

Z-Emuslix D-10

D-phase Emulsifier

Innovative emulsifier technology creating multi-sensory experiences and convenient oil-based solutions



Definition & Technical Origin

Technical Definition

Homogeneous D-phase gel network formed by nonionic surfactants and polyols.

Through two-phase transitions of oil dispersion and water dilution, it spontaneously builds a 50–200 nm nanoemulsion system.

Origin of Technology

D-phase emulsification method is an innovative emulsification technology developed by Sagitani's team in 1983 based on the PIC method - a mature technical route validated over 40 years in the cosmetics field

Process Characteristics

Surfactant dosage reduced to 3%-5%; energy consumption only 20%-30% of high-pressure homogenization.

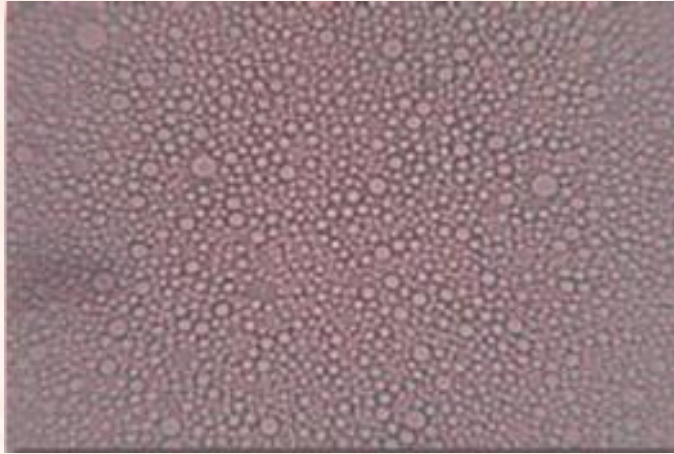
Produced emulsions feature >92% light transmittance with physical stability over 6 months.

Advantages of D-phase Emulsification

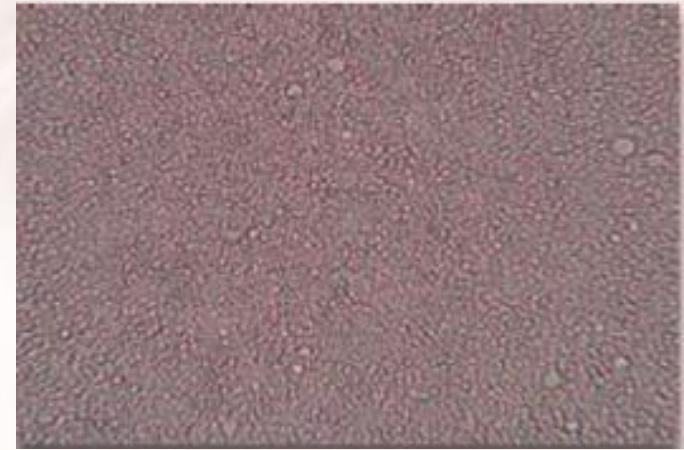
Low Energy Consumption

D-phase emulsification requires no homogenization

Conventional Emulsification



D-phase Emulsification



With an identical formulation, D-phase emulsification delivers noticeably smaller and more uniform particles.

Small particle size with narrow distribution

Emulsions made by D-phase technology feature small average droplet size and uniform distribution for superior stability.

