SUNJIN BEAUTY SCIENCE

# ECODROPGEL

ECODROPGEL is a **silicone-free water drop system** for highly moisturizing effect for W/O emulsion.

Water Drop emulsions originated as a K-Beauty concept and provide this highly desired visual and sensory effect for consumers.

Shearing forces generated by the rubbing in or application of the cosmetic formulation cause the water-in-oil emulsion to rupture, thereby causing the internal aqueous phase to emerge in the form of droplets. The water droplets are large enough for the visual effect and the desirable cooling and moisturizing effect as the water evaporates on the skin.

## Benefits

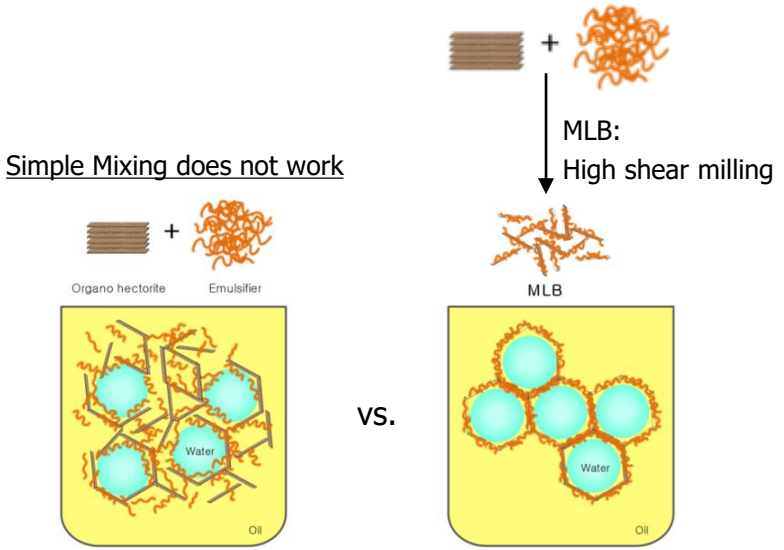
- PEG-free, Silicone-free emulsifier
- Suitable for CLEAN BEAUTY
- The world first & only non silicone based water drop system

INCI: Polyglyceryl-4 Isostearate (and) Coco-Caprylate/Caprate (and) Disteardimonium Hectorite
CAS #: 91824-88-3 & 95912-86-0 & 97280-96-1
Natural Origin Index according to ISO 16128: 1
Korea Patent number: 10-2091318

# MLB

MLB is a **W/O emulsifier system** that is **silicone-free, PEG-free and PPG-free** for **CLEAN BEAUTY**.
MLB uses Sunjin's **2 dimensional** Hectorite technology to produce a range of product forms from low viscosity **W/O lotions and milks** to **W/O stick** formulations while maintaining the moisturizing effect.

| Grade | INCI NAME | Remark |
|---|---|---|
| **MLB** | Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite | Good for non-polar oils |



