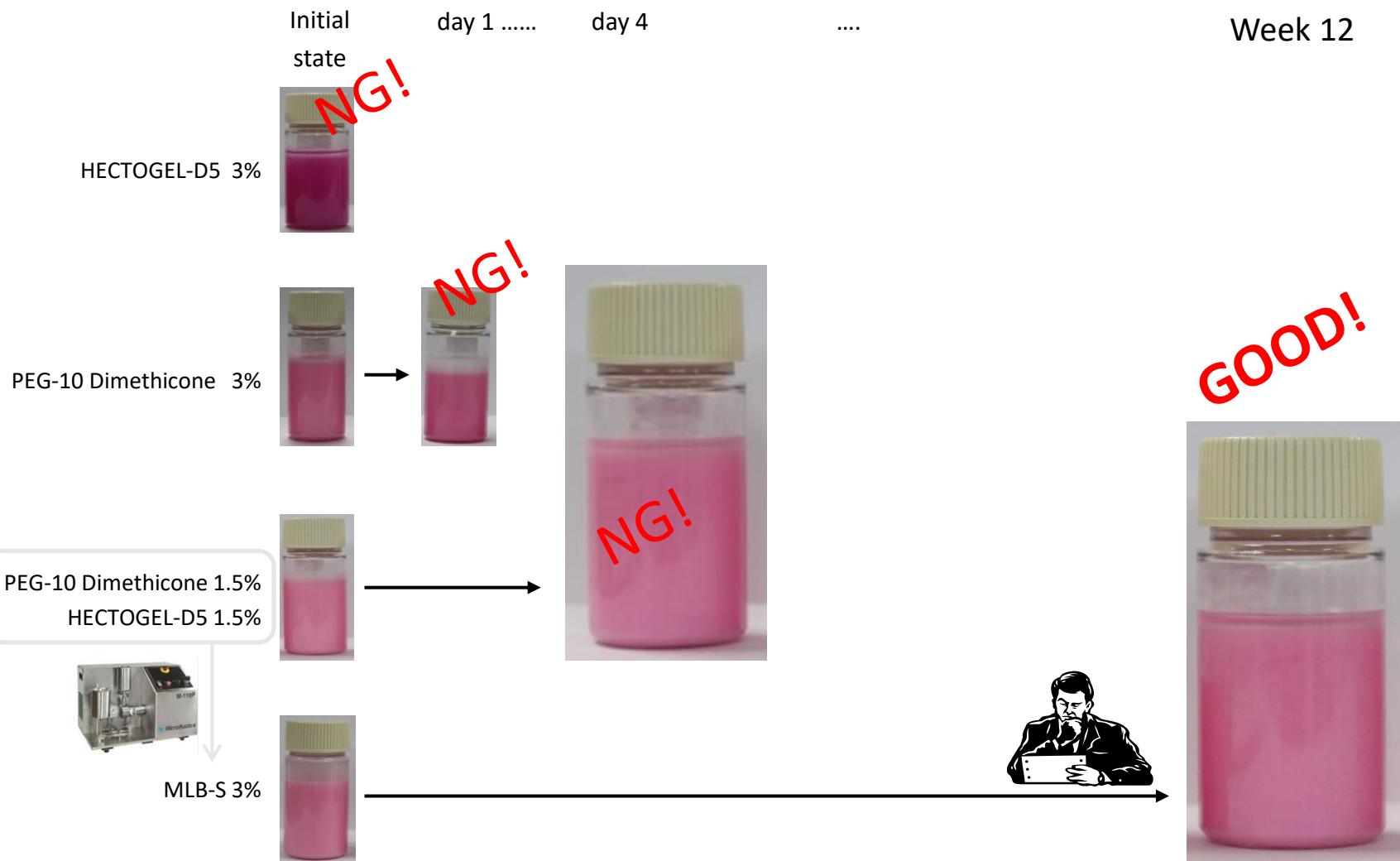


Mix with 37% of D5 and  
3% Hectorite Gel or  
3% PEG-10 Dimethicone or  
1.5% Hectorite Gel + 1.5% PEG-10 Dimethicone or  
3% MLB-S

*Stirring 600-700 rpm  
10 mins.*

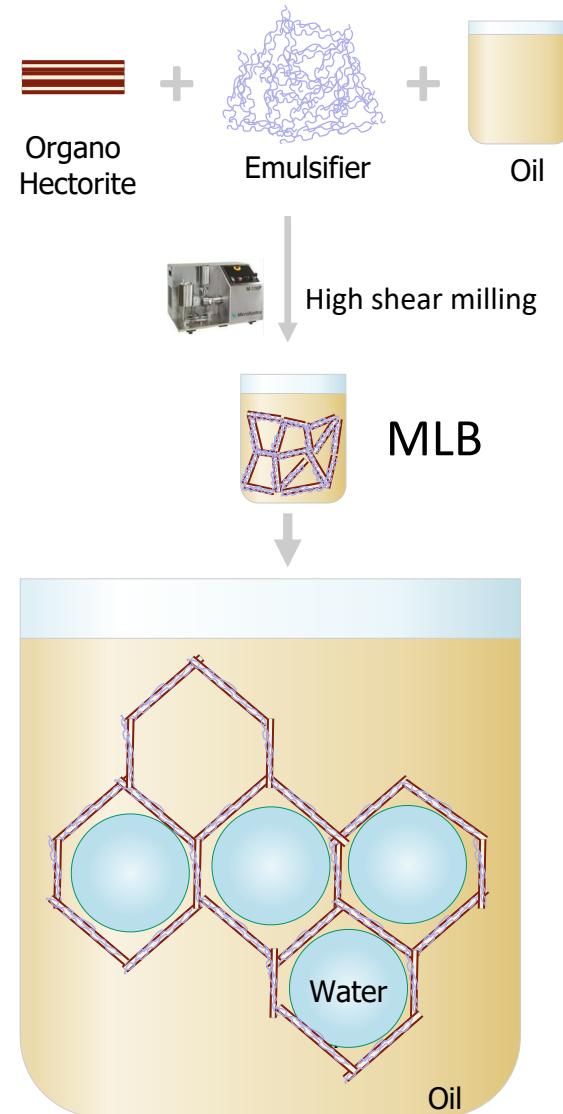
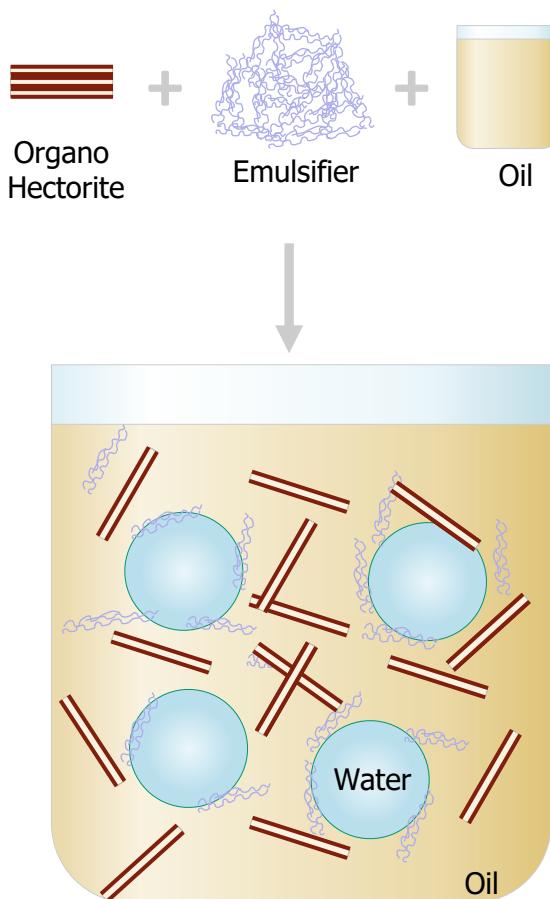
*Keeping at 45 °C*

# Emulsifying Test Results @ 45 °C



\*D5 : Cyclopentasiloxane

# How stabilizing emulsion?



# Case Studies

# Color pigment separation test

## in Silicone Base formula

Tested formula

Phase	Product Name	#1	#2
A	Emulsifiers	5	5
	Hectogel-D5	-	3
	Cyclopentasiloxane	20	20
	AS Treated Color Base	10	10
B	Water	58	55
	1,3-B.G	6	6
	NaCl	1	1

Tested Emulsifiers		
Test 1	KF-6017	PEG-10 Dimethicone
Test 2	KF-6038	Lauryl PEG-9 Polydimethylsiloxyethyl Dimethicone
Test 3	MLB-S	PEG-10 Dimethicone (and) Cyclopentasiloxane (and) Disteardimonium Hectorite

# Silicone Base Formula



KF-6017 5%	KF-6017 5% Hectogel-D5 3%	KF-6038 5%	KF-6038 5% Hectogel-D5 3%	MLB-S 5%
viscosity	16,400	21,600	14,400	19,800

## Test Condition

1 day after @ room temperature

# Color pigment separation test

## in Natural oil Base formula

Tested formula

Phase	Product Name	#1	#2
A	Emulsifiers	5	5
	Hectogel-CCTG		3
	Coco-Caprylate/Caprate	20	20
	Cetyl Alcohole Treated Color Base	10	10
B	Water	58	55
	1,3-B.G	6	6
	NaCl	1	1

Tested Emulsifiers		
Test 1	ISOLANG I 34	Polyglyceryl-4 Isostearate
Test 2	Radia-7887	Polyglyceryl-3 Polyricinoleate, Sorbitan Isostearate
Test 3	MLB	Polyglyceryl-4 Isostearate, Coco-Caprylate/Caprate, Polyglyceryl-3 Polyricinoleate, Sorbitan Isostearate, Disteardimonium Hectorite

# Natural oil Base Formula



GI 34 5%

GI-34 5%  
Hectogel-CCTG 3%

RAIDA 7887 5%

RADIA-7887 5%  
Hectogel-CCTG 3%

MLB 5%

viscosity

Oil separated

Oil separated

14,800

16,100

14,300

## Test Condition

1 day after @ room temperature

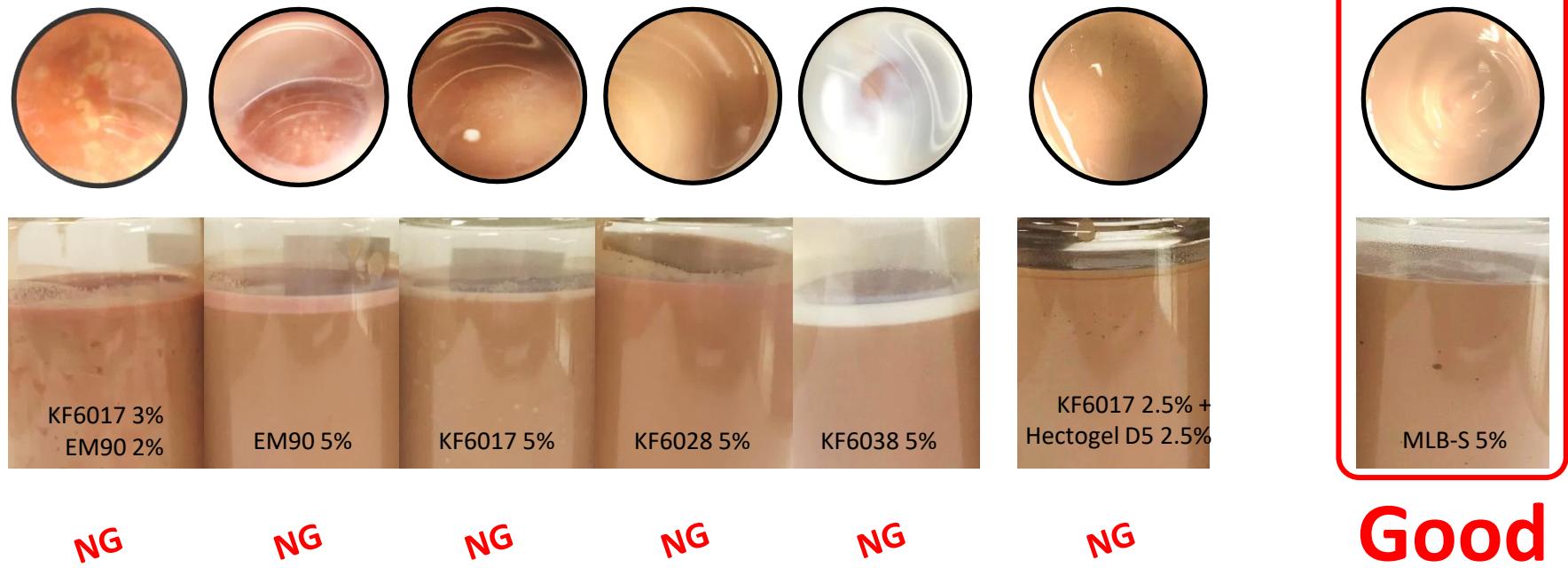
# Color pigments separation tested Cushion BB formula

Part	Product Name	%
A	D.I Water	37
	2,3 BG	7
	NaCl	1
B	Emulsifiers	5
	KF-995	13
	Cetiol CC	4
	Parsol MCX	5
	10cs	3
	ININ	5.5
D	TX-85	7.1
	T80-AS	7.1
	SUNIOY-AS	1.3
	SUNIOR-AS	0.4
	SUNIOB-AS	0.2
	SUNTALC-AS	1.7
	SUNTITAN-AS	1.7

Tested Emulsifiers		
Test 1	KF-6017	3%
	ABIL EM90	2%
Test 2	ABIL EM90	
Test 3	KF-6017	
Test 4	KF-6027	
Test 5	KF-6038	
Test 6	KF-6017	2.5%
	HECTOGEL-D5	2.5%
Test 7	MLB-S	

\* Viscosity : around 4,000cps

# Color pigment separation test in BB Cushion



Test Condition :

- @ 45°C for 2 months
- BB cushion viscosity : 4,000cps

# Stickiness test



KF6017 3%  
EM90 2%

EM90 5%



KF6017 5%



KF6028 5%



KF6038 5%



KF6017 2.5% +  
Hectogel D5 2.5%

MLB-S 5%



**Good**

Test method



# **Case Study: Sun Cream**

# W/S Sun Cream Tested Formula

Part	Product Name	INCI Name	Emulsifier	Hectogel-D5 + KF-6017	MLB-S
A	D.I Water	Water	39.2	39.2	39.2
	2,3 BG	Butylene Glycol	5.0	5.0	5.0
	NaCl	Sodium Chloride	1.0	1.0	1.0
	Optiphen	Phenoxyethanol	0.5	0.5	0.5
B	KF 6017	PEG-10 Dimethicone	3.0	1.75	-
	ABIL EM 90	Cetyl PEG/PPG-10/1 Dimethicone	2.0	-	-
	Hectogel-D5	Disteardimonium Hectorite	-	3.25	-
	MLB-S	Cyclopentasiloxane & PEG-10 Dimethicone & Disteardimonium Hectorite	-	-	5.0
	KF-995	Cyclopentasiloxane	15.0	15	15.0
	KSG16	Dimethicone/Vinyl Dimethicone crosspolymer	3.0	3.0	3.0
	Tegosoft DEC	Diethylhexyl Carbonate	6.0	6.0	6.0
	Cetiol CC	Dicaprylyl Carbonate	3.0	3.0	3.0
	Parsol MCX	Ethylhexyl Methoxycinnamate	7.5	7.5	7.5
	Parsol EHS	Ethylhexyl Salicylate	2.5	2.5	2.5
	TX-85	Titanium Dioxide & Silica & Dimethicone	5.0	5.0	5.0
	SUNZnO-NAS	Zinc Oxide & Triethoxycaprylylsilane	5.0	5.0	5.0
C	SUNPMMA-COCO170	Methyl Methacrylate Crosspolymer	2.0	2.0	2.0
	Fragrance	Fragrance	0.3	0.3	0.3

# W/S Sun Cream Test Results @ 45 °C

	Initial state	day 1 ...	1 week .....	3 week .....	6 week
KF-6017 3.0% ABIL EM 90 2.0%					 NG!
Hectogel D5 3.25% PEG-10 Dimethicone 1.75%				 NG!	
MLB-S 5.0%					 OK!