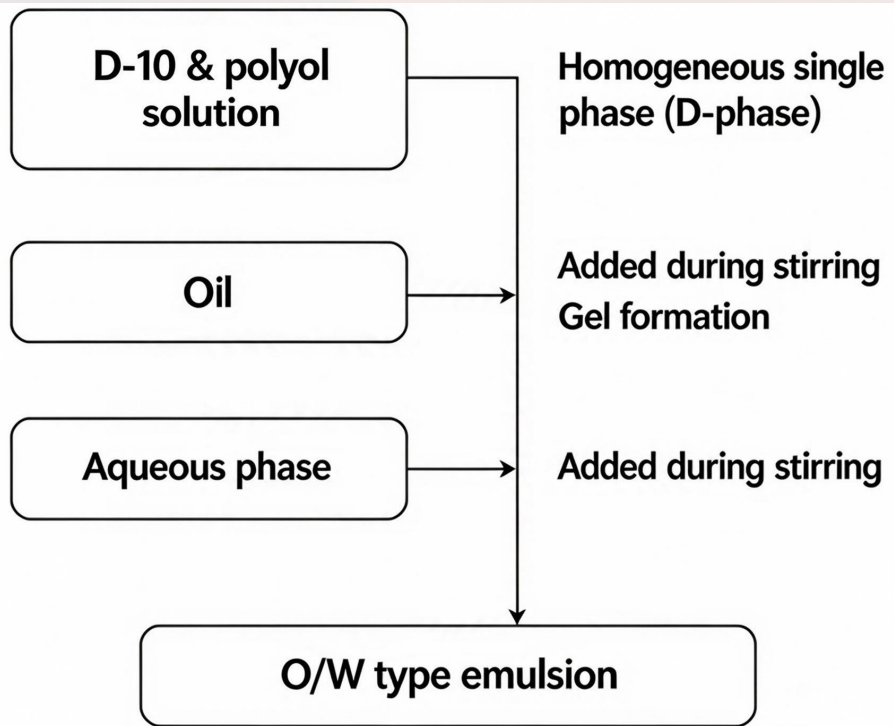
Low emulsifier dosage

D-phase emulsification requires no large amount of emulsifier, with flexible requirements for emulsifying temperature.

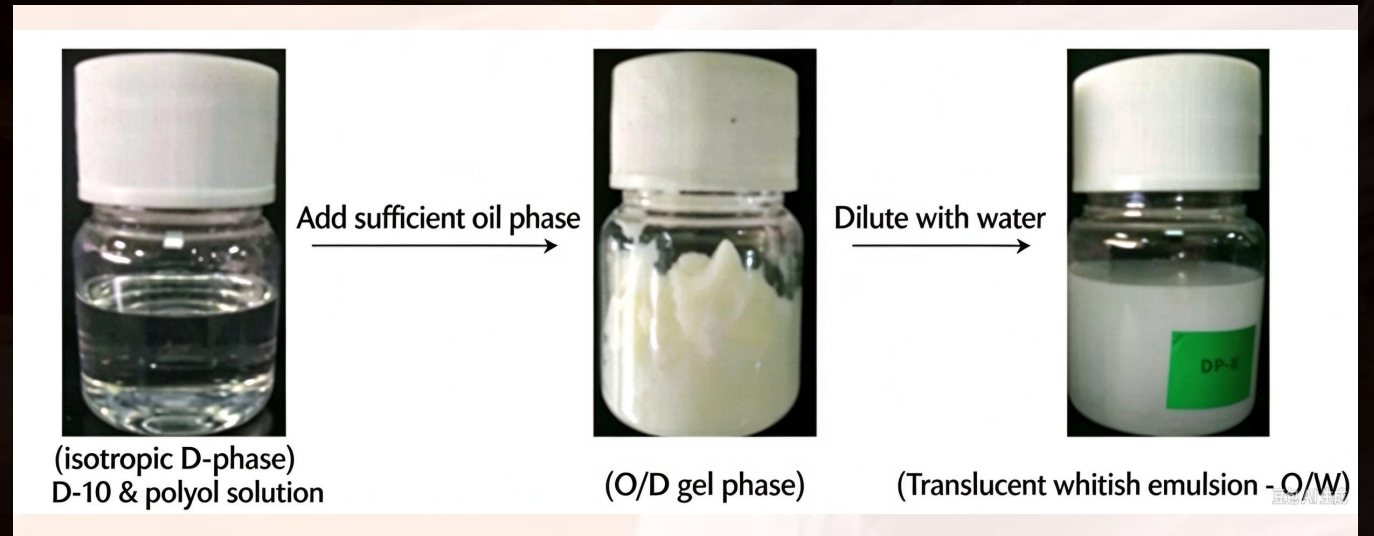
Wide range of oils emulsifiable

Compatible with a broad range of oils, including plant oils with complex compositions.