# W/O Silicone, PEG free emulsion system

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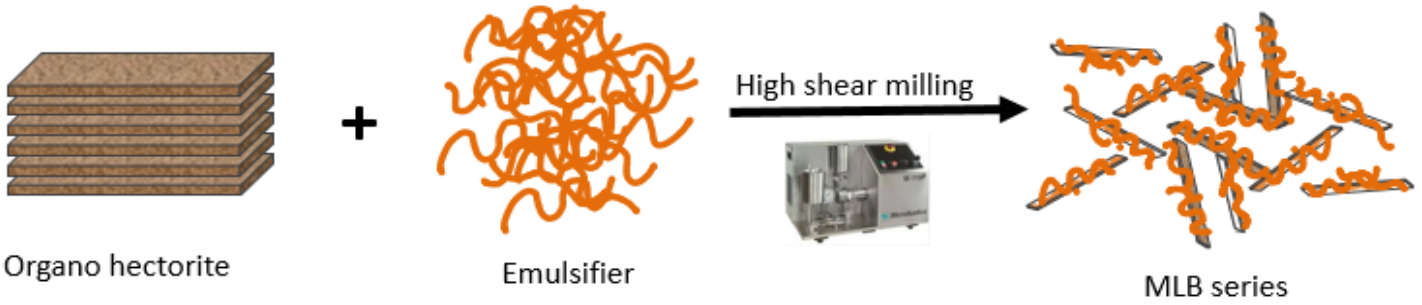
| Grade | INCI | Remark |
|---|---|---|
| ECODROPGEL | Polyglyceryl-4 Isostearate, Coco-Caprylate/Caprate, Disteardimonium Hectorite | W/O emulsifier to make **big size** emulsion droplet for **water drop effect** |
| MLB | Polyglyceryl-4 Isostearate & Coco Caprylate/Caprate & Polyglyceryl-3 polyricinoleate & Sorbitan isostearate & Disteardimonium Hectorite | **Clean Beauty** W/O emulsifier |
| MLB-S | Cyclopentasiloxane & Disteardimonium Hectorite & PEG-10 Dimethicone | W/S emulsifier |
| MLB-SD (non D5) | Dimethicone & Disteardimonium Hectorite & PEG-10 Dimethicone | |



# Formulation Tips

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## ECODROPGEL

ECODROPGEL can be used to produce a range of textures in skin care formulations while maintaining the water drop moisturizing effect. Product textures range from soft creams to firm balms.

Recommended use level for ECODROPGEL is 3 to 6% dependent on the oil phase quantity. However the use level of ECODROPGEL should be optimized to create a stable macro emulsion which maintaining the Water Drop Effect.

When formulating with ECODROPGEL, the water phase must be added to the oil phase with increasing agitation speed to produce a w/o emulsion with larger water droplets. Use of a homogenizer is not recommended since this higher shear will reduce the water droplet size and the water drop effect will be lost.

Additional considerations when formulating with ECODROPGEL include the addition of active ingredients, fragrances and preservative type and use level. Any instability issues can be corrected by increasing the concentration of ECODROPGEL or MLB. Adding MLB is more workable to improve emulsion stability.

## MLB

Applications include : skin care, sun care and color cosmetics (foundations and lip products). For low viscosity formulations, the recommended use level for MLB is 5% or more.

The concentration of MLB will depend on the percentage of mineral filters or other active ingredients plus the water phase concentration.