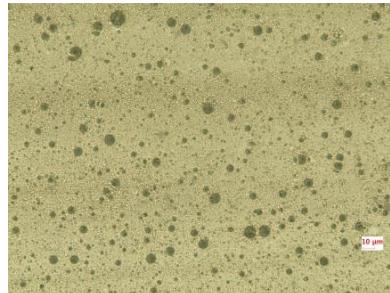
# State of dispersion: Sun Cream

x200

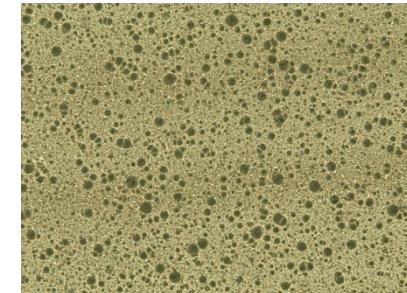
*Samples keeping @ 45 °C*

Initial State

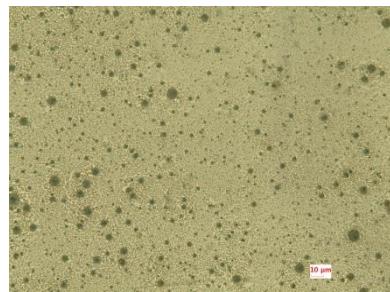
KF-6017 3.0%  
ABIL EM 90 2.0%



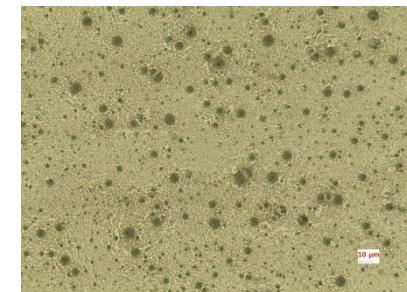
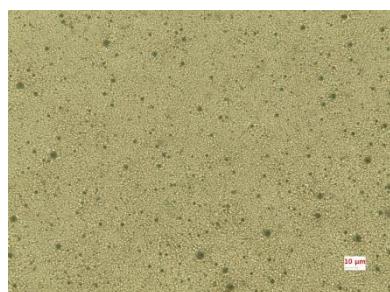
1 week



Hectogel D5 3.25%  
PEG-10 Dimethicone 1.75%



MLB-S 5.0%

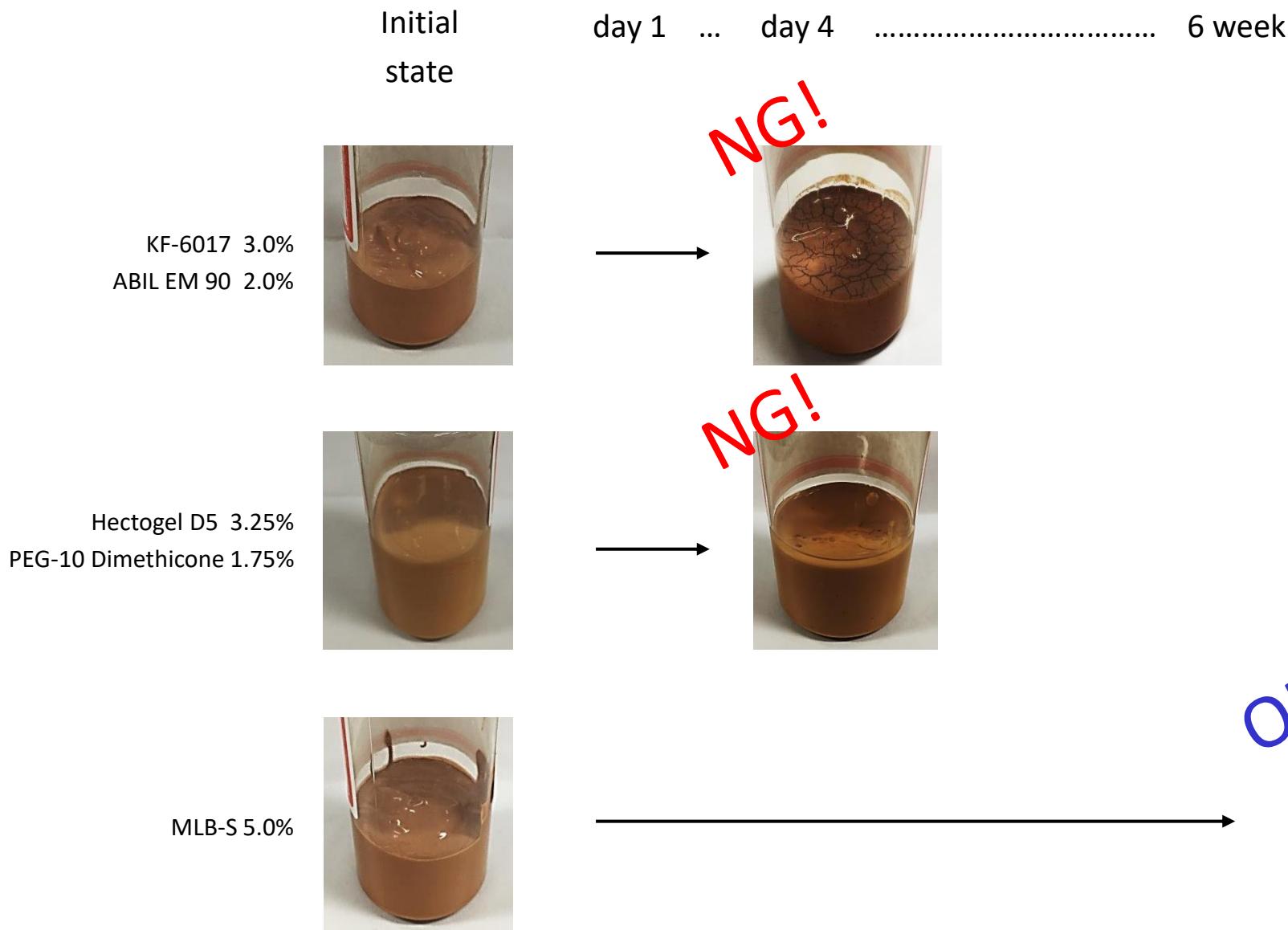


# **Case Study: BB Cream**

# W/S BB Cream Tested Formula

Part	Product Name	INCI Name	Emulsifier	Hectogel-D5 + KF-6017	MLB-S
A	D.I Water	Water	37.0	37.0	37.0
	2,3 BG	Butylene Glycol	7.0	7.0	7.0
	NaCl	Sodium Chloride	1.0	1.0	1.0
B	KF-6017	PEG-10 Dimethicone	3.0	1.75	-
	ABIL EM90	Cetyl PEG/PPG-10/1 Dimethicone	2.0	-	-
	Hectogel-D5	Disteardimonium Hectorite & Cyclopentasiloxane	-	3.25	-
	MLB-S	Cyclopentasiloxane & PEG-10 Dimethicone & Disteardimonium Hectorite	-	-	5.0
	KF-995	Cyclopentasiloxane	10.0	10	10.0
	Cetiol CC	Dicaprylyl Carbonate	4.0	4.0	4.0
	Parsol MCX	Ethylhexyl Methoxycinnamate	5.0	5.0	5.0
	10cs	Dimethicone	3.0	3.0	3.0
	ININ	Isononyl isononanoate	5.5	5.5	5.5
D	KSG16	Dimethicone/Vinyl Dimethicone crosspolymer	3.0	3.0	3.0
	TX-85	Titanium Dioxide & Silica & Dimethicone	7.1	7.1	7.1
	T80-AS	Silica & Titanium Dioxide & Triethoxycaprylylsilane	7.1	7.1	7.1
	SUNIOY-AS	Iron Oxide & Triethoxycaprylylsilane	1.3	1.3	1.3
	SUNIOR-AS	Iron Oxide & Triethoxycaprylylsilane	0.4	0.4	0.4
	SUNIOB-AS	Iron Oxide & Triethoxycaprylylsilane	0.2	0.2	0.2
	SUNTALC-AS	Talc & Triethoxycaprylylsilane	1.7	1.7	1.7
	SUNTITAN-AS	Titanium Dioxide & Triethoxycaprylylsilane	1.7	1.7	1.7

# W/S BB Cream Test Results @ 45 °C



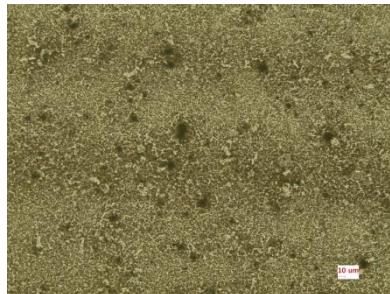
# State of dispersion: BB Cream

x200

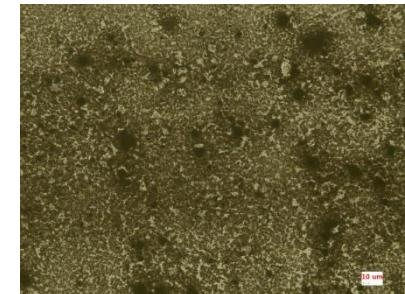
*Samples keeping @ 45 °C*

Initial State

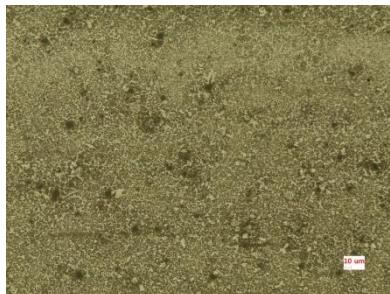
KF-6017 3.0%  
ABIL EM 90 2.0%



1 week



Hectogel D5 3.25%  
PEG-10 Dimethicone 1.75%



MLB-S 5.0%



# Innovative 2phase w/O Sticks By MLB

2 phase  
W/O formula



2 phase  
O/W formula



1 phase  
Oil(wax) or  
Water



# Lip Balm

Water Content  
≥47.25%

Hardness gf



SJF-2003 Water Lip Balm with ceraPLEX ver1.1

Phase	Ingredients	INCI Name	%	Maker
A	MLB	Polyglyceryl-4 Isostearate & Coco-Caprylate/Caprate & Disteardimonium Hectorite & Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	6	SUNJIN
	CeraPLEX	Polyglyceryl-4 Isostearate, Squalane, Disteardimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	5	SUNJIN
	RADIA7887	Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	1	
	Cetiol C5C	Coco-Caprylate / Caprate	11	BASF
	Tocopheryl acetate	Tocopheryl acetate	0.2	
	Multi Wax W445	Microcrystalline wax	2	Sonneborn
	Phytowax Olive 12L44	Hydrogenated Lanolin, Olive Esters	4	SEPPIC
	Ceresin #810	Ceresin	2	NIKKO RICA
	Ozokerite Wax SP1020P	Ozokerite	10	S&P
	COSMOL 222	Diisostearyl Malate	4	Nissrin Oilli O
B	water	water	47.25	
	2,3-BDO	2,3-Butanediol	6	GS Caltex
	1,2-Hexanediol	1,2-Hexanediol	1	
	Sensiva SC 50	Dimethylhexylglycerin	0.05	Schülke
	NaCl	Sodium chloride	0.5	

Water Emulsion Stick A1.25%

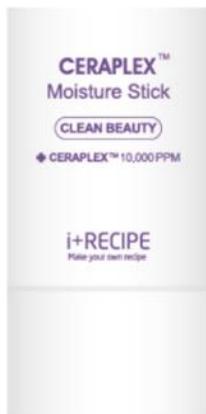
# Moisture Stick with ceraPLEX

SJF-2002 W/O Moisture Stick with ceraPLEX

New in 2020

Water Content  
>46.05%

Hardness 134.3 gf



Phase	Ingredients	INCI Name	%	Maker
A	MLB	Polyglyceryl-4 Isostearate & Coco-Caprylate/Caprate & Disteardimonium Hectorite & Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	6	SUNJIN
	CeraPLEX	Squalane & Polyglyceryl-4 Isostearate & Disteardimonium Hectorite & Ceramide NP & Phytosterol & Stearic Acid	5	SUNJIN
	RADIA7887	Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	1	
	Cetiol C5C	Coco-Caprylate / Caprate	7.7	BASF
	COSMOL 168ARV	Dipentaerythrityl Hexahydroxystearate/Hexamysteate/Hexarosinate	1	Nisshin oillio
	Bergacare SB	Butyrospermum Parkii Butter	1	Berg+Schmidt
	Ozokerite Wax SP1020P	Ozokerite	13.1	Strahl&Pitsch
	Phytowax Olive 12L44	Hydrogenated Lauryl Olive Esters	1	
	Tocopheryl Acetate	Tocopheryl acetate	0.3	
B	SUNSIL-OLEO LITE 150H	Silica & Cetyl alcohol	3	SUNJIN
	Water	Water	46.05	
	1,3-BG	Butylene Glycol	8	OXEA
	Glycerin	Glycerin	2	
	Sensiva SC50	Ethylhexylglycerin	0.05	Schulke
	AQUA PHYTOPLEX	Myrcene & Canola Oil & Helianthus Annuus Seed Oil & Campanthes alba (Meadowfoam) Seed Oil & Rosa Canina Fruit Oil & Argania Spinosa Kernel Oil & Polyglyceryl-10 Stearate	2	SUNJIN
	1,2-Hexanediol	1,2-Hexanediol	2	
C	NaCl	Sodium chloride	0.5	
	Fragrance	Fragrance	0.3	

Water 46.05%  
Emulsion Stick

# Cica Madeca moisture stick

New in 2019

Phase	Ingredients	INCI Name	%	Maker
A	MLB	Polyglyceryl-4 Isostearate & Coco-Caprylate/Caprate & Disteardimonium Hectorite & Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	11	SUNJIN
	Cetiol C5C	Coco-Caprylate / Caprate	8.7	BASF
	COSMOL 168ARV	Dipentaerythrityl Hexahydroxystearate/Hexaステアレート, Hexarosinate	1	Nisshin oillio
	Tegosoft SH	Stearyl Heptanoate	1	Evonik
	Bergacare SB	Shea Butter	1	Berg+Schmidt
	Ozokerite Wax SP1020P	Ozokerite	14.1	Schahl&Pitsch
	Tocopheryl Acetate	Tocopheryl acetate	0.1	
B	Centelo	Centella Asiatica Leaf Extract	46.05	Biospectrum
	Supercentella	Butylene Glycol & Water & Madecassoside & Asiaticoside & Asiatic acid & Madecassic acid	1	Biospectrum
	Madewhite	Water & Propylene Glycol & Madecassoside	1	Biospectrum
	2,3-BG	Butylene Glycol	8	GS Caltex
	Glycerin	Glycerin	2	
	Sensiva SC50	Ethyhexylglycin	0.05	Schulke
	AQUA Barrier Argan	Glycerin & Argania spinosa kernel oil & Hydrogenated Lecithin	2	SUNJIN
	1,2-Hexanediol	1,2-Hexanediol	2	
	NaCl	Sodium chloride	0.5	
C	Fragrance	Liberty Number CSN024754	0.3	KIMEX



Active Extract  
46.05%  
Emulsion Stick

# W/O Water drop Sun Stick SPF50+ PA4+

Better Transparent  
inorganic filter only

Phase	Ingredients	VER1.0	ver2.0	ZnO only	Maker
A	MLB	4	5	3	SUNJIN
	Parsol MCX	7.5	7.5		DSM
	Parsol EHS	5	5		DSM
	Parsol 340	2.5	3		DSM
	Saboderm AB	6	7		SABO
	SUNCLEAR-Z80HEMI	7.5	7.5	14.87	SUNJIN
	EWG-Z80HEMI			14.87	SUNJIN
	EWGTXD65-HEMI	3.8			SUNJIN
	SUNBEMT-S	2	3		SUNJIN
	Bergacare EM-CO			5.3	
B	RADIA 7207			4.26	
	Ozokerite Wax SP1020P	11	11	11	Strahl&Pitsch
	Phytowax Olive 12-44	5	5		Sophim
C	EDTA-2Na	0.05	0.05	0.1	
	2,3-BG	2	2	2	GS Caltex
	1,2-Hexanediol	1	1	1	
	Sensiva SC50	0.05	0.05	0.05	Schülke Inc.
D	AQUA PHYTOPLEX	2	1	2	SUNJIN
	Water	36.6	35.9	36.55	
D	SUNSIL-OLEO130	4	5		SUNJIN