Flow Chart



D-phase Emulsification & Its Mechanism

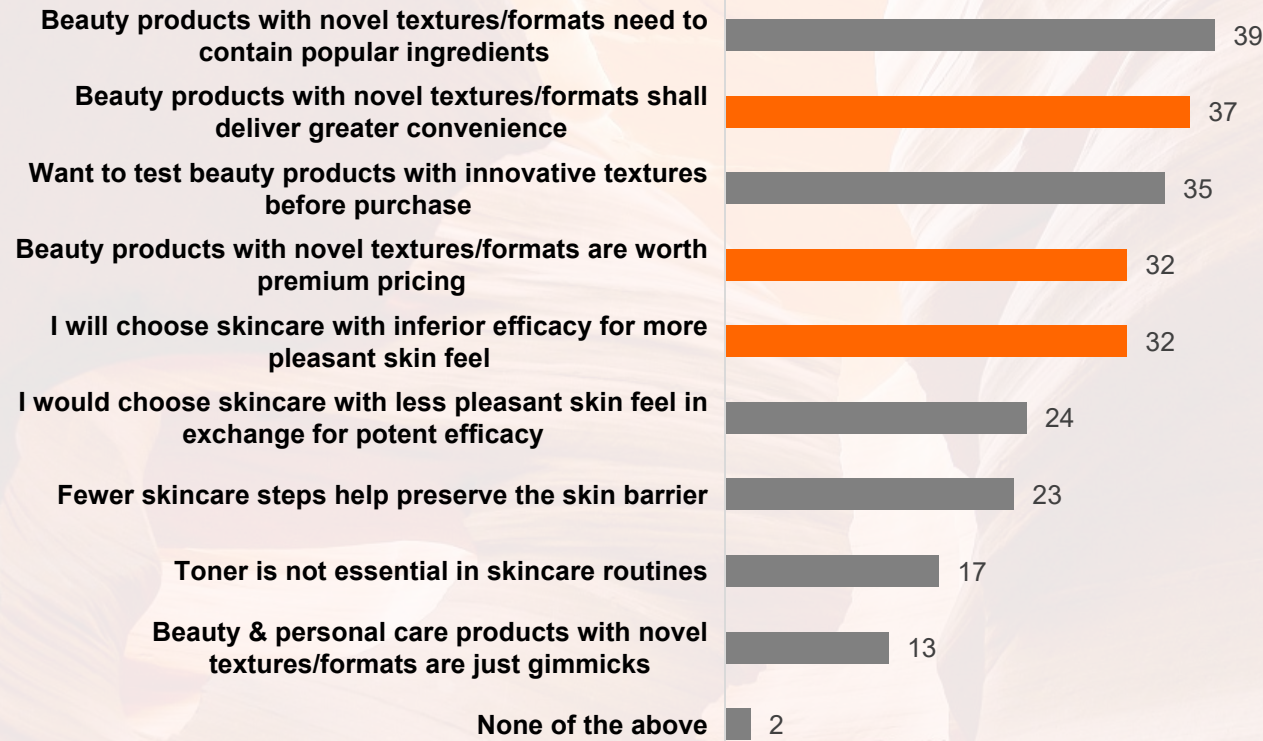


Once the D-phase is prepared, add oil phase. At oil loading up to 70%, a translucent or clear O/D gel forms. Water is then added slowly. Driven by self-assembly, the emulsion forms spontaneously.

Novel Textures Unlock Multi-Sensory Experiences



**Consumer Attitudes
toward Form & Texture**
Mintel Consumer Survey 2023



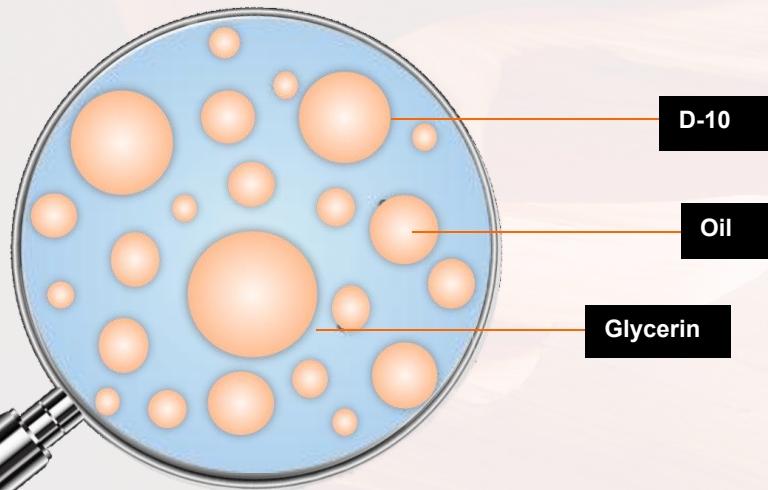
Source: Mintel - based on 3,000 internet users aged 18-59

