Influence of the emollient polarity on the properties of cosmetic emulsion containing lamellar liquid crystals

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Influence of the emollient structure on the properties of cosmetic emulsions containing lamellar liquid crystals

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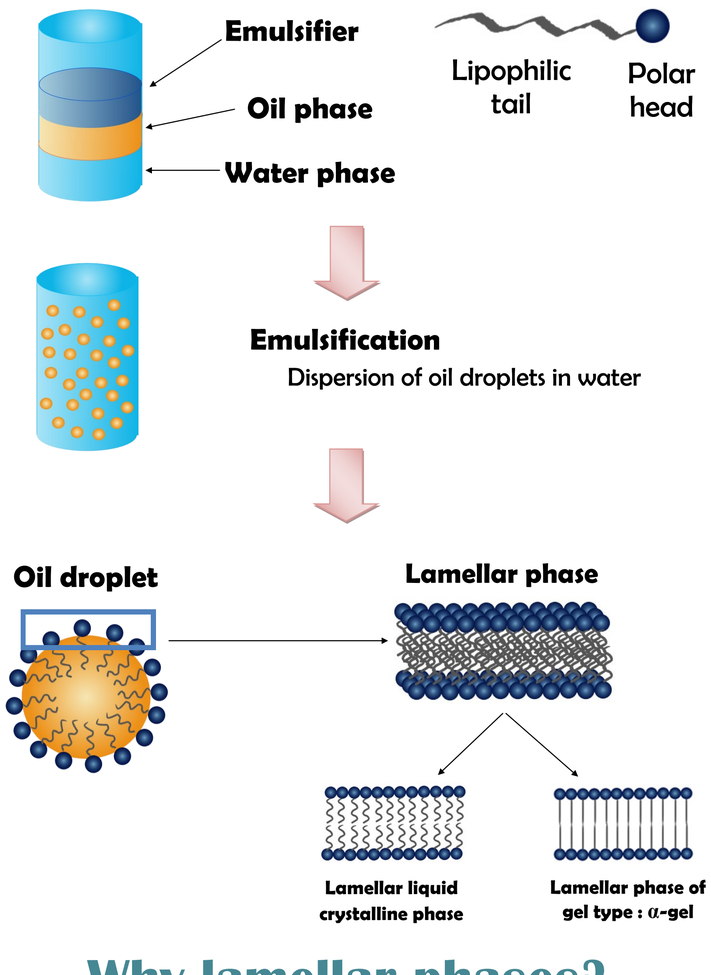
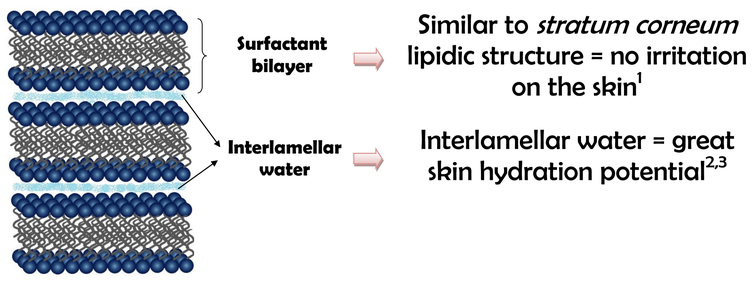
Aim

The aim of this study is to understand the influence of the emollient structure on the properties of cosmetic emulsions containing lamellar liquid crystals.

Emulsion



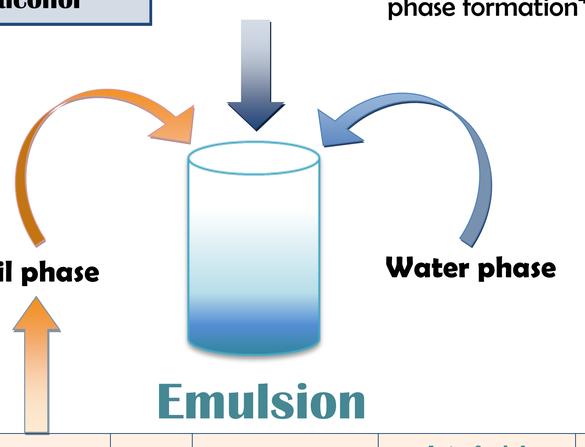
Why lamellar phases?