Water 36%  
Emulsion Stick



# Water Drop BB Stick SPF50 PA4+

2018



SJF-1843 Water Drop BB Stick, **SPF50 PA++++** \_ver1.0

New in 2018

Phase	Ingredients	INCI Name	%	Maker
A	MLB	Polyglyceryl-4 Isostearate & Coco-Caprylate/Caprate & Disteardimonium Hectorite & Polyglyceryl-3 Polyricinoleate & Sorbitan Isostearate	5	SUNJIN
	Parsol MCX	Ethylhexyl Methoxycinnamate	7.5	DSM
	Parsol EHS	Ethylhexyl Salicylate	2	DSM
	Parsol 340	Octocrylene	2.5	DSM
	Saboderm AB	C12-15 Alkyl Benzoate	10	SABO
	Hallbrite BHB	butyloctyl salicylate	5	Hallstar
	Tocopheryl acetate	Tocopheryl acetate	0.2	
	SUNBEMT-S	Bis-Ethylhexyloxyphenol Methoxyphenyl Triazine	5	SUNJIN
	Ozokerite Wax	Ozokerite	8.5	S&P
B	Microcrystalline Wax	Microcrystalline Wax	5.5	Sonneborn
	SUNZnO-NAS	Zinc Oxide & Triethoxycaprylylsilane	5	SUNJIN
	SUNTITAN-AS	Titanium Dioxide & Alumina & Triethoxycaprylylsilane	6.56	SUNJIN
	SUNIOY-AS	Yellow Iron Oxide & Triethoxycaprylylsilane	1.08	SUNJIN
	SUNIOR-AS	Polymer Oxide & Triethoxycaprylylsilane	0.23	SUNJIN
C	SUNIOB-AS	Black Iron Oxide & Triethoxycaprylylsilane	0.13	SUNJIN
	EDTA-2Na	Disodium EDTA	0.1	
	NaCl	Sodium chloride	1	
	1,2-Hexanediol	1,2-Hexanediol	1	
	Sensiva SC 50	Ethyleneglycerin	0.05	Schülke
	2,3-BG	2,3-butanediol	1	GS Caltex
	Water	Aqua	32.65	

Water Emulsion Stick 32.65%

# W/S BB cushion



W/S BB Cushion

Part	Product Name	INCI Name	%
A	D.I Water	Water	37
	2,3 BG	Butylene Glycol	7
	NaCl	Sodium Chloride	1
B	MLB-S	Cyclopentasiloxane & PEG-10 Dimethicone & Disteardimonium Hectorite	5
	KF-995	Cyclopentasiloxane	13
	Cetiol CC	Dicaprylyl Carbonate	4
	Parsol MCX	Ethylhexyl Methoxycinnamate	5
	10cs	Dimethicone	3
	ININ	Isononyl isononanoate	5.5
C	TX-85	Titanium Dioxide & Silica & Dimethicone	7.1
	T80-AS	Silica & Titanium Dioxide & Triethoxycaprylylsilane	7.1
	SUNIOY-AS	Iron Oxide & Triethoxycaprylylsilane	1.3
	SUNIOR-AS	Iron Oxide & Triethoxycaprylylsilane	0.4
	SUNIOB-AS	Iron Oxide & Triethoxycaprylylsilane	0.2
	SUNTALC-AS	Talc & Triethoxycaprylylsilane	1.7
	SUNTITAN-AS	Titanium Dioxide & Triethoxycaprylylsilane	1.7

# 5. Ceraplex:

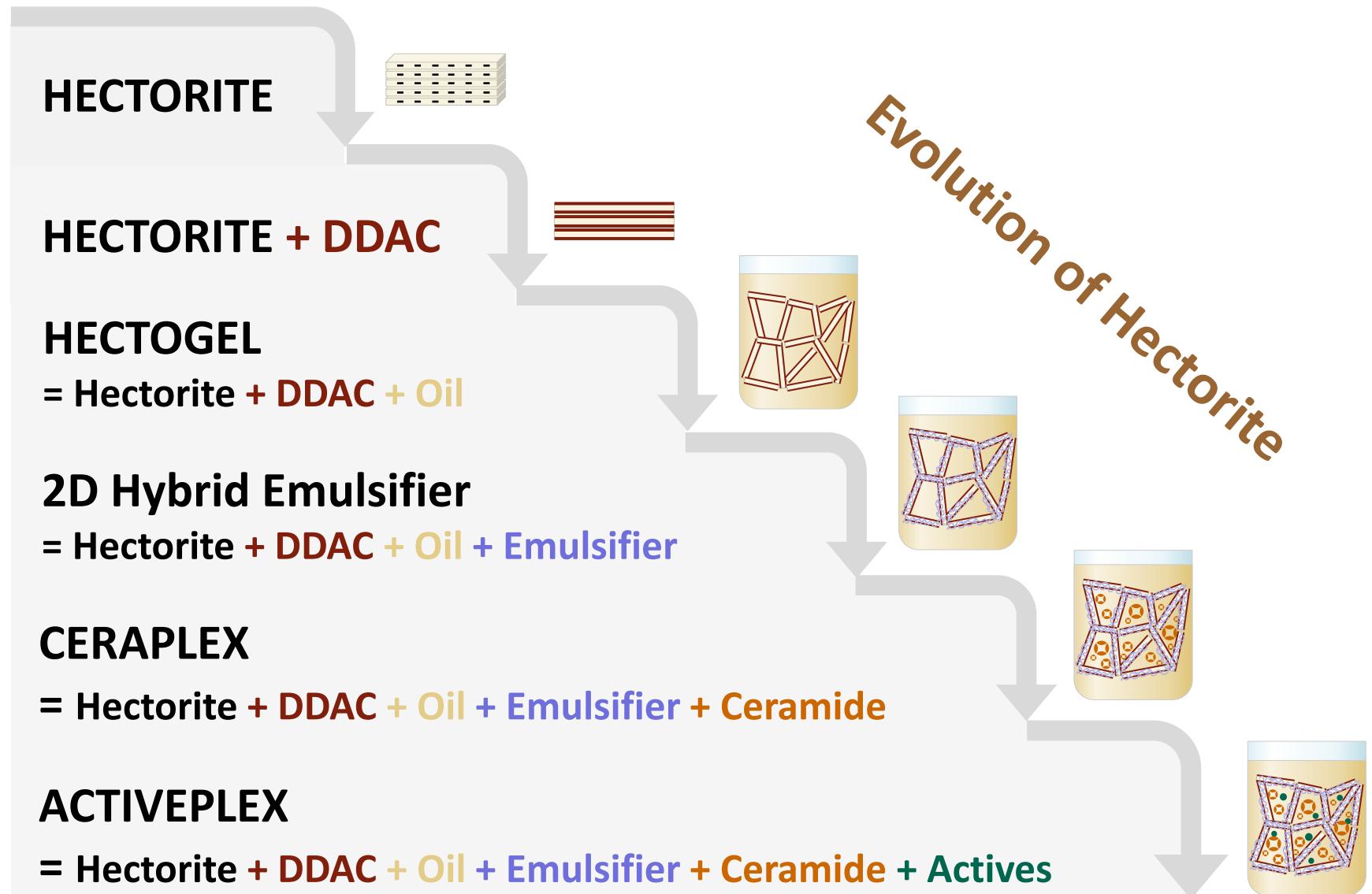
**CERAPLEX**

= Hectorite + DDAC + Oil + Emulsifier + Ceramide

More Actives

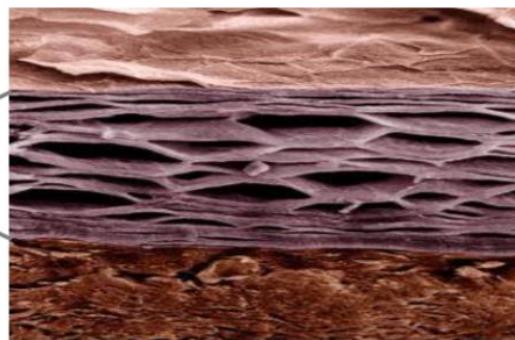
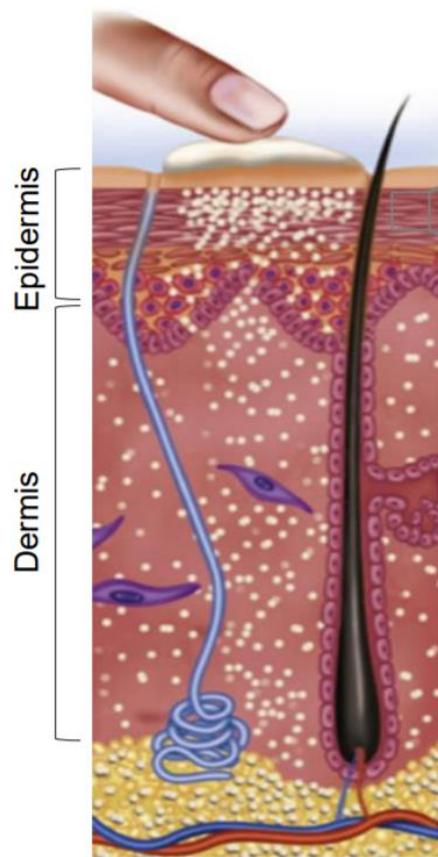


# Hectorite Technologies

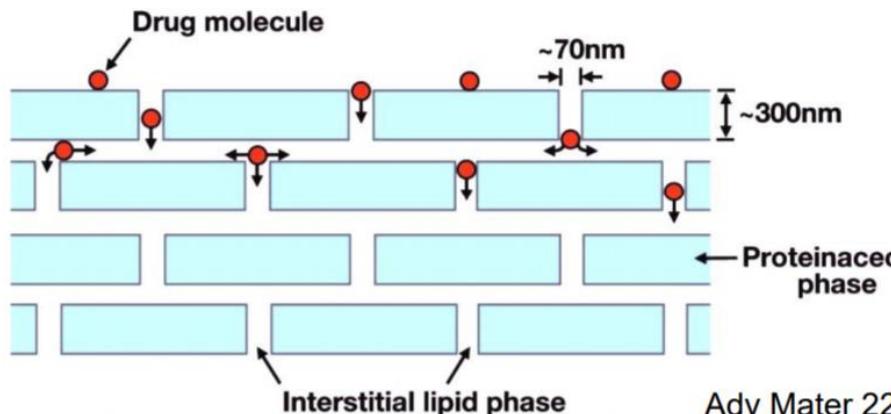
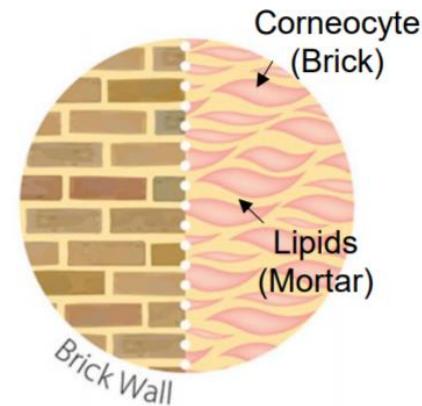


# Stratum Corneum

**Stratum corneum (SC):** protecting an epidermal barrier against trans-epidermal water loss as well as protection against environmental irritants

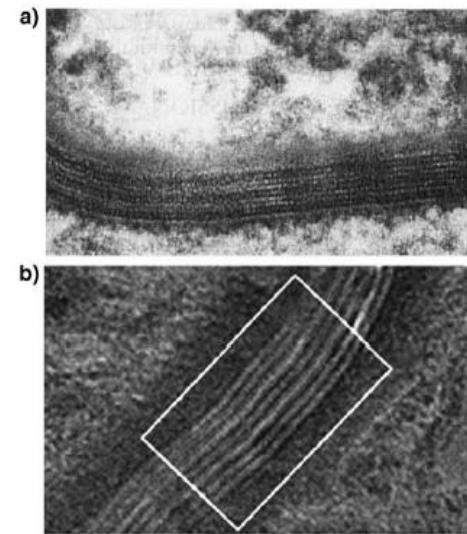
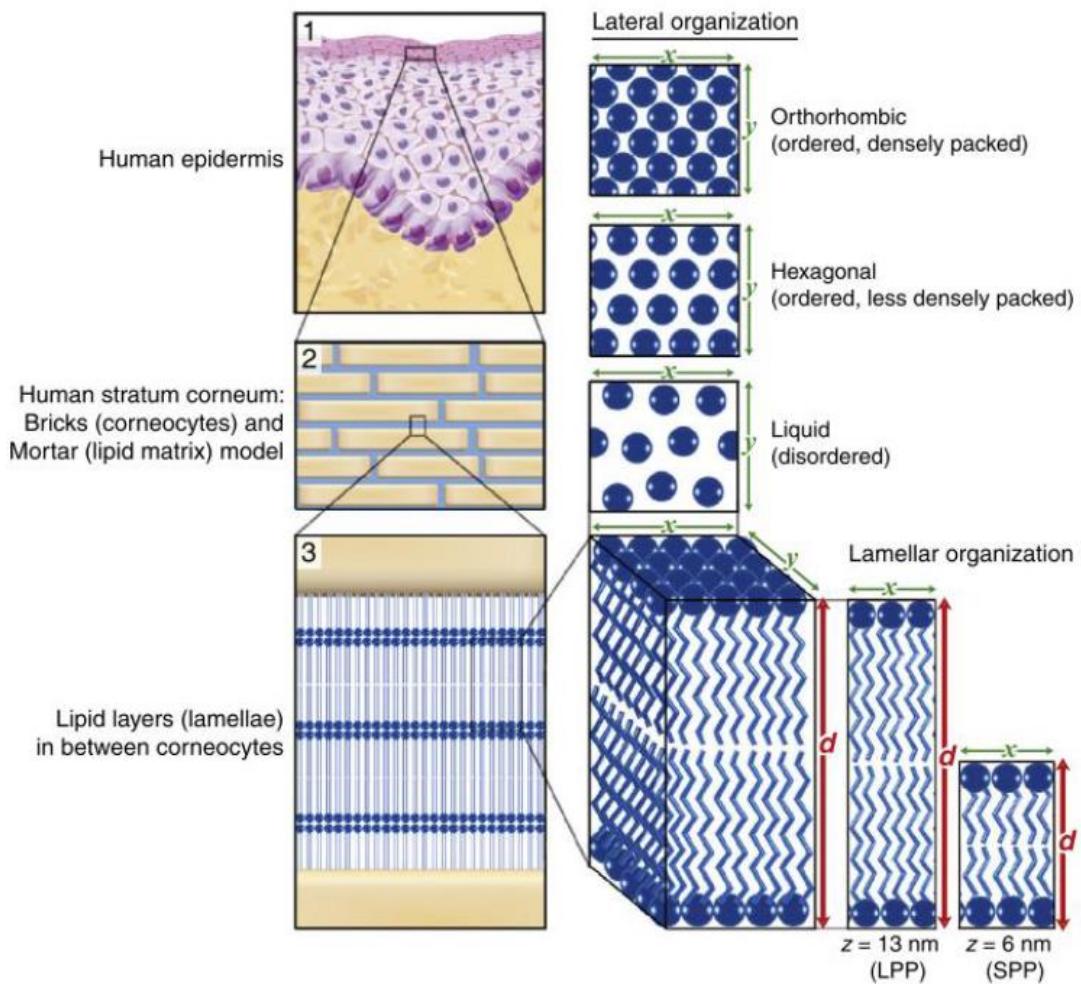


Stratum corneum



Adv Mater 22, 739 (2010)