**// Consumers
Prefer Pleasant
User Experience //**

- Emotional benefits and sensory experience matter
- Innovative/novel textures help elevate and increase price premium

Z-Emuslix D-10

A powerful EO-free emulsifier that easily creates transparent D-phase oil gels and O/W formulations



Z-Emuslix D-10: Cocoamidopropyl Betaine,
Polyglyceryl-10 Laurate

Gel formed via high internal phase (typically >60%).
Stability is enabled by Cocamidopropyl Betaine.

This powerful emulsifier/stabilizer is delivered as a polyol phase, easily achieving clarity and minimum water content through refractive index matching.

Benefits of this specific structure:

- Suspension capability
- Enables preservative-free formulations

Product Information

INCI: Cocoamidopropyl Betaine, Water, Citric Acid, Polyglyceryl-10 Laurate

Z-Emuslix D-10 is an easy-to-use, high-efficiency **EO-free** emulsifier. It is designed for polyol oleogel and **O/W systems**, presenting translucent or transparent gel appearance that transforms into oil or emulsion upon application.

It meets consumer demands for innovative formats and textures, enabling sensory-breaking new products while delivering intensive nourishment and protection for skin, hair and scalp.

It is an ideal option for formulators to develop novel oil-base formulations aligned with beauty, health and self-care trends.

Recommended Dosage

2.5-5.5%

Solubility

Water-soluble

pH

4.5-6

Advantages

No strict HLB requirement, low dosage, low production energy consumption, fine & uniform particle size.

Maintains long-term shelf stability even in diluted emulsions; compatible with a wide range of oils for emulsification.



Appearance:
Pale yellow transparent
liquid

Application Fields of Z-Emuslix D-10

Z-Emuslix D-10 makes it possible to design products that deliver both emotional and functional wellness.

// New transformative textures //

// Non-greasy application //

// Ultra-gentle, preservative-free formulas //

// Enhanced care and lightness //



Skincare

Application Areas

- Nourishing balm
- O/W nanoemulsions, low-viscosity lotions, emulsion sprays
- Body massage balm, sleeping mask



Facial/ Body Cleansing

Application Areas

- Makeup-removing gel
- Body cleansing balm



Hair Care

Application Areas

- Pre-wash care: use instead of, or on top of, conditioner/hair mask (adjustable care)
- Post-color fragrance retention: improved softness & easier styling
- Pre-color use: scalp comfort & hydration

Crystal Essence Oil Cream XY260707-1

Formulated with innovative oil gel technology Z-Emuslix D-10. Precisely controls the fusion of oil and aqueous phases to build a stable, homogeneous gel structure. It delivers excellent skin compatibility for smooth, clean, non-greasy and soothing skin feel.

Reference Formula
Oil gel/custom lotion

Preparation
of Phase D

Add the oil phase to
form an O/D gel

Adjust the refractive
index to create a
transparent oil gel

Name	INCI	Content
Z-Emuslix D-10	Cocoamidopropyl Betaine, Water, Citric Acid, Polyglyceryl-10 Laurate	3.50%
Glycerin	Glycerin	20.00%
EMOGREEN L15	C15-19 Alkane	31.50%
GTCC	Caprylic/Capric Triglyceride	40.00%
Water	Water	5.00%

// Customizable Efficacy and Skin Feel //

Combined with various active serums, it forms an emulsion with customizable efficacy and skin feel.