Formulation

Alkylpolyglucoside / Fat alcohol → **Emulsifier**

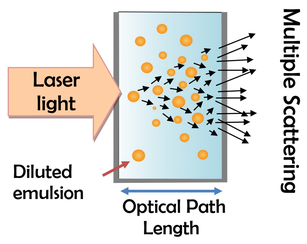
Known for the lamellar phase formation[4]



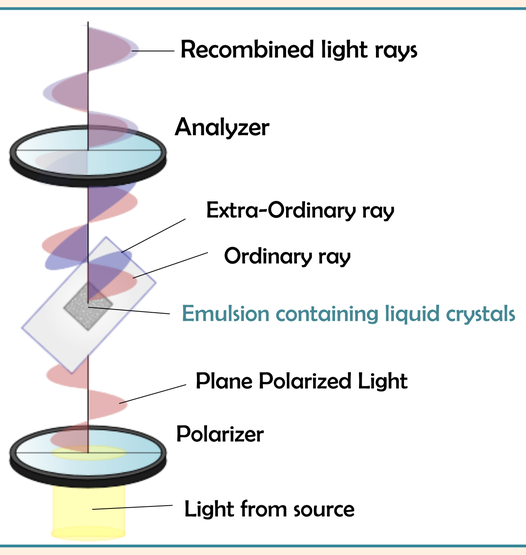
Name	Abr.	Chemical structure	Interfacial tension vs water (mN/m)	
Mineral oil	MO	Hydrocarbons mixture	54	Nonpolar
Isohexadecane	IHD	$C_{16}H_{34}$	43,61	
Ethylhexyl palmitate	EHP	$C_{24}H_{48}O_2$	30,11	Polar
Ethylhexyl stearate	EHS	$C_{26}H_{52}O_2$	29,78	
Propylene glycol dicaprylate/ dicaprate	PGDD	$C_{39}H_{76}O_8$	22,02	
Caprylic/Capric Triglyceride	CCT	$C_{21}H_{40}O_5$	13,49	
Cocoglycerides	COCOG	Blend of Mono-, Di- and Triglycérides	8,37	