# Stratum Corneum



## Intercellular lipids

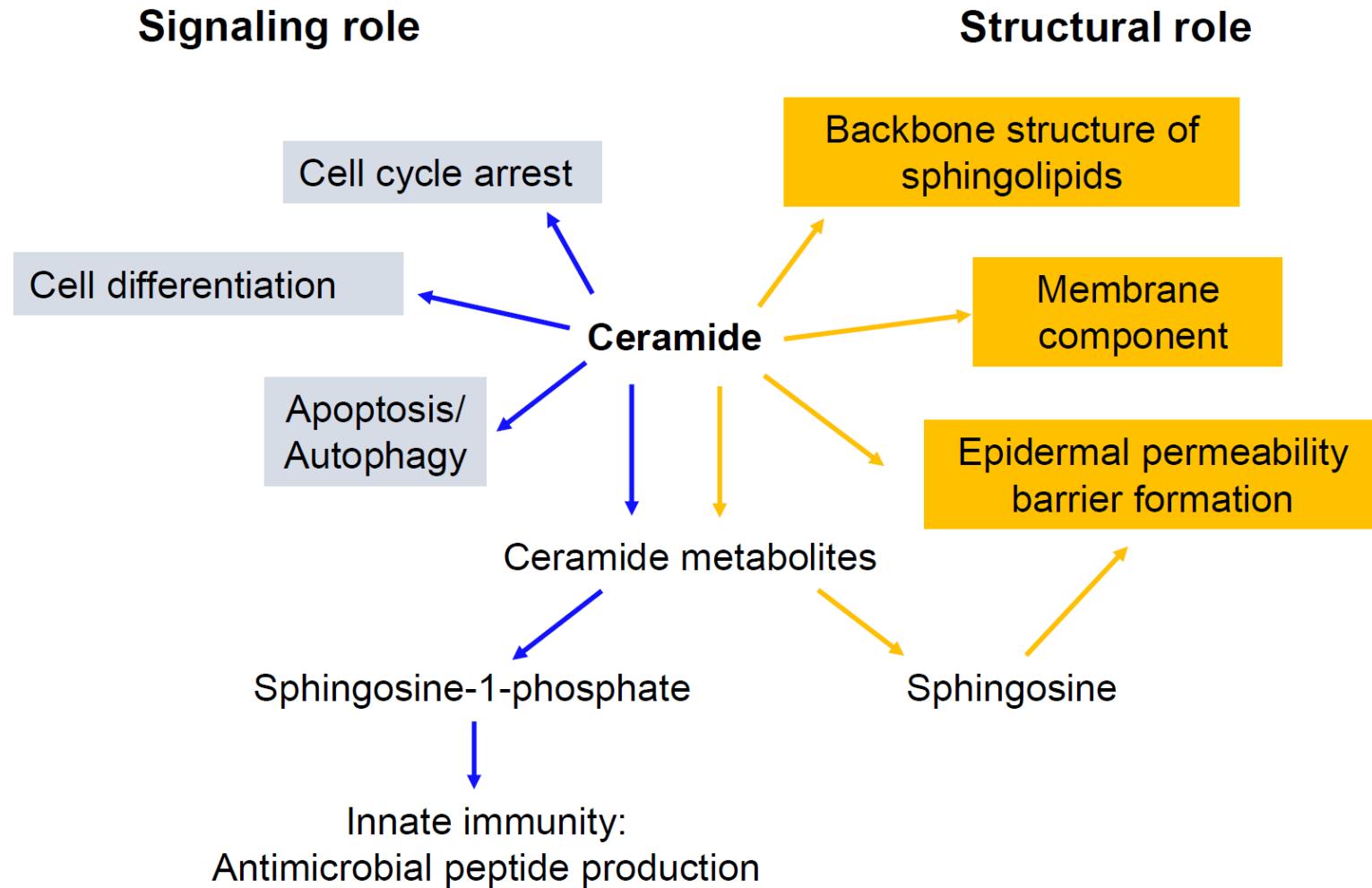
- Ceramide > 40%
- Cholesterol: 25%
- Free fatty acid: 25%

J. van Smeden et al., *Biochimica et Biophysica Acta* 1841 (2014) 295–313

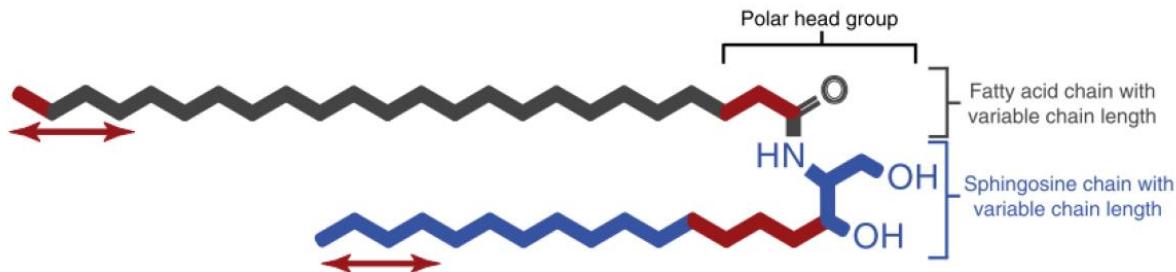
# Ceramide

- Ceramides can be naturally found in the SC.
- They are the most important structural elements of the intercellular lipids, which are necessary to link the protein-rich corneocytes into **a waterproof barrier** that is capable of protecting the underlying skin tissues and regulating body homeostasis.
- Ceramides are **orderly arranged in lamellar form** to act as a membrane and fill the intercellular space in the SC.
- They function to help maintain the integrity of the skin barrier.
- It has been shown that ceramides applied externally, in the form of moisturizers, can effectively **reduce dry skin symptoms**.

# Role of Ceramides



# Ceramide Structures



Sphingoid base moiety	Fatty acid moiety	[N]	[A]	[EO]	
[S]	Sphingosine				
[dS]	Dihydrosphingosine (sphinganine)				
[P]	Phytosphingosine				
[H]	6-hydroxy-sphingosine				
<b>[NS], Cer 2</b> 7.4%		<b>[AS], Cer 5</b> 9.6%		<b>[EOS], Cer 1</b> 6.5%	
<b>[NdS], Cer 10</b> 9.8%		<b>[AdS], Cer 11</b> 1.6%		<b>[EOdS]</b> 0.4%	
<b>[NP], Cer 3</b> 22.1%		<b>[AP], Cer 6</b> 8.8%		<b>[EOP], Cer 9</b> 1.1%	
<b>[NH], Cer 8</b> 14.5%		<b>[AH], Cer 7</b> 10.8%		<b>[EOH], Cer 4</b> 4.3%	

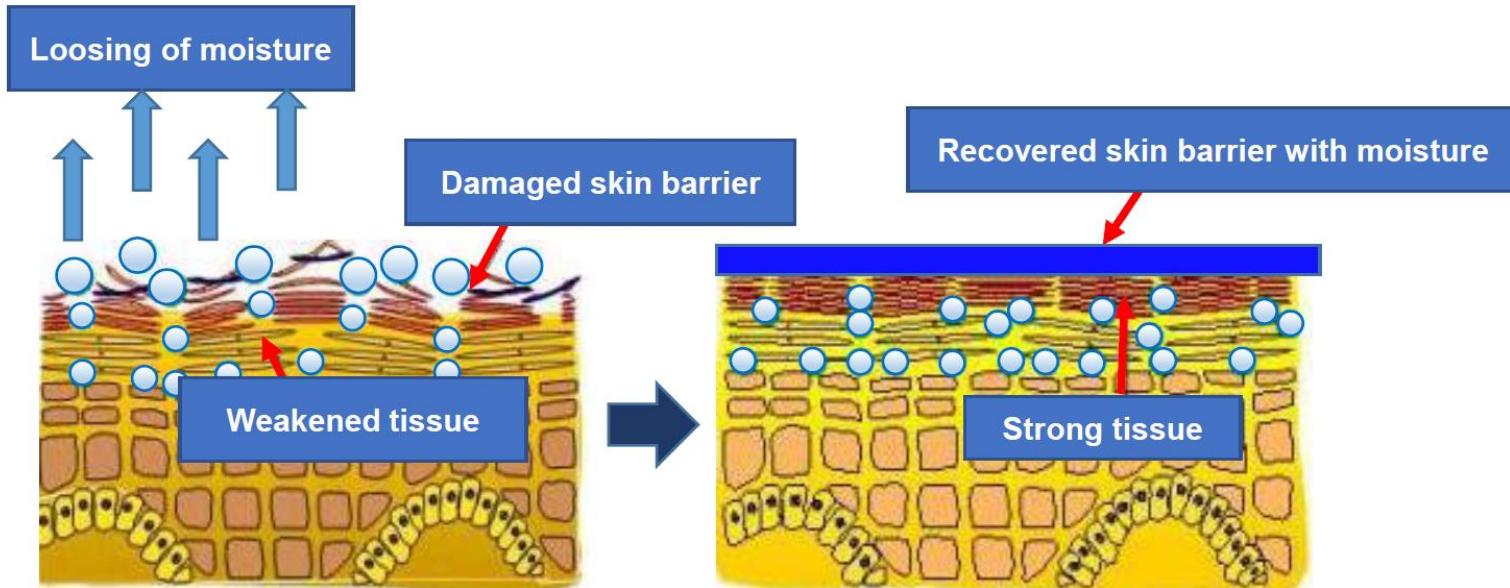
J. van Smeden et al., Biochimica et Biophysica Acta 1841 (2014) 295–313; Int. J. Mol. Sci. 21 (2020) 1958

# Aging and Ceramide level

	Age	Ceramide level
Hands	21-30 years	100%
	31-40 years	78%
	41-50 years	63%
Face	21-30 years	100%
	31-40 years	62%
	41-50 years	37%

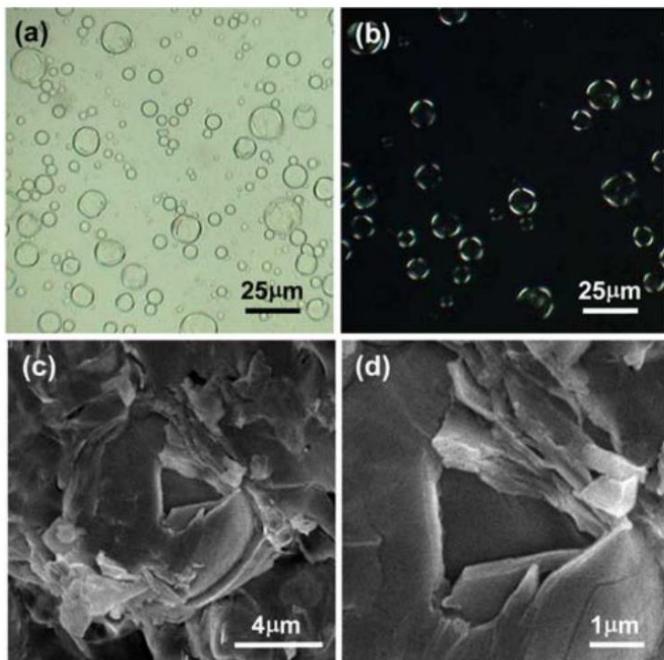
A.V. Rawlings et al. in Biocosmetics-Skin aging, IFSCC, vol. I, 31-45 (1993)

# Ultimate Moisturization: Skin Barrier by Ceramide

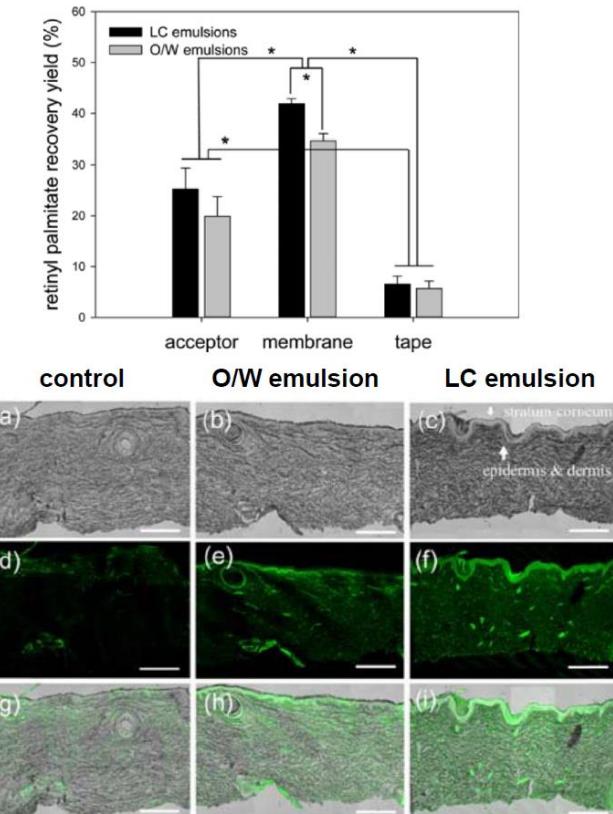


# Conventional methods to incorporate Ceramide in Skin Care

Liquid crystal (LC) emulsions composed of multi-lamellar structures enhance the percutaneous absorption of retinyl palmitate across skin barriers



**Figure 1.** Morphological characterization of LC emulsions. The prepared LC emulsions characterized by (a) light microscopy, (b) polarized optical microscopy, (c) cryo FE-SEM, and (d) FE-SEM at a high resolution of the freeze-fractured LC emulsions.



Macromolecular Research, 24(1) (2016) 44-50

# Conventional methods to incorporate Ceramide in Skin Care

- Pseudo-ceramidebased lipid microparticles for recovery of skin barrier functions

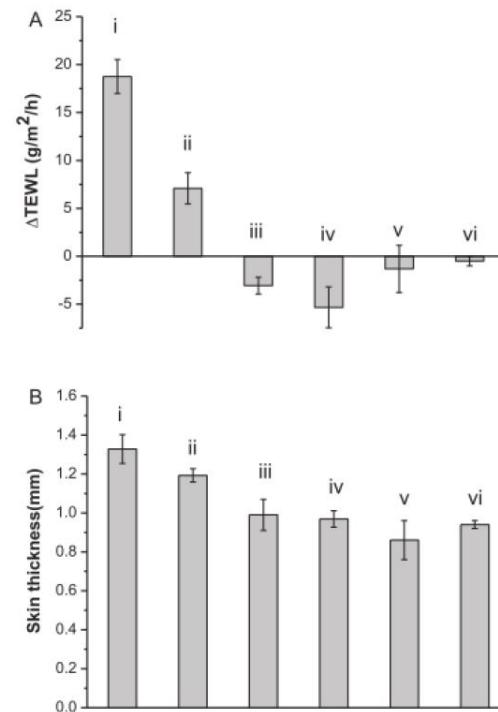
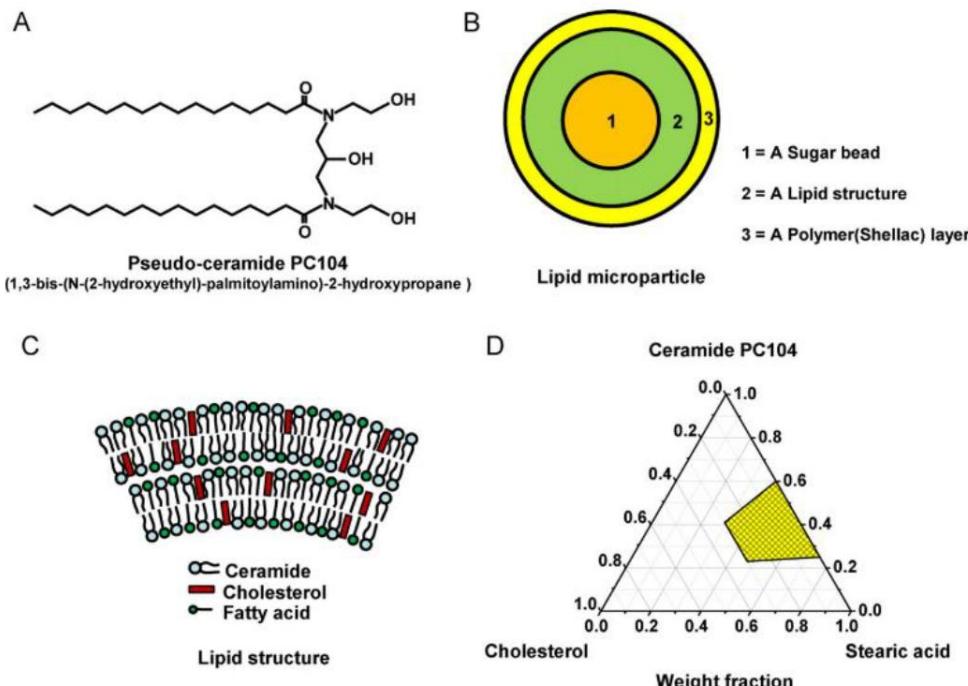
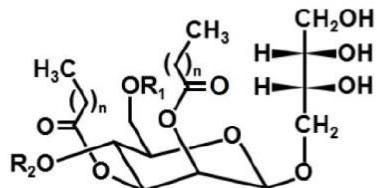


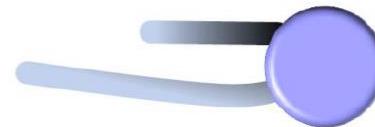
Fig. 5. (A)TEWL values and (B)Skin thickness of the mice skin after inducing the chronic dermatitis with (i) Oxazolone, and the following treatment with (ii) vehicle (0.15 wt% polyacrylic acid gel), (iii) 1wt% of lipid microparticles in the vehicle, (iv) 2 wt% of lipid microparticles in the vehicle, and (v) Desowen ointment (Desonide 0.05 wt%, Galderma, USA). (vi) for the skin without treatment of oxazolone. For this experiment, we introduced an oxazolone-induced murine AD model, and we used the lipid microparticles coated with the polymer(shellac). The number of samples (mice) for each data set is 7, and error bars are the standard deviation. From a Student's-T test of these data, we obtained  $p < 0.01$  for (iv) vs. (i); (iv) vs. (ii); and  $p > 0.05$  (vi) vs. (v).