Pre-wash Hair Oil Gel

XY260924-1

Hair Pre-wash Formula
Oil-gel,Self-emulsifying

Name	INCI	Content %
Z-Emuslix D-10	Cocoamidopropyl Betaine, Water, Citric Acid, Polyglyceryl-10 Laurate	3.50%
Glycerin	Glycerin	20.00%
DM5	Dimethicone	40.00%
GTCC	Caprylic/Capric Triglyceride	36.00%
Water	Water	0.50%



Pre-wash care:

Creates innovative textures and user-friendly oil-based solutions to push sensory boundaries, while delivering comfort and moisturization to the scalp.

Advantages

// Powerful nourishment/

// Excellent sensory experience//

//Lightweight & voluminous//



Preparation Process

01

Stage A: Thoroughly mix glycerin (polyol) and Z-Emuslix D-10 to form the D phase

02

Stage B: Mix all the oils, then slowly drip them into Stage A, observing the mixture and adjusting the stirring speed until an O/D gel forms

03

Stage C: Add water to the formed O/D gel to adjust the oil gel's transparency; it can be omitted if transparency is not required. Continued water addition forms an O/W emulsion system



Process Key Points

- Recommended dosage: 2.5-5.5%
- Recommended oil content: 60-80%
- Amount of external-phase solvent = $100\% - \text{oil}\% - \text{Z-Emuslix D-10}\%$
- Pure glycerin is the best solvent/filler for formulation stability
- In some cases, sorbitol can also be used

Oil Phase Addition Rate

The oil phase should be added slowly, especially at the initial stage; under laboratory conditions, add slowly at about 0.1 g/s

Temperature Control

Generally carried out between room temperature and 80 °C. It is recommended to keep the temperature difference among oil phase, D phase and water phase within 10 °C to avoid system instability caused by cold shock or abrupt heating.

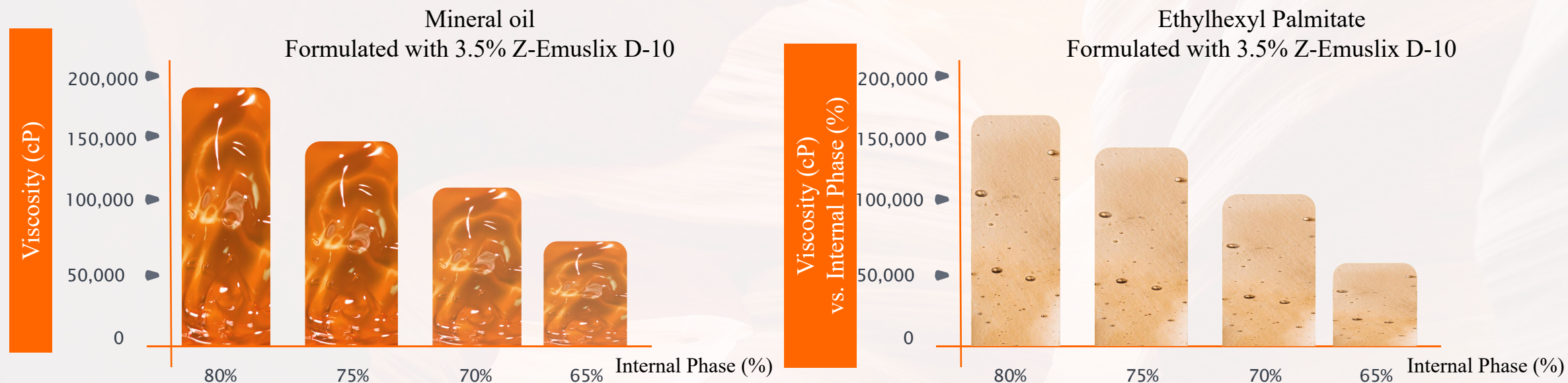
Stirring Method and Shear Conditions

Magnetic stirring or paddle stirring can be used in the laboratory at 300–600 rpm. Anchor or paddle stirrers can be adopted for industrial production. High-shear homogenizer is normally not required; low shear is sufficient to avoid introducing excessive air bubbles. If the O/D gel is too viscous for stirring, the temperature can be raised appropriately to reduce viscosity.