Skin care

Make-up

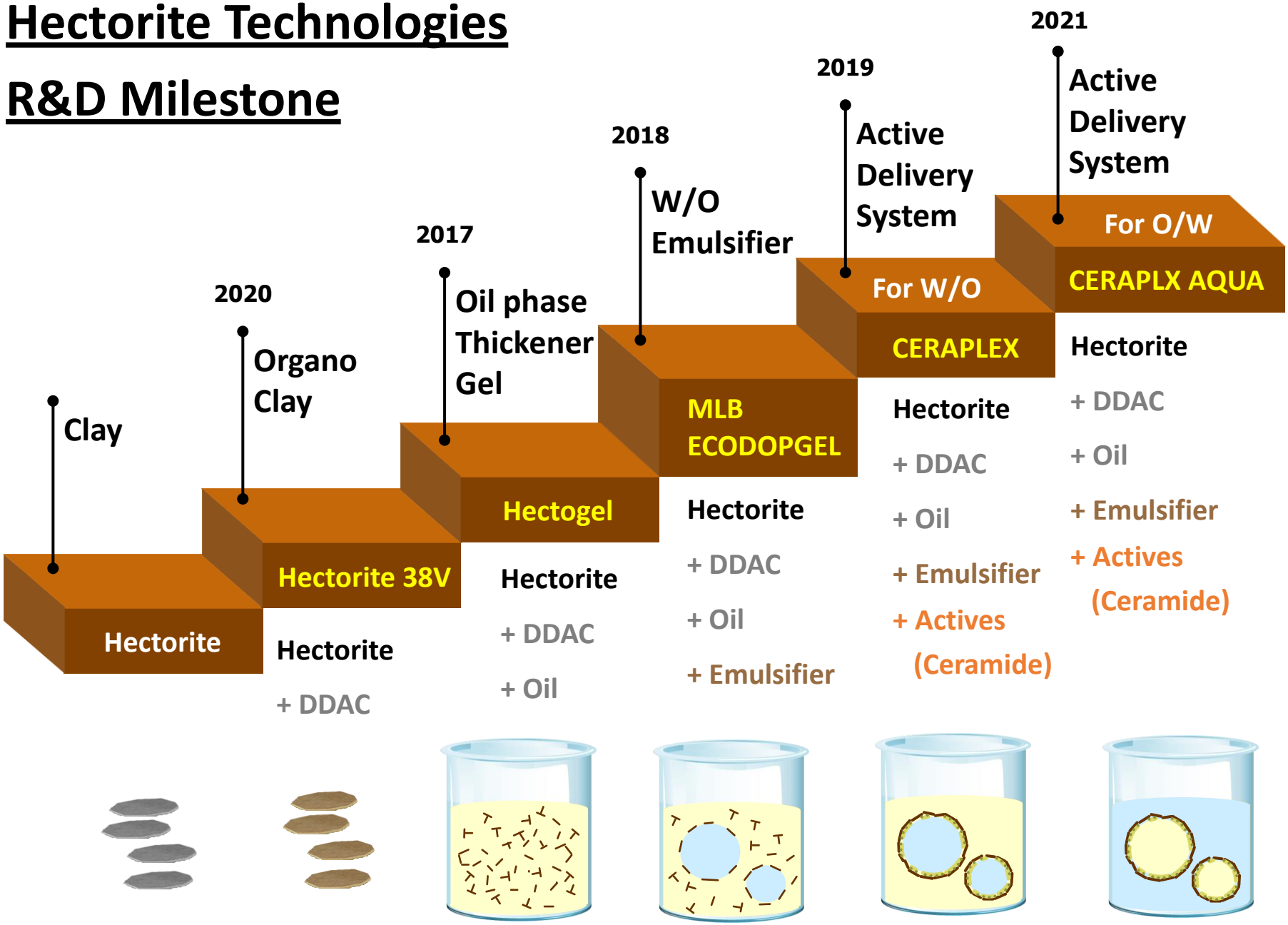

W/O sticks

For moisturizing stick formulations, the recommended use level for MLB is 6 to 11%. The concentration of MLB will depend on the water phase concentration. Higher water phases provide the unique moisturizing effect.

As an example, a water phase of 50% will require the use of 10 to 11% MLB depending on the sensory effect required.

# Hectorite Technologies

# R&D Milestone



# Emulsion Capability Test

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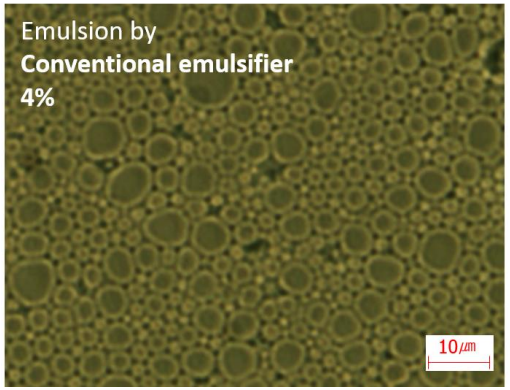
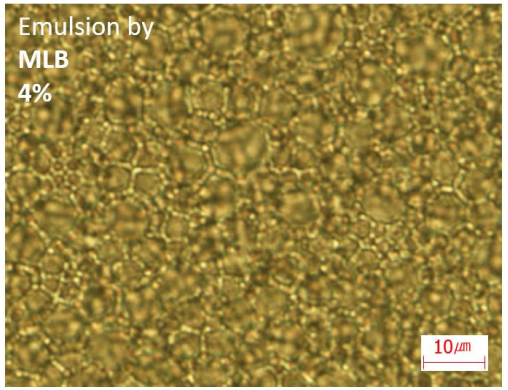
| | Product Name | #1 | #2 |
|---|---|---|---|
| A | Emulsifiers | 5 | 5 |
| | Hectogel-CCTG | | 3 |
| | Coco-Caprylate/Caprate | 20 | 20 |
| | Cetyl Alcohol Treated Color Base | 10 | 10 |
| B | Water | 58 | 55 |
| | 1,3-B.G | 6 | 6 |
| | NaCl | 1 | 1 |