# Conventional methods to incorporate Ceramide in Skin Care

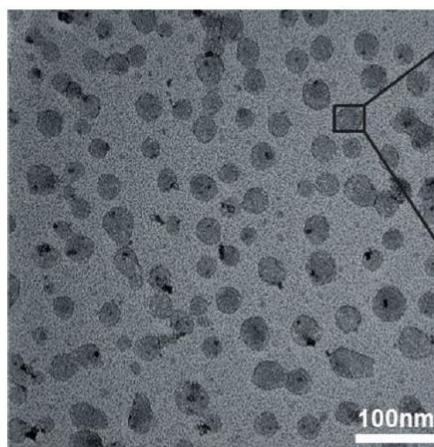
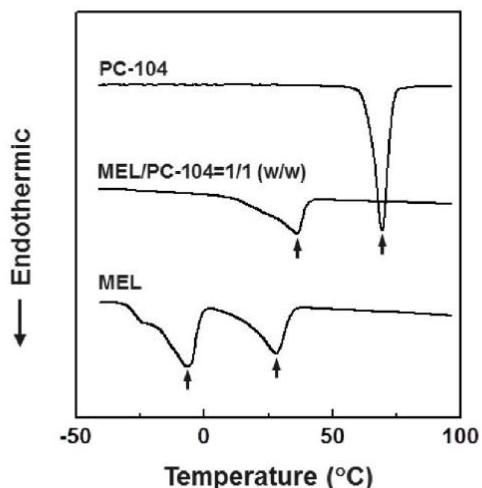
- Asymmetric structure of hydrophobic chains
- Prohibit ceramides from crystallization



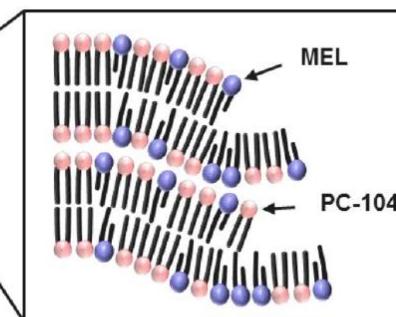
**Mannosylerythritol lipids (MEL)**



Hydrophilic moiety: mannosylerythritol  
Hydrophobic moiety: fatty acids



Colloid Surf. B: Biointerf.  
116, 597 (2014)



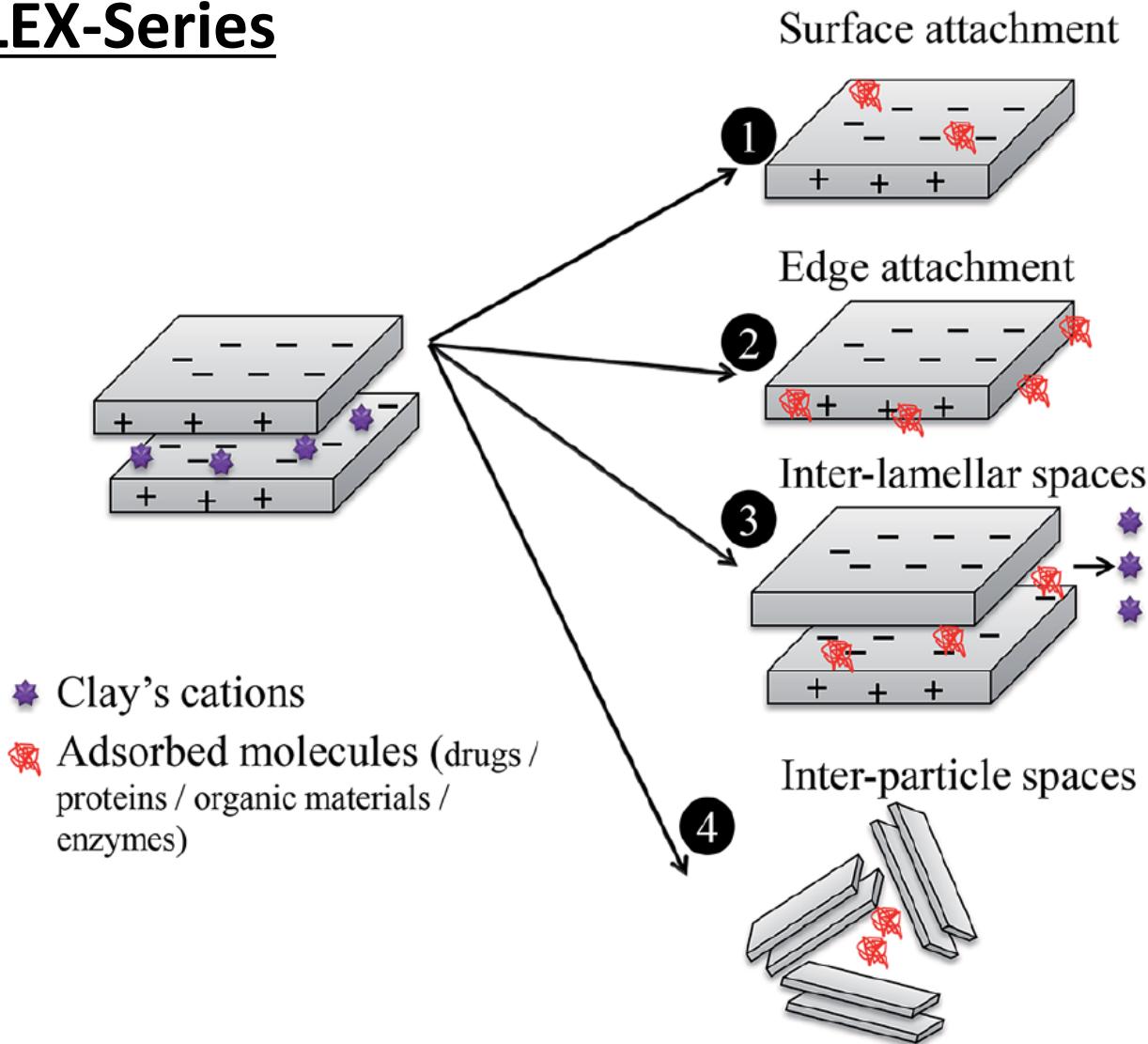
# CERAPLEX-Series

Hectorite + DDAC + Oil + Emulsifier + Ceramide

Grade	INCI NAME	Remark
<b>CERAPLEX</b>	Squalane, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite, <b>Ceramide NP, Phytosterol, Stearic Acid</b>	Natural, Most moist, Ceramide complex <b>200,000ppm</b>
<b>CERAPLEX Lite NP</b>	Disteardimonium Hectorite, Polyglyceryl-4 Isostearate, Polyglyceryl-3 polyricinoleate, Sorbitan isostearate, Coco-Caprylate/ Caprate, <b>Ceramide NP</b>	Natural, Ceramide <b>10,000ppm</b>
<b>CERAPLEX Lite 104</b>	Disteardimonium Hectorite, Polyglyceryl-4 Isostearate, Polyglyceryl-3 polyricinoleate, Sorbitan isostearate, Coco-Caprylate/ Caprate, Hydroxypropyl <b>Bispalmitamide MEA</b>	Most economic, Pseudoceramide <b>10,000ppm</b>

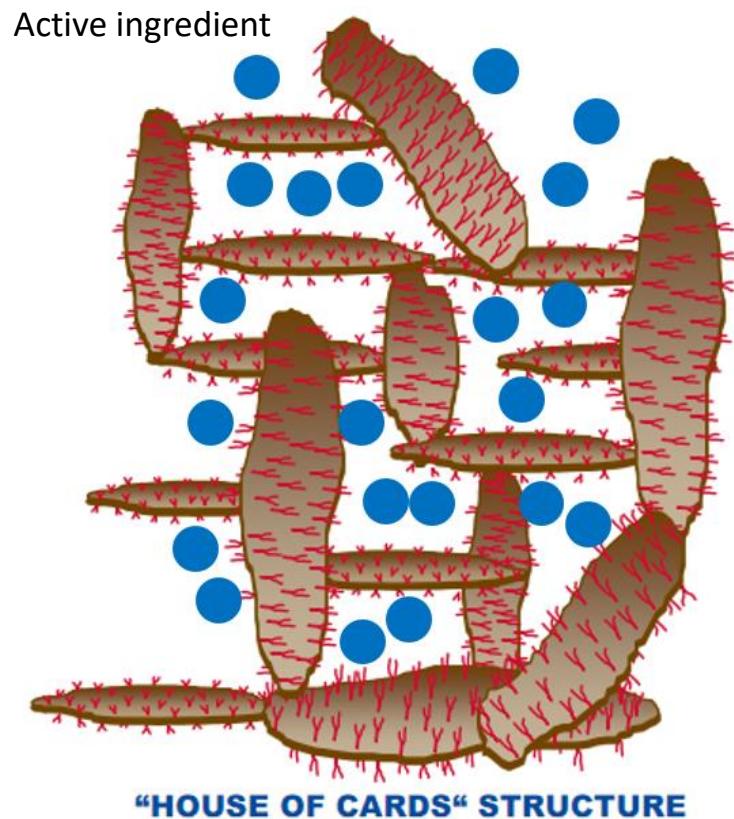


# CeraPLEX-Series



RSC Adv., 2015, 5, 29467–29481

# CeraPLEX-Series



# CeraPLEX in W/O formula



**Without hectorite**



Emulsion



Ceramide



**With hectorite**



Organo Hectorite

# CERAPlex Moisturizing Effect Tested Formula

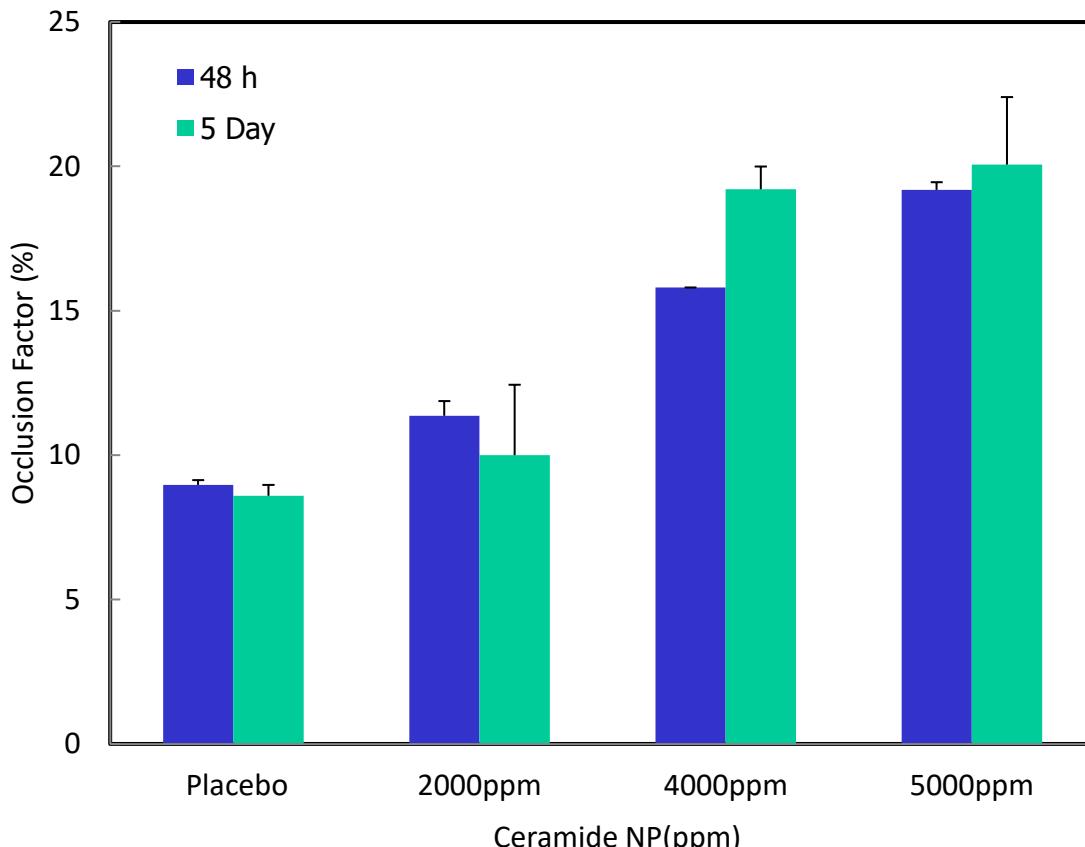
Phase	Trade Name	%
A	EcoDropGel	4
	CeraPLEX	-
	Cetiol C5C	6
	Neossance Squalane	4
B	NaCl	0.5
	1,2-Hexanediol	0.7
	Water	To 100.0



	Sample	CERAPlex%
Test 1	Placebo	0
Test 2	Ceramide NP 2000ppm	1
Test 3	Ceramide NP 4000ppm	2
Test 4	Ceramide NP 5000ppm	2.5

# CERAPlex moisturizing effect

## In vitro occlusive effect



Data were presented as the mean  $\pm$  SD of three independent experiments.

### Occlusion Factor(%)

$$F = 100 \times (A - B) / A$$

A: Water loss in control

B: Water loss in samples

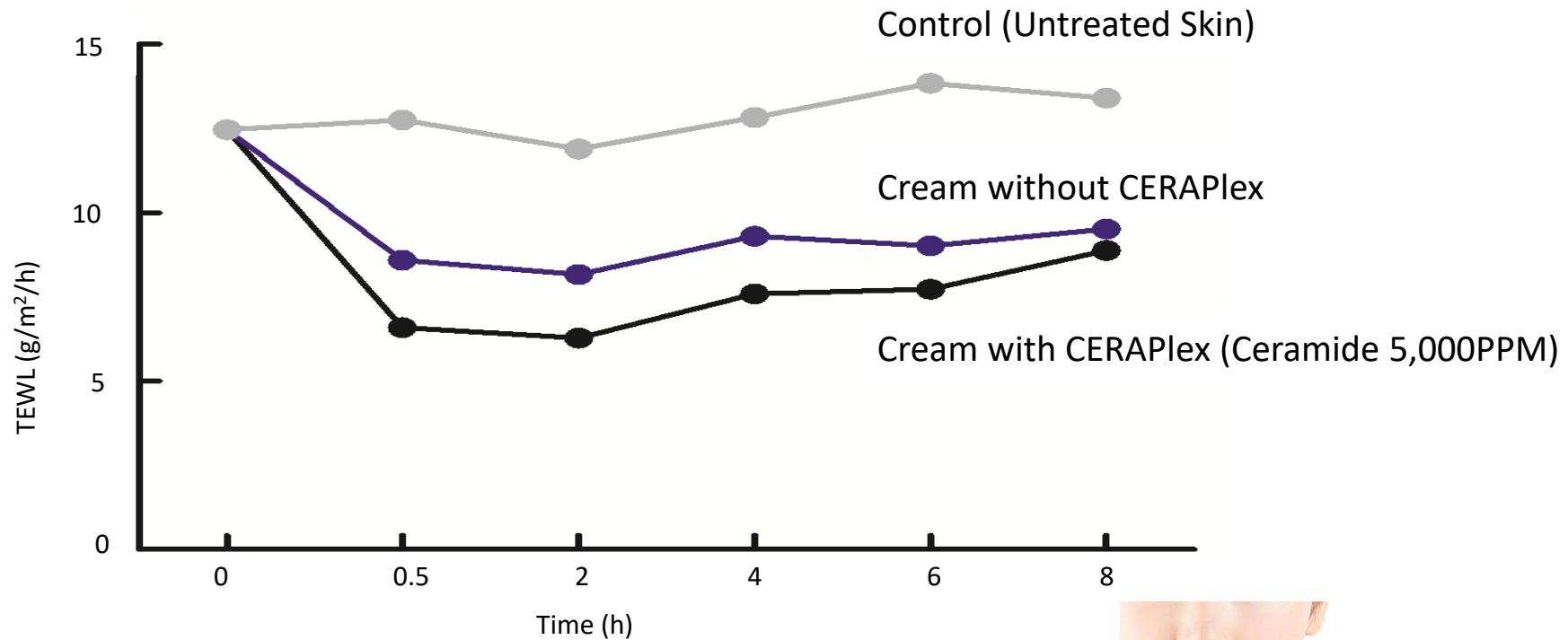


### Test Method

- Beakers were poured with 30g of distilled water
- Covered with cellulose acetate membrane filter with cream
- Beakers were stored at 40 °C with a relative humidity of 70~75%
- The weight was measured at 48h and 5day
- The occlusion factor(F) was calculated using the below equation