Water Phase Dilution Method

The O/D gel and aqueous phase can be mixed in either order; gel-in-water is commonly applied in practice. Prepare the aqueous phase first, then add the gel phase in one batch or multiple portions. For high-viscosity systems or scale-up production, addition in 3–4 portions is recommended, with 1–2 minutes stirring for each portion to prevent sudden local concentration changes. Maintain continuous stirring throughout until the emulsion is fully homogeneous.

Managing Formulation Viscosity



Conclusion Summary:

Internal phase: Viscosity is positively proportional to oil level.

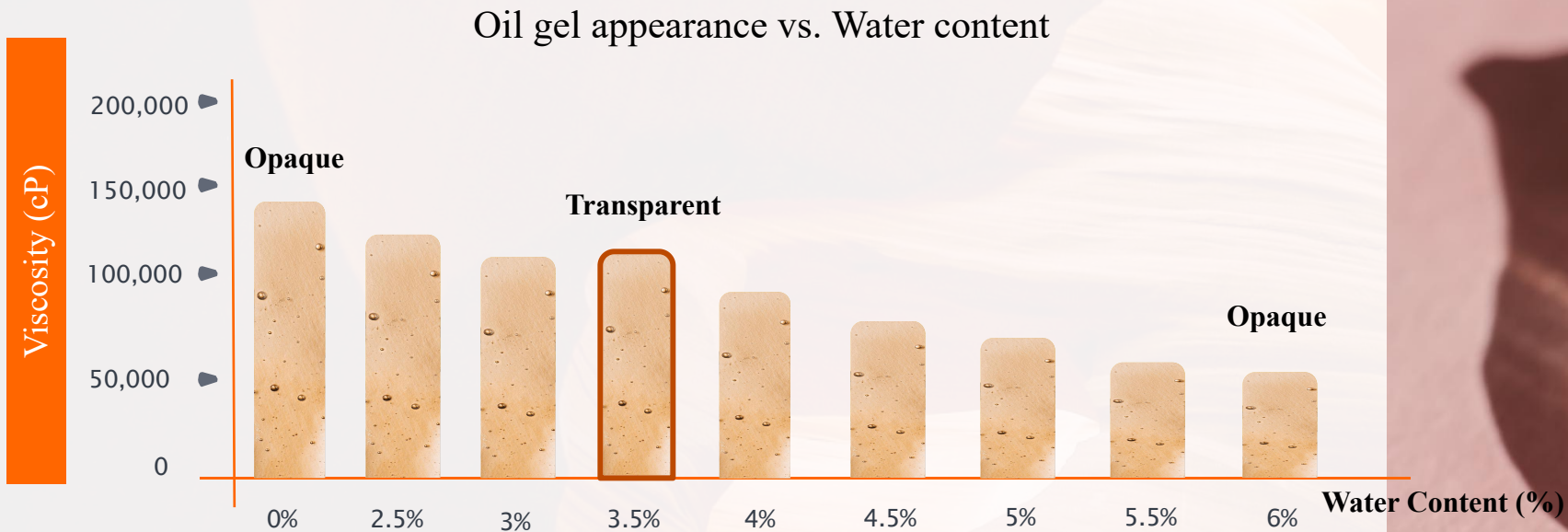
Oil Compatibility Notes:

Highly compatible oils: mineral oil, light synthetic oils (e.g. isononyl isononanoate, caprylic/capric triglyceride), low-polarity oils

Least compatible oils: high-polarity oils, silicone gels and silicone resin derivatives

Oils with refractive index very close to that of glycerin, e.g. mineral oil and Cyperus Esculentus Root Oil (glycerin RI = ~ 1.473 , mineral oil RI = ~ 1.461 , Cyperus Esculentus Root Oil = ~ 1.454 - 1.469)

Achieving Clarity



Oil content: 75%

Oil: Ethylhexyl Palmitate (RI= $\sim$ 1,445); 5% Z-Emuslix D-10, 20% Glycerin



THANK YOU

Add: Unit 338, Geochemistry Institute of the Chinese Academy of Science,
Kehua Road, Guangzhou, China
Website: <https://greenzn.net/>