| Emulsifier | G*** 5% | G*** 5% Hectogel-CCTG 3% | R*** 5% | R*** 5% Hectogel-CCTG 3% | MLB 5% |
|---|---|---|---|---|---|
| Viscosity | Oil separated | Oil separated | 14,800 | 16,100 | 14,300 |



# HECTOGEL

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## Hectogel

**Hectorite gel** is oil phase thickener.

| Grade | INCI NAME |
|---|---|
| **HECTOGEL-ISDV(E)** | Isododeane, Disteardimonium Hectorite, Propylene Carbonate |
| **HECTOGEL-D5(E)** | Cyclopentasiloxane, Disteardimonium Hectorite, Propylene Carbonate |
| **HECTOGEL-CCTG(E)** | Caprylic/Capric Triglyceride, Disteardimonium Hectorite, Propylene Carbonate |
| **HECTOGEL-D** | Dimethicone, Disteardimonium Hectorite, Propylene Carbonate |
| **HECTOGEL-AK** | $C_{15-19}$ Alkane, Disteardimonium Hectorite, Propylene Carbonate |
| **HECTOGEL-HSQ** | $C_{13-16}$ Isoparaffin, Disteardimonium Hectorite, Propylene Carbonate |

**Benefits**

- Increase viscosity
- Formulation stability enhanced
- Elegant texture in formulation
- Suspending capability
- Good spreading properties
- Thixotropic flow characteristics