# CERAPlex moisturizing effect

In vivo measurement of TEWL



Tested condition:

- Formulations were applied on the forearms. N = 3 subjects.
- TEWL: Transepidermal water loss
- The LowerTEWL means, the better water loss from your skin



Corneometer

# CERAPLEX Water Bomb Cream 2020

## Ingredients

Water, Coco-Caprylate/Caprate, Squalane, Glycerin, Polyglyceryl-4 Isostearate, 2,3-Butanediol, Butyrospermum Parkii Butter, Glycosyl Trehalose, 1,2-Hexanediol, Hydrogenated Starch Hydrolysate, Sodium chloride, Disteardimonium Hectorite, Ceramide NP(2,500ppm), Butylene Glycol, Phytosterol(1,250ppm), Stearic Acid(1,250ppm), Paeonia Albiflora Flower Extract, Magnolia Liliflora Flower Extract, Lilium Candidum Flower Extract, Fragrance, Phenoxyethanol



## Key ingredients

### CeraPLEX

INCI : CoCo-Caprylate/Caprate,  
Polyglyceryl-4 Isostearate,  
Disteardimonium Hectorite, Ceramide NP

### EcoDropGel

INCI : Polyglyceryl-4 Isostearate,  
Coco-Caprylate/Caprate, Disteardimonium Hectorite

# W/O Skin care Proposals

## from SUNJIN



SJF-2001

Ceraplex Water balm

**facial cream**

SJF-2081

Ceramide 1000PPM

**Body lotion**



SJF-2082

Ceramide 2000PPM

**Hand Cream**



SJF-2083

Ceramide 1000PPM

**Hair Essence**

New in 2020

# W/O Skin care & body care



Phase	Trade Name	INCI	SJF-2001	SJF-2081	SJF-2082
A	EcoDropGel	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium Hectorite	1.5	6	6
	CeraPLEX	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2.5	1	2
	Cetiol C5C	Coco-Caprylate/Caprate	6	8	9
	Bergacare SB	Butyrospermum Parkii Butter	1		
	Cetiol Ultimate	Undecane, Tridecane		7	5
	Thixin R PC	Trihydroxystearin		0.3	0.6
	Neossance Squalane	Squalane	4	2	3
B	Water	Water	76.57	65.55	63.25
	NaCl	Sodium chloride	0.5	1	1
	Glycerin	Glycerin	3	3	6
	2.3-BDO	2,3-Butanediol	1.7	5	3
	1,2-Hexanediol	1,2-Hexanediol	0.7	1	1
	Tornare	Glycosyl Trehalose, Hydrogenated Starch Hydrolysate, Water	2		
	Sensivia SC50	Ethylhexylglycerin	0.5	0.1	0.1
	Fragrance	Fragrance	0.03	0.05	0.05
			<b>NET CERAMIDE</b>	<b>2500</b>	<b>1000</b>
					<b>2000</b>

# iRECIPE CERAPLEX Water Bolm Cream

SJF-2001 W/O Moisturizing Cream with ceraPLEX

New in 2020

Phase	Trade Name	INCI	%	Maker
A	EcoDropGel	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium Hectorite	1.5	SUNJIN
	CeraPLEX	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2.5	SUNJIN
	Cetiol C5C	Coco-Caprylate/Caprate	6	
	Bergacare SB	Butyrospermum Parkii Butter	1	
	Neossance Squalane	Squalane	4	
B	Water	Water	76.57	
	NaCl	Sodium chloride	0.5	
	Glycerin	Glycerin	3	
	2,3-BDO	2,3-Butanediol	1.7	G.S Caltex
	1,2-Hexanediol	1,2-Hexanediol	0.7	
	Tornare	Glycosyl Trehalose, Hydrogenated Starch Hydrolysate, Water	2	
	White Flower Complex	Butylene Glycol, Paeonia Albiflora Flower Extract, Lilium Candidum Flower Extract, Magnolia Liliflora Flower Extract, Phenoxyethanol	0.5	
	Fragrance	Fragrance	0.03	

i+RECIPE  
Make your own recipe

CERAPLEX™  
Water Bomb Cream

Ceramide 2,500 PPM  
Phytosterol 1,250 PPM  
Fatty Acid 1,250 PPM

Free from Paraben, Sulfate, PEG, Silicone,  
Phenoxyethanol, Ethanol, Mineral Oil, GMO

CLEAN BEAUTY

# iRECIPE CERAPLEX Water Bolm Cream

## stability test

### SJF-2001\_W/O Moisturizing Cream with ceraPLEX

	1 week	2 week	4 week	6 week	8 week	10 week
	2020.01.15	2020.01.22	2020.02.05	2020.02.19	2020.03.04	2020.03.28
Room Temperature	OK	OK	OK	OK	OK	OK
50°C	OK	OK	OK	OK	OK	OK
0~5°C	OK	OK	OK	OK	OK	OK
Cycling	NG 	After 1 Cycle, emulsion break				



# Ceramide Body Lotion

SJF-2081\_Ceramide 1000PPM W/O Body lotion



Phase	Ingredients	INCI Name	%	Maker
A	<b>ECODROP GEL</b>	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Distearidimonium, Hectorite	6	SUNJIN
	Cetiol C5C	Coco-Caprylate / Caprate	8	
	Squalane	Squalane	2	
	Cetiol Ultimate	Undecane, Tridecane	7	
	<b>CeraPLEX</b>	Polyglyceryl-4 Isostearate, Squalane, Distearidimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	1	SUNJIN
	Thixin R PC	Trihydroxystearin	0.3	
B	Water	Water	65.55	
	2,3-BDO	2,3-Butanediol	5	G.S Caltex
	Glycerin	Glycerin	3	
	1,2-Hexanediol	1,2-Hexanediol	1	
	NaCl	Sodium chloride	1	
C	Fragrance	Liberty Number CSN024754	0.05	KIMEX
	Sensivia SC50	Ethylhexylglycerin	0.1	

# Ceramide hand cream

SJF-2082\_Ceramide 2000PPM W/O Hand Cream

Phase	Ingredients	INCI Name	%	Maker
A	<b>ECODROP GEL</b>	Coco-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium, Hectorite	6	SUNJIN
	Cetiol C5C	Coco-Caprylate / Caprate	9	
	Squalane	Squalane	3	
	Cetiol Ultimate	Undecane, Tridecane	5	
	<b>CeraPLEX</b>	Polyglyceryl-4 Isostearate, Squalane, Disteardimonium Hectorite, Ceramide NP, Phytosterol, Stearic Acid	2	SUNJIN
	Thixin R PC	Trihydroxystearin	0.6	
B	Water	Water	63.25	
	2,3-BDO	2,3-Butanediol	3	G.S Caltex
	Glycerin	Glycerin	6	
	1,2-Hexanediol	1,2-Hexanediol	1	
	NaCl	Sodium chloride	1	
C	Fragrance	Liberty Number CSN024754	0.05	KIMEX
	Sensivia SC50	Ethylhexylglycerin	0.1	



# Berry Balm 2019

## Silicone Free Ceramide (5000ppm)

Water, CoCo-Caprylate/Caprate, Glycerin, Ozokerite, Dicaprylyl Carbonate, Polyglyceryl-4 Isostearate, Propanediol, Stearyl Heptanoate, 1,2-Hexanediol, Disteardimonium Hectorite, Ceramide NP(5,000 ppm), Sodium Chloride, Stearyl Caprylate, Butylene Glycol, Tocopherol, Fragrance, Rubus Fruticosus(Blackberry) Fruit Extract, Ribes Nigrum(Black Currant) Fuit Extract, Vaccinium Angustifolium(Blueberry) Fruit Extract, Euterpe Oleracea Fruit Extract, Rubus Idaeus(Raspberry) Fruit Extract, Extract, CI 17200

### Key ingredients

#### **CeraPLEX**

INCI : CoCo-Caprylate/Caprate, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite, Ceramide NP

- ✓ 20% Ceramide inside
- ✓ Stable in formulation



# W/O Berry balm Ceramide

2017 New in 2019

Phase	Trade Name	INCI	SJF-1702 Ver.1.0	SJF-1901 Ver.1.0
A	CeraPLEX (Ceramide 20wt%)	Caprylic/capric triglyceride & Ceramide NP & Disteardimonium Hectorite & Polyglyceryl-4 Isostearate	-	2.5
	EcoDropGel	Coco-Caprylate/Caprate & Polyglyceryl-4 Isostearate & Disteardimonium Hectorite	4.5	4
	Cetiol C5C	Coco-Caprylate/Caprate	6	9
	Cetiol CC	Dicaprylyl Carbonate	2	4
	Tegosoft SH	Stearyl Heptanoate	1.5	1.5
	Ozokerite wax	Ozokerite Wax	5.5	4.5
B	Water	Water	68.17	62.17
	NaCl	Sodium chloride	0.5	0.5
	Glycerin	Glycerin	9	9
	1,3-Propanediol	1,3-Propanediol	1.7	1.7
	1,2-Hexanediol	1,2-Hexanediol	0.7	0.7
	Fragrance	Fragrance	0.03	0.03
	CI 16185 0.1% Sol.	CI 16185 0.1% Sol.	0.4	0.4



Ceramide (ppm)	0	5,000
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# CERAPLEX Lite grade: Economic Grade

Hectorite + DDAC + Oil + Emulsifier + Ceramide

Grade	INCI NAME	Remark
<b>CERAPLEX</b>	Squalane, Polyglyceryl-4 Isostearate, Disteardimonium Hectorite, <b>Ceramide NP, Phytosterol, Stearic Acid</b>	Natural, Most moist, Ceramide complex <b>200,000ppm</b>
<b>CERAPLEX Lite NP</b>	Disteardimonium Hectorite, Polyglyceryl-4 Isostearate, Polyglyceryl-3 polyricinoleate, Sorbitan isostearate, Coco-Caprylate/ Caprate, <b>Ceramide NP</b>	Natural, Ceramide <b>10,000ppm</b>
<b>CERAPLEX Lite 104</b>	Disteardimonium Hectorite, Polyglyceryl-4 Isostearate, Polyglyceryl-3 polyricinoleate, Sorbitan isostearate, Coco-Caprylate/ Caprate, Hydroxypropyl <b>Bispalmitamide MEA</b>	Most economic, Pseudoceramide <b>10,000ppm</b>



# Stability Test of Cream with CERApex-Lite at 50 °C (Day 15)

Polarized optical microscope (POM) analysis



Ceraplex Lite NP

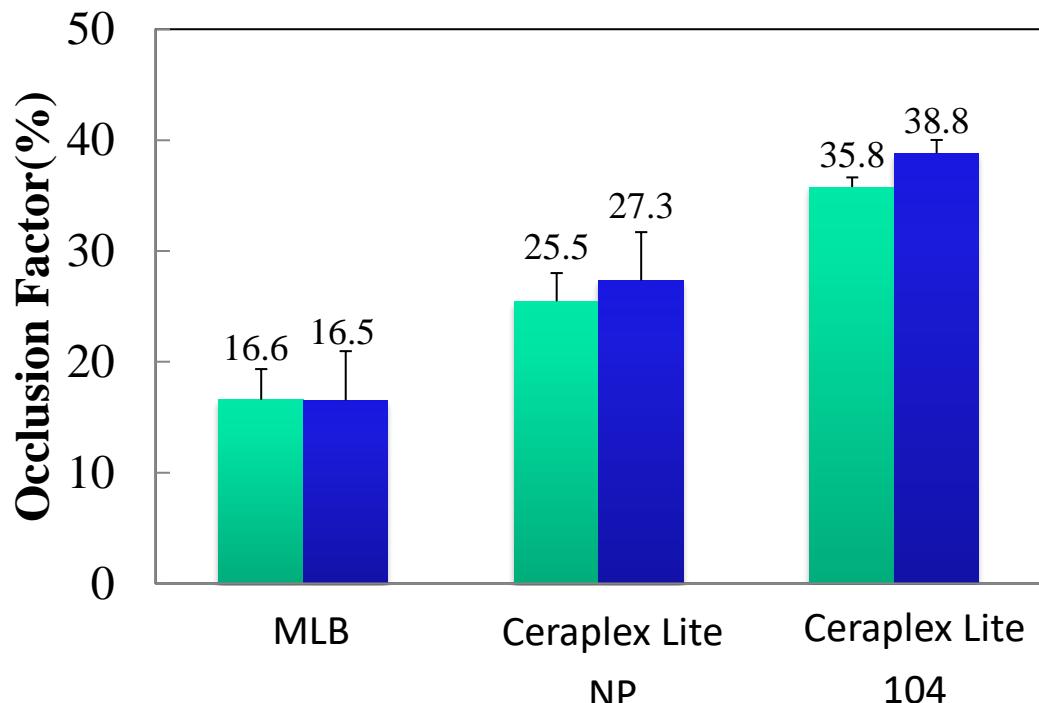


Ceraplex Lite 104

- No ceramide crystal was formed either in cream with CERApex-Lite NP or CERApex-Lite 104.

# Ceraplex Lite moisturizing effect

In vitro occlusive effect



Data were presented as the mean  $\pm$  SD of three independent experiments.