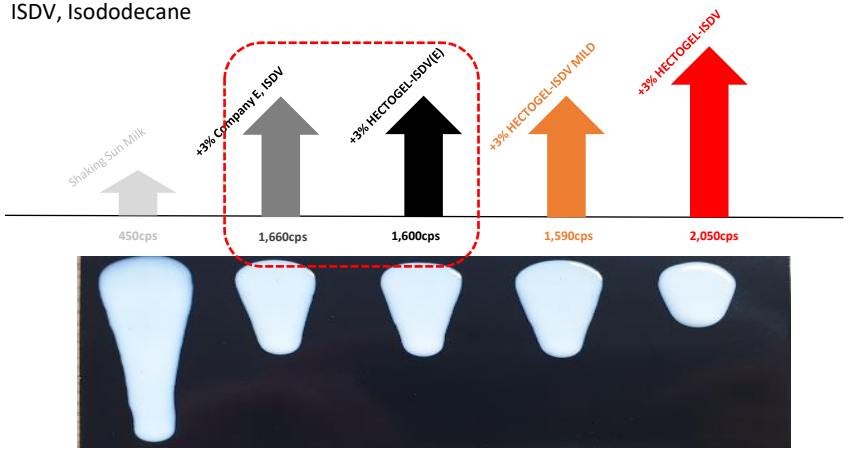
## Hectogel Mild

**Hectorite gel** is without propylene carbonate to reduce skin irritation.

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

**Viscosity Test Result:**

ISDV, Isododecane



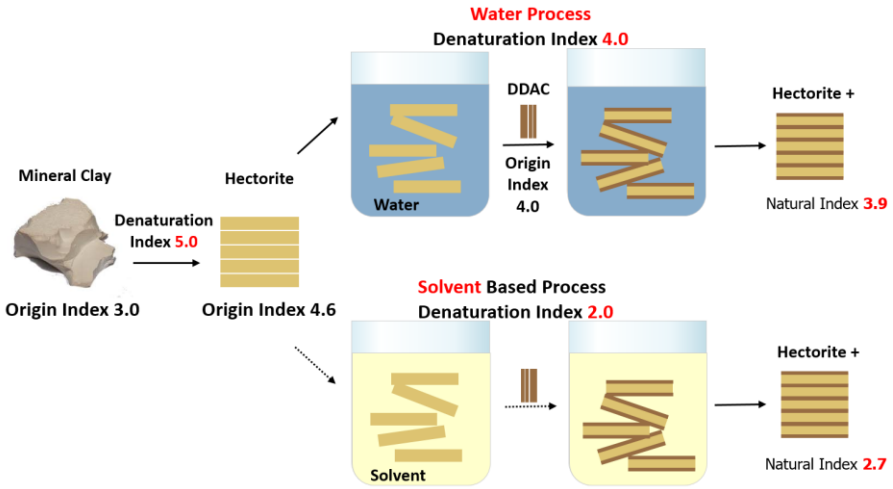
# HECTO 38V

SUNJIN BEAUTY SCIENCE

## Overview

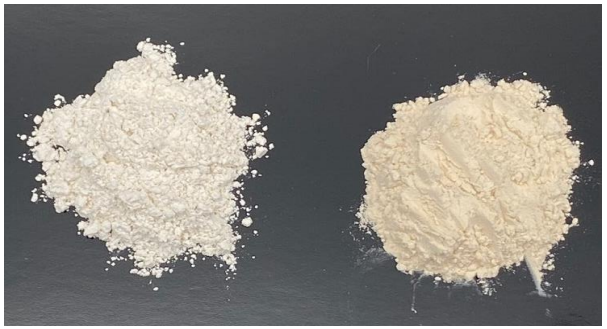
**HECTO 38V** is oil phase thickener by eco-friendly manufacturing process.

| Grade | INCI NAME |
|---|---|
| **HECTO 38V** | Disteardimonium Hectorite |




## Benefits

- Natural Index 3.9
- Less yellowish color



HECTO 38V
SUNJIN

Product 'B'
Company 'E'

INCI : Disteardimonium Hectorite
CAS No. : 97280-96-1

# Academic Paper published by SUNJIN

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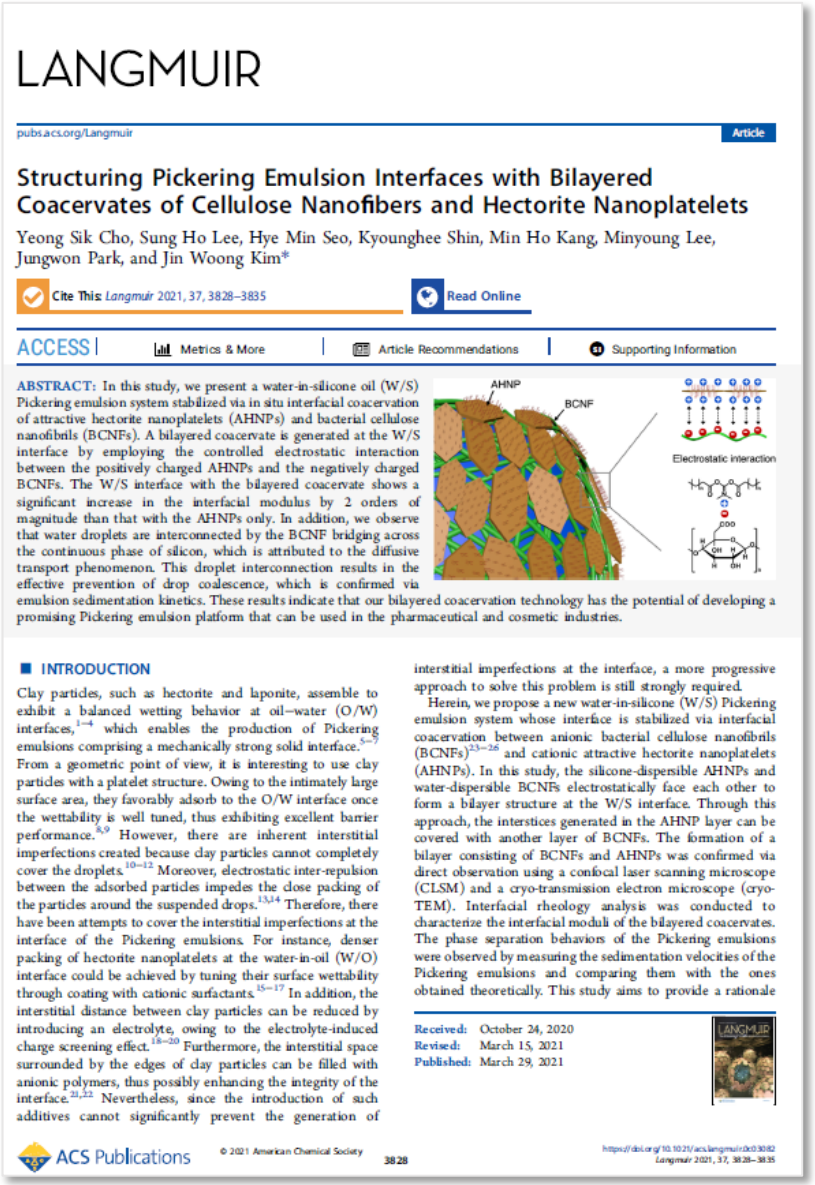

LANGMUIR

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## Structuring Pickering Emulsion Interfaces with Bilayered Coacervates of Cellulose Nanofibers and Hectorite Nanoplatelets

Yeong Sik Cho, Sung Ho Lee, Hye Min Seo, Kyounghee Shin, Min Ho Kang, Minyoung Lee, Jungwon Park, and Jin Woong Kim*

Cite This: *Langmuir* 2021, 37, 3828–3835 Read Online

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**ABSTRACT:** In this study, we present a water-in-silicone oil (W/S) Pickering emulsion system stabilized via in situ interfacial coacervation of attractive hectorite nanoplatelets (AHNPs) and bacterial cellulose nanofibrils (BCNFs). A bilayered coacervate is generated at the W/S interface by employing the controlled electrostatic interaction between the positively charged AHNPs and the negatively charged BCNFs. The W/S interface with the bilayered coacervate shows a significant increase in the interfacial modulus by 2 orders of magnitude than that with the AHNPs only. In addition, we observe that water droplets are interconnected by the BCNF bridging across the continuous phase of silicon, which is attributed to the diffusive transport phenomenon. This droplet interconnection results in the effective prevention of drop coalescence, which is confirmed via emulsion sedimentation kinetics. These results indicate that our bilayered coacervation technology has the potential of developing a promising Pickering emulsion platform that can be used in the pharmaceutical and cosmetic industries.



### INTRODUCTION

Clay particles, such as hectorite and laponite, assemble to exhibit a balanced wetting behavior at oil–water (O/W) interfaces,[1−4] which enables the production of Pickering emulsions comprising a mechanically strong solid interface.[5−7] From a geometric point of view, it is interesting to use clay particles with a platelet structure. Owing to the intimately large surface area, they favorably adsorb to the O/W interface once the wettability is well tuned, thus exhibiting excellent barrier performance.[8,9] However, there are inherent interstitial imperfections created because clay particles cannot completely cover the droplets.[10−12] Moreover, electrostatic inter-repulsion between the adsorbed particles impedes the close packing of the particles around the suspended drops.[13,14] Therefore, there have been attempts to cover the interstitial imperfections at the interface of the Pickering emulsions. For instance, denser packing of hectorite nanoplatelets at the water-in-oil (W/O) interface could be achieved by tuning their surface wettability through coating with cationic surfactants.[15−17] In addition, the interstitial distance between clay particles can be reduced by introducing an electrolyte, owing to the electrolyte-induced charge screening effect.[18−20] Furthermore, the interstitial space surrounded by the edges of clay particles can be filled with anionic polymers, thus possibly enhancing the integrity of the interface.[21,22] Nevertheless, since the introduction of such additives cannot significantly prevent the generation of interstitial imperfections at the interface, a more progressive approach to solve this problem is still strongly required.