Occlusion Factor(%)

$$F = 100 \times (A - B) / A$$

A: Water loss in control

B: Water loss in samples

2 Days

3 Days

Test Method

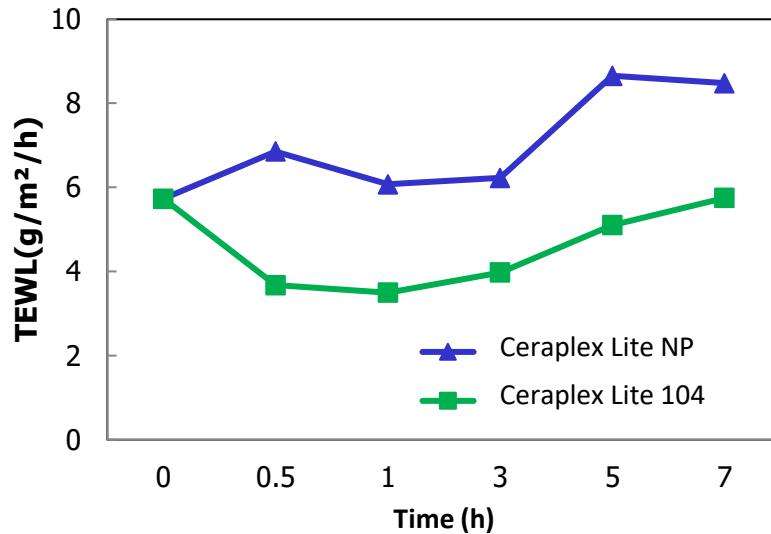
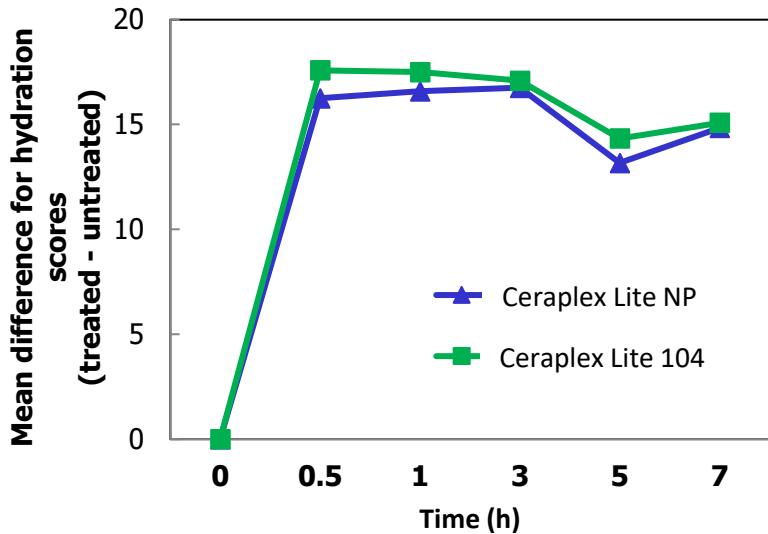


- Beakers were poured with 30g of distilled water
- Covered with cellulose acetate membrane filter with cream
- Beakers were stored at 40 °C with a relative humidity of 70~75%
- The weight was measured at 48h and 5day
- The occlusion factor(F) was calculated using the below equation

CERApex-Lite 104, better Occlusive effect

# Ceraplex Lite moisturizing effect

In vivo measurement of SCH and TEWL



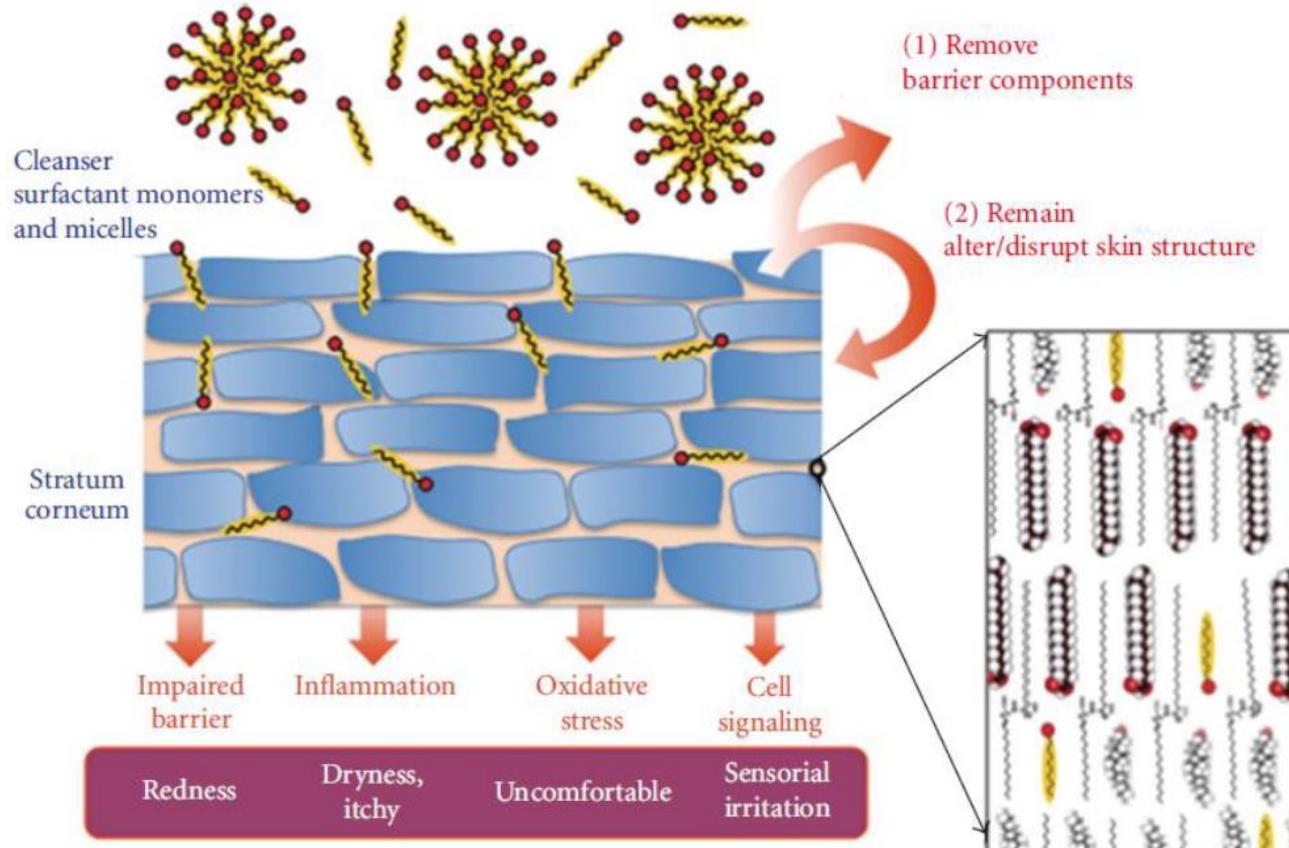
## Tested condition:

- Formulations were applied on the forearms. N = 4 subjects.
- TEWL: Transepidermal water loss
- SCH: Stratum corneum hydration

CERAPLEX-Lite 104 , better Skin Hydration & TEWL

# In the era of COVID19: Hand Washing

## Disadvantages of surfactants



R. Walters et al., *Dermatology research and practice*, 2012, 495917

# In the era of COVID19: Hand Washing

## Disadvantages of surfactants

- Surfactants may **damage the skin** by
  - Causing disarray of the highly structured nature of skin lipids
  - Interacting with cellular components, for example, keratin
  - Causing skin inflammation
- Surfactants can cause **water loss** from normal and sensitive skin, leading to dryness and damage of the skin barrier
  - Surfactants can bind to proteins in the skin causing swelling, which leads to water loss and allows other irritants to further penetrate the skin

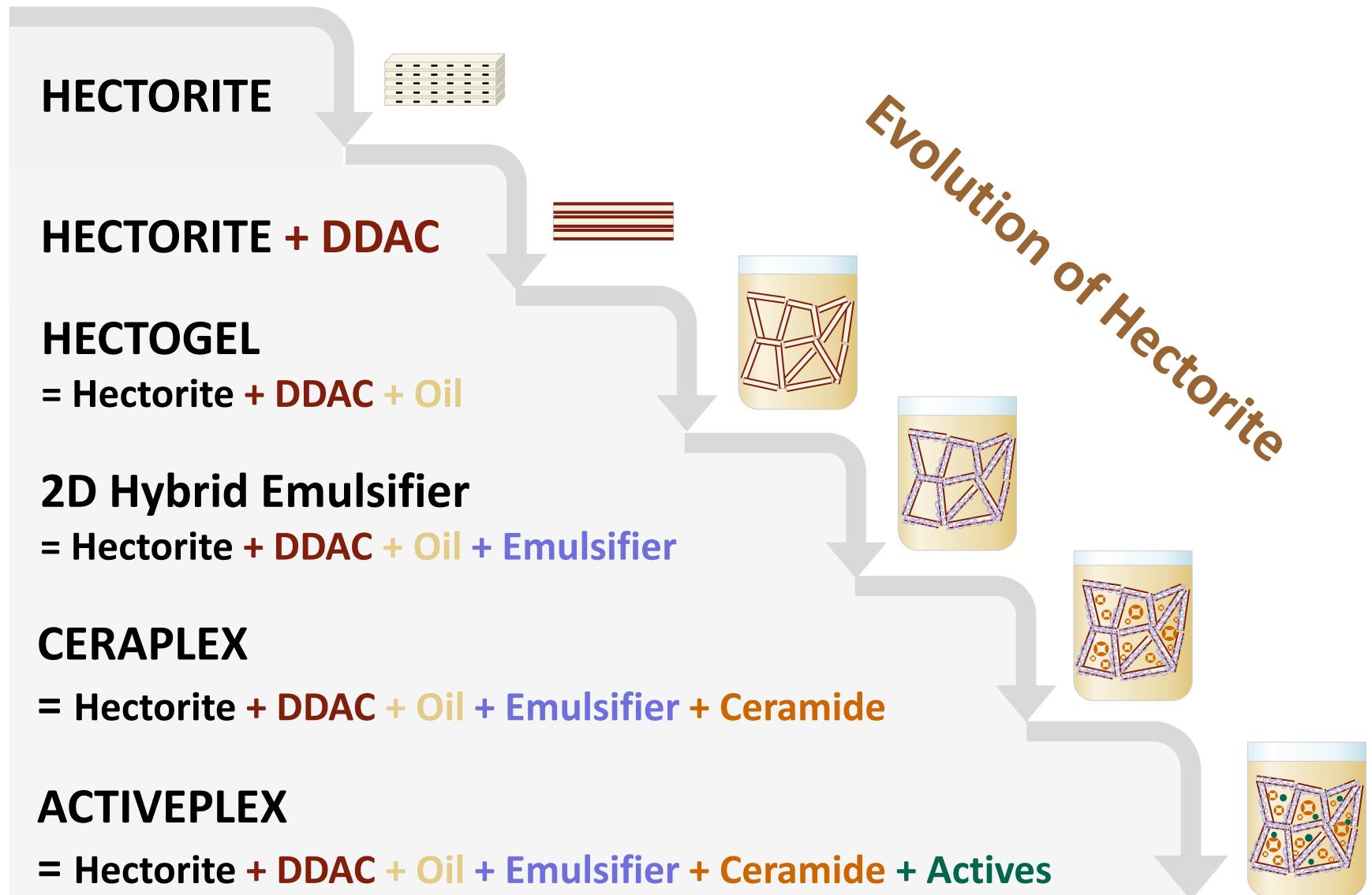
# 6. ACTIVEPlex:

**ACTIVEPlex**

= **Hectorite + DDAC + Oil + Emulsifier + Ceramide**  
+ More Actives



# Hectorite Technologies



## **ACTIVEPLEX to come**

**RETIPLEX:** Retinol for Anti-Aging

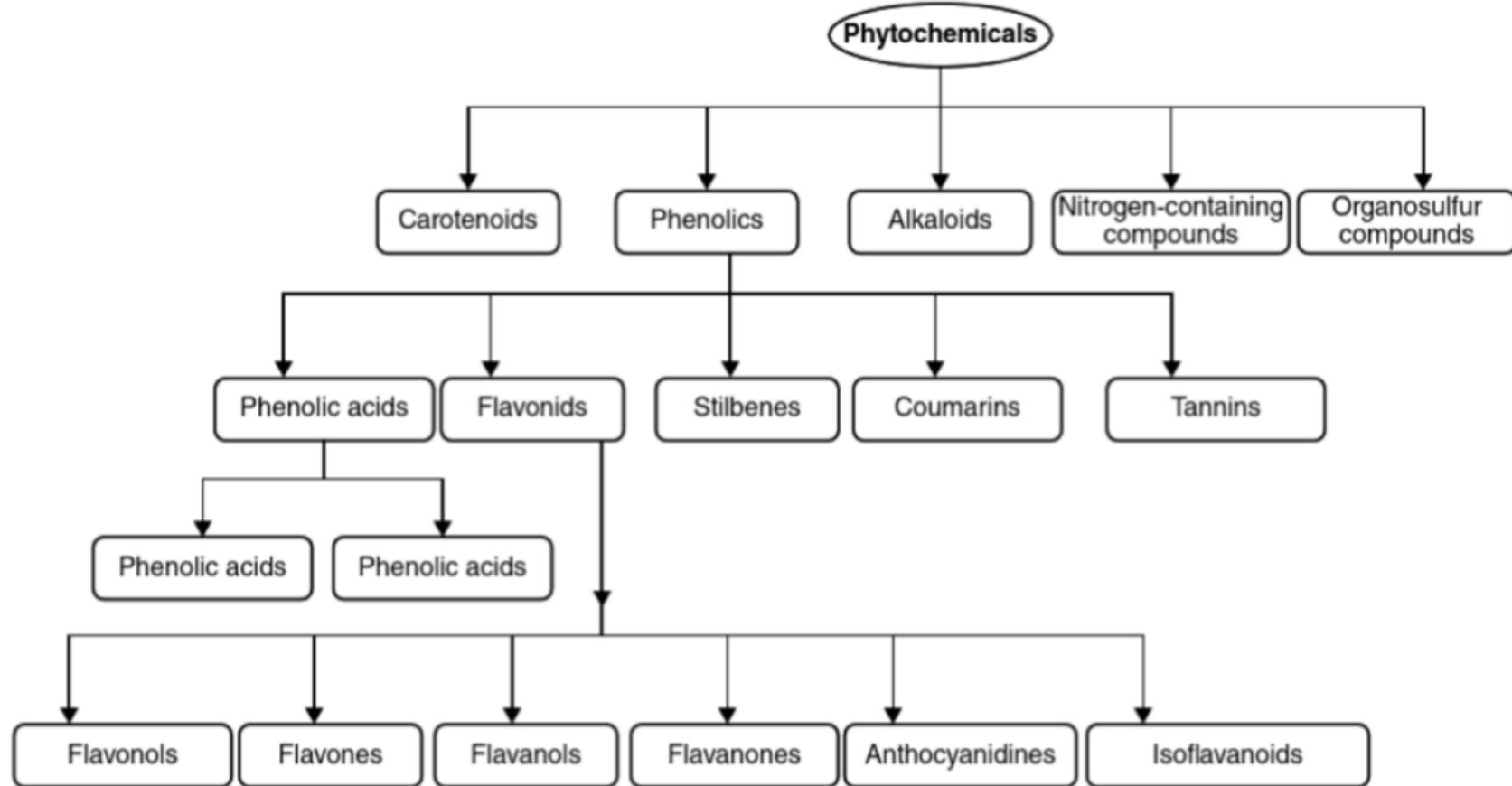
**APPLEX:** Ascorbyl Palmitate for Whitening

**TIGERPLEX:** Madecasoside for Soothing

**LICORICEPLEX:** Glabridin for Whitening

**XXXPLEX:** Glabridin for Anti-Viral

# Classification of Phytochemical



Sahar Amiri , and Sanam Amiri "Cyclodextrins : Properties and Industrial Applications", John Wiley & Sons (2017)

# Phenolic Acid

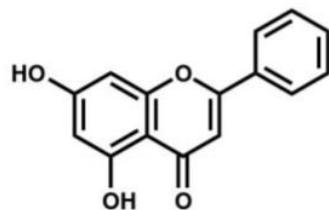
## Health benefits

- Elimination of free radicals
- Protection and regeneration of other dietary antioxidants (e.g. vitamin E)
- Chelation of pro-oxidant metals

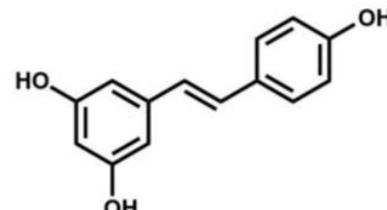
## Phenolic compounds and free radicals

- Phenolic compound have many phenolic hydroxyl groups that inclined to donate a hydrogen atom or an electron to free radical.