Herein, we propose a new water-in-silicone (W/S) Pickering emulsion system whose interface is stabilized via interfacial coacervation between anionic bacterial cellulose nanofibrils (BCNFs)[23−26] and cationic attractive hectorite nanoplatelets (AHNPs). In this study, the silicone-dispersible AHNPs and water-dispersible BCNFs electrostatically face each other to form a bilayer structure at the W/S interface. Through this approach, the interstices generated in the AHNP layer can be covered with another layer of BCNFs. The formation of a bilayer consisting of BCNFs and AHNPs was confirmed via direct observation using a confocal laser scanning microscope (CLSM) and a cryo-transmission electron microscope (cryo-TEM). Interfacial rheology analysis was conducted to characterize the interfacial moduli of the bilayered coacervates. The phase separation behaviors of the Pickering emulsions were observed by measuring the sedimentation velocities of the Pickering emulsions and comparing them with the ones obtained theoretically. This study aims to provide a rationale

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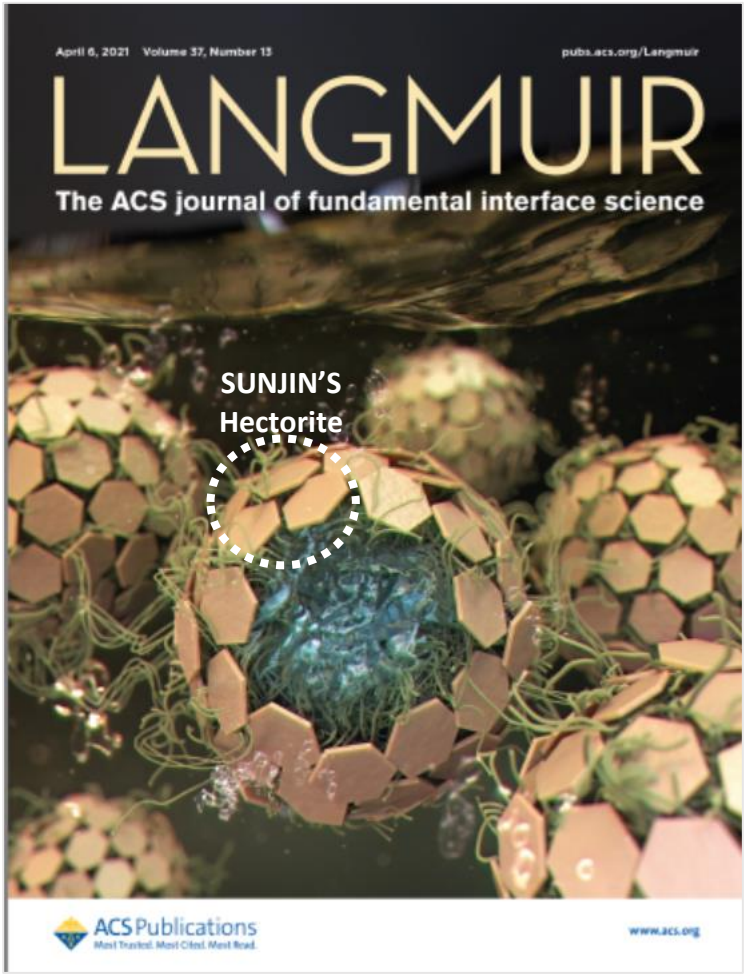


## Front Cover at LANGMUIR April 2021