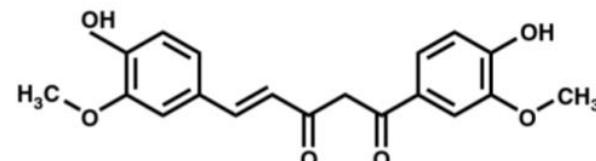
## Some polyphenol structures



Chrysin

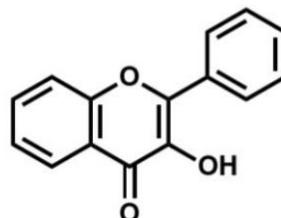
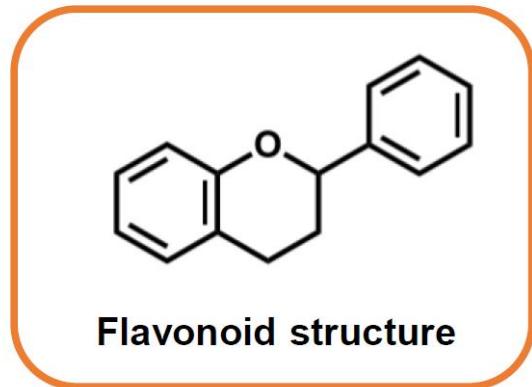


Resveratrol

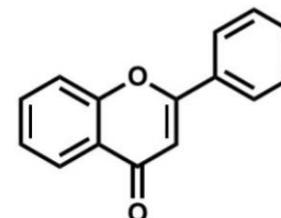


Curcumin

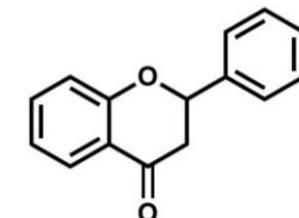
# Flavonoids



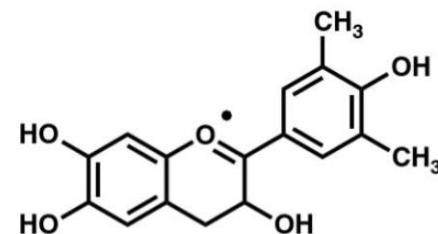
Flavonol



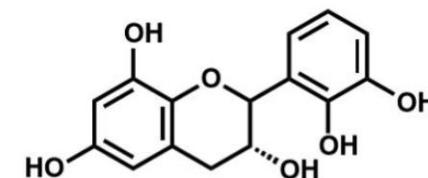
Flavone



Flavanone



Anthocyanidine



Catechins

## Therapeutic activities

- Anti-inflammatory, antioestrogenic, antimicrobial, antiallergic, antioxidant, antitumor
- Resistant to oxidative stress

# Classification of Antioxidant

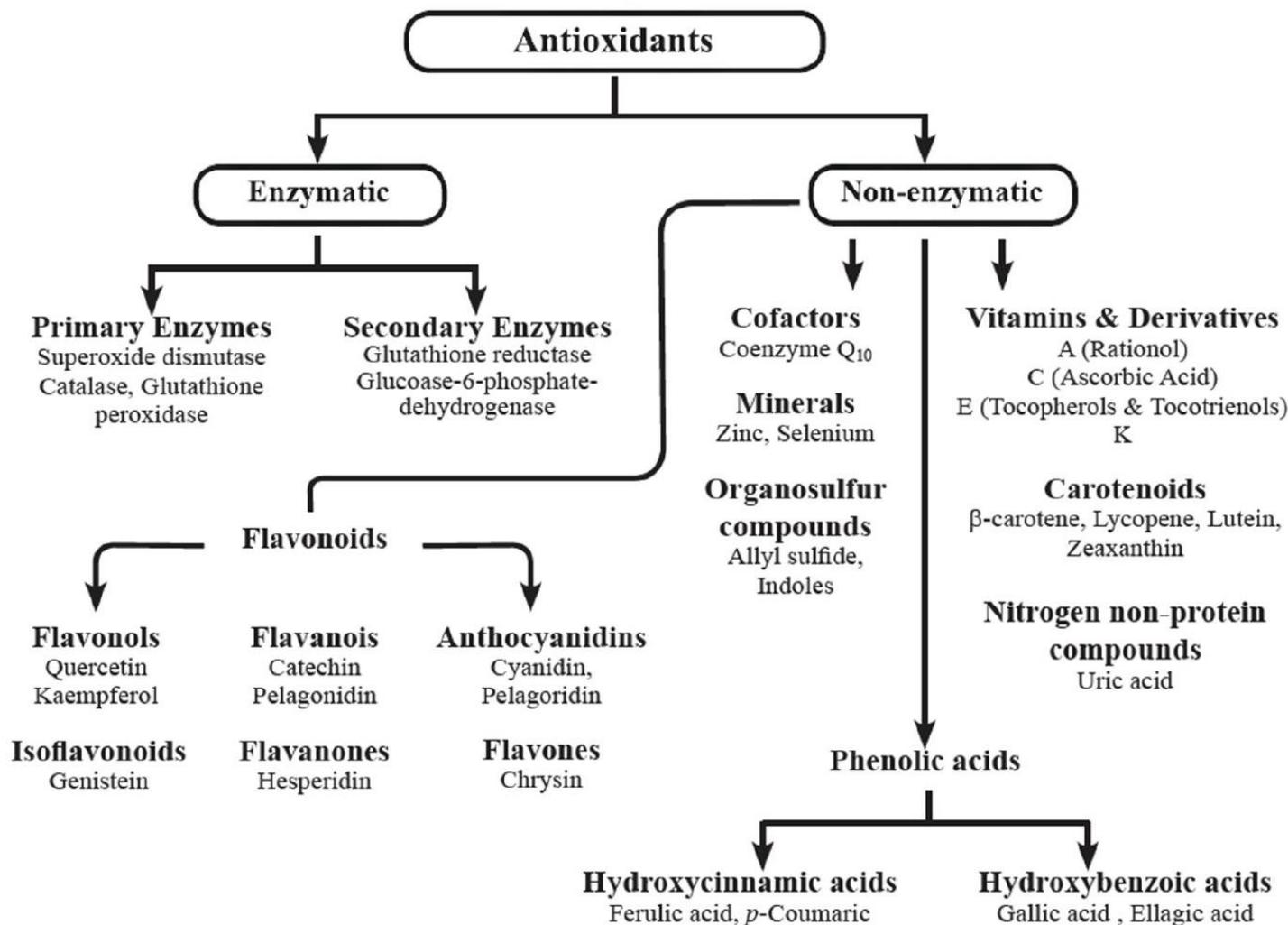
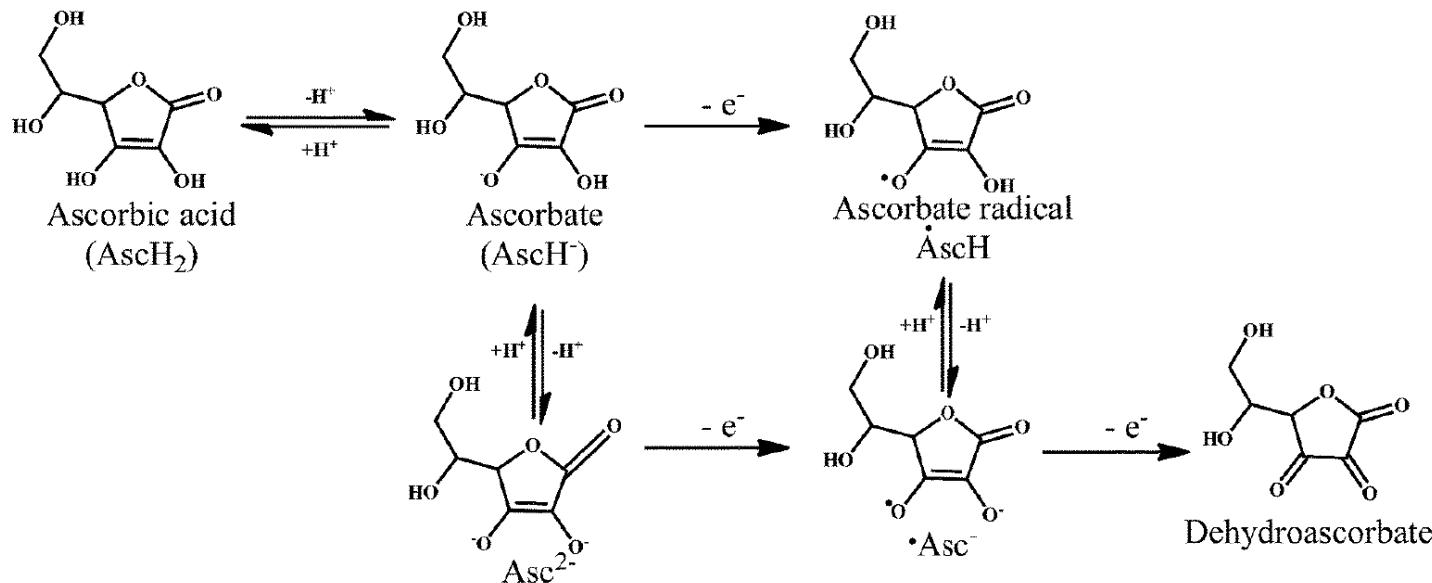


Fig. 1: Classification of antioxidants (Carocho & Ferreira, 2013)

# Vitamin C: Ascorbic Acid

**Sources:** Citrus fruits, oranges, pineapple, grapes, green peppers, cabbages, watermelon, papaya, spinach, strawberries

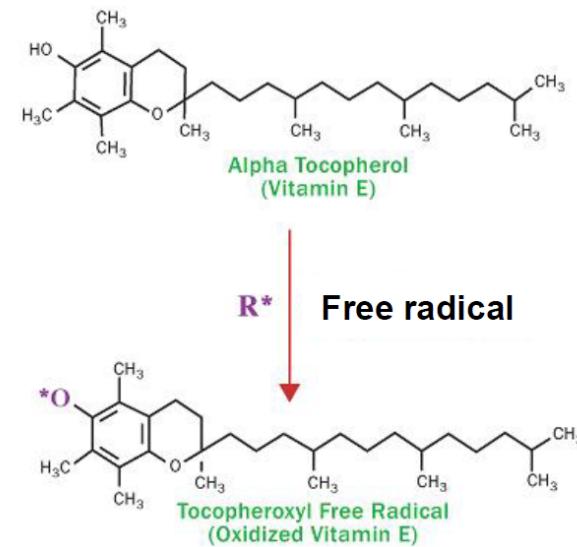
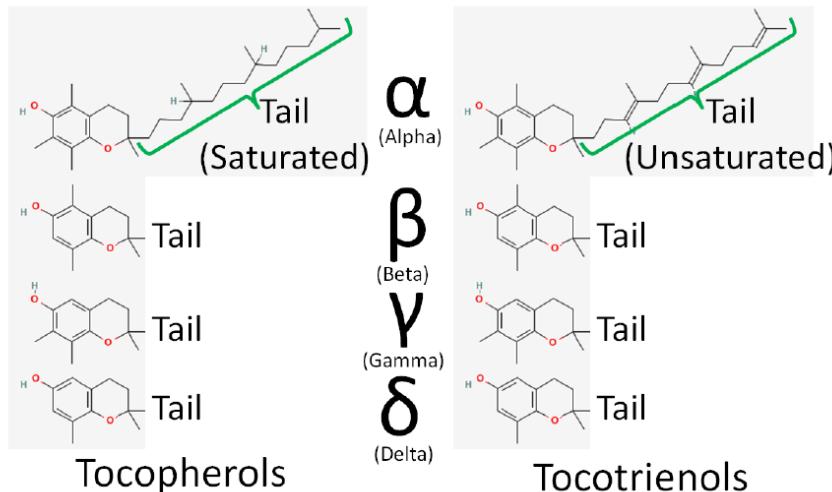
**Mechanism:** Scavenging water-soluble peroxyxyl, perhydroxyl, superoxide, hypochlorous acid, singlet oxygen



# Vitamin E: Tocopherol

**Sources:** Unsaturated fats like sunflower, safflower, olive, wheat germ oils, whole-wheat flour

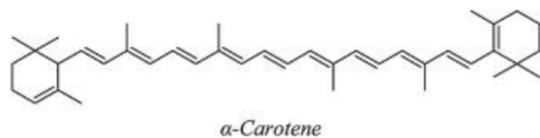
- Most important and effective lipid-soluble antioxidant
- Nonenzymatic terminator of free radical chain reaction
- Requires other antioxidant species to be re-constituted  
(co-enzyme Q10, ascorbic acid)



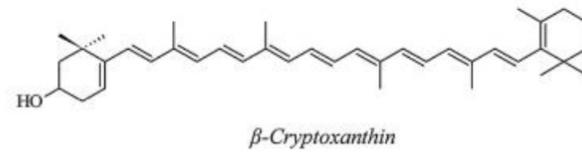
# Carotenoids

**Sources:** Deep orange, red, yellow fruits and vegetables like carrots, pumpkin, sweet potatoes, red grapes, watermelon, tomatoes

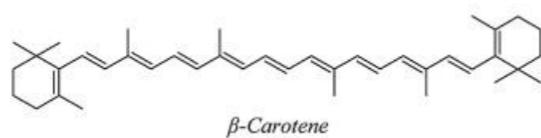
- Carotenoids are lipophilic pigments with C-40-based isoprenoid structure responsible for yellow, orange, red, or dark green color.
- Carotenoids include more than 700 compounds that can be initially divided in carotenes (hydrocarbon carotenoids) and xanthophylls (oxygenated carotenoids)



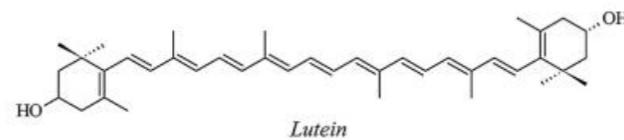
$\alpha$ -Carotene



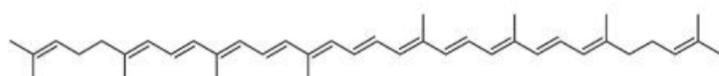
$\beta$ -Cryptoxanthin



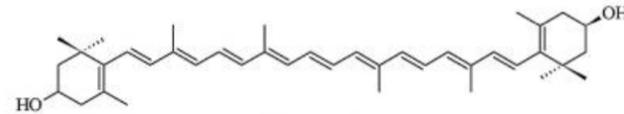
$\beta$ -Carotene



Lutein

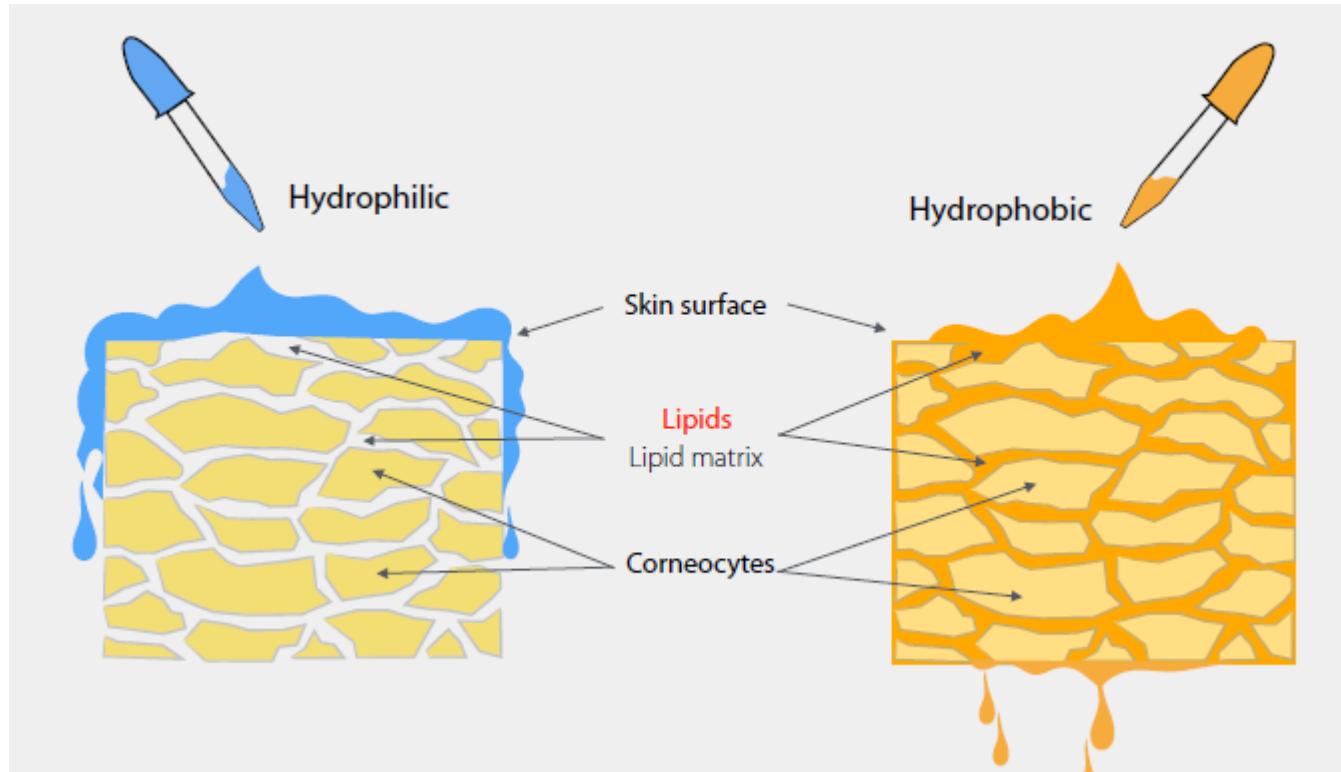


Lycopene



Zeaxanthin

# Do we need W/O skin care?



The skin lipid layer consists of keratinocyte which is protein and it is closely packed by lipid materials.

Due to this structure, skin layer protects our body but at the same time, it works as a critical barrier against the penetration of active materials.

Thus, to improve the penetration level, the active materials should be able to fuse in a lipid layer.