Methods

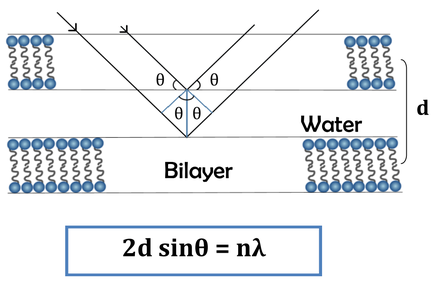
Granulometry



Polarized light Microscope



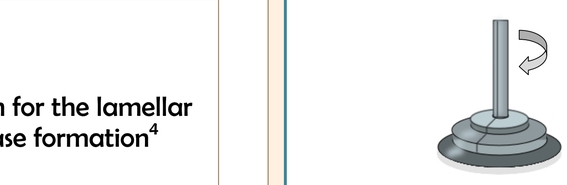
Wide-angle X-ray diffraction



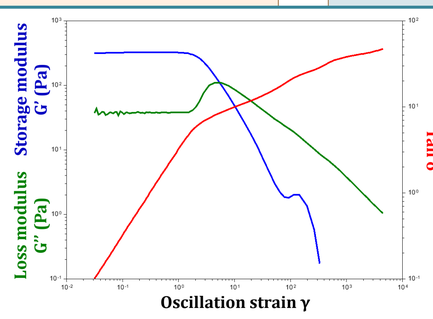
$$2d \sin\theta = n\lambda$$

Rheology

Oscillatory test
Amplitude sweep

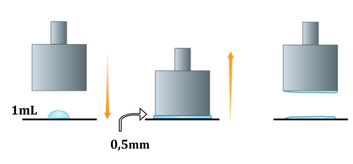


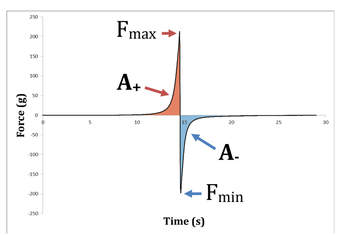
$\tan\delta = G''/G'$



Texture analysis

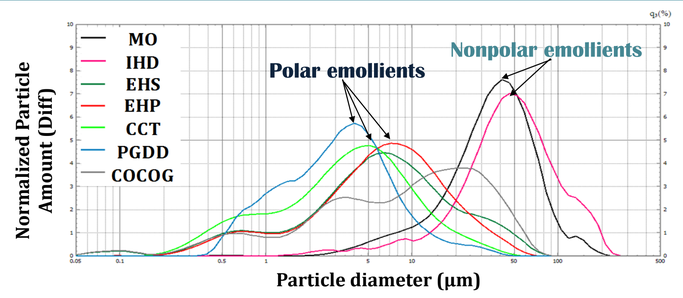
Compression test





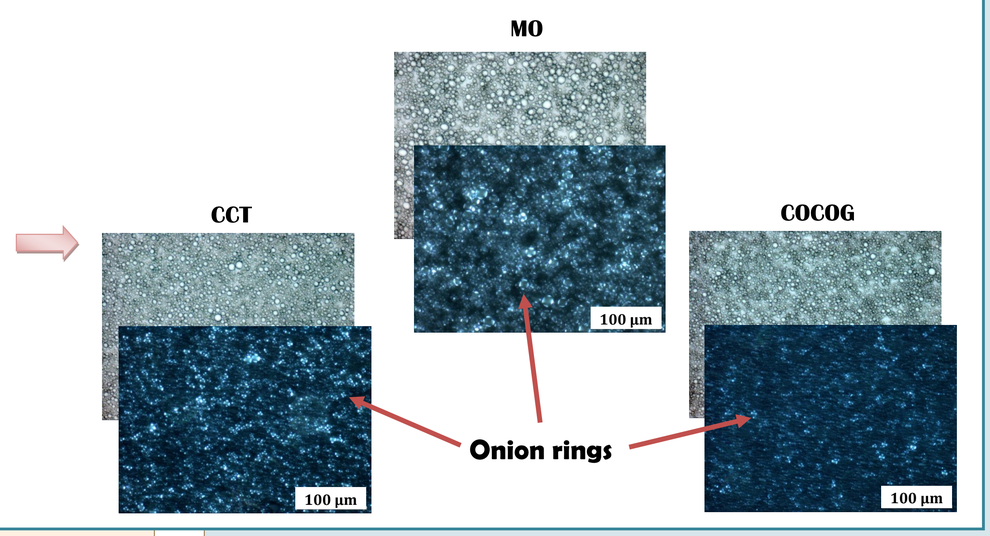
Results

Emulsions containing nonpolar oils ↗ droplet size

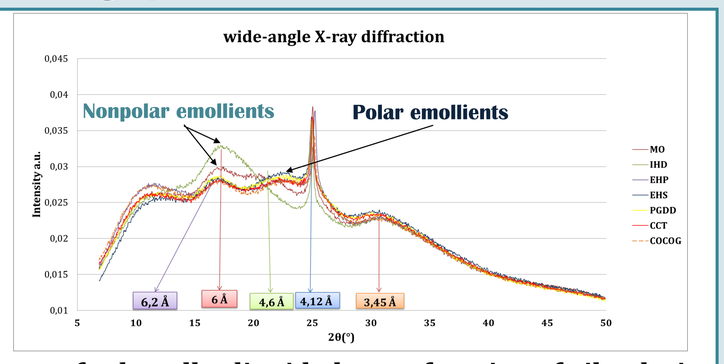


Results coherent with microscopic observations

Lamellar phases formation proved by the presence of « Onion rings »

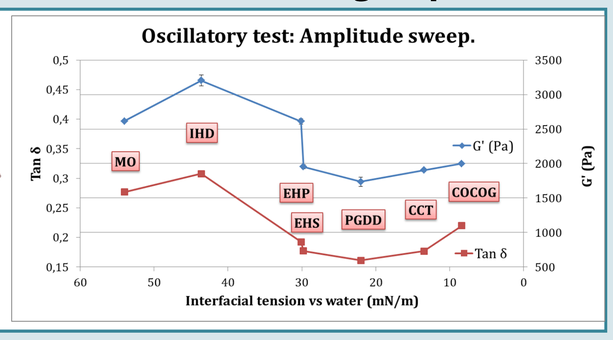


α-gel present in all emulsions at 4,12 Å[5]

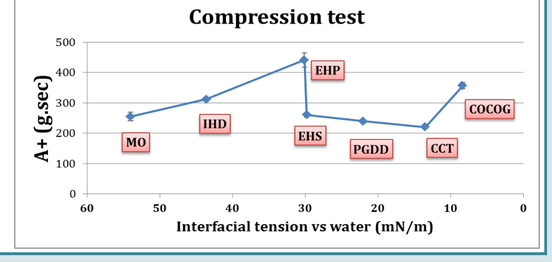


Distances for lamellar liquid phase ≠ function of oil polarity

Tanδ ↗ for the emulsions containing nonpolar oils



No direct link between emollient polarity and texture properties



Conclusion

Emollient structure has an impact on the properties of cosmetic emulsions like:

- **Droplet size (↘ for polar oils)**
- **Microstructure (visually emulsions are finer for polar oils)**
- **Lamellar phase formation (oil polarity impacts the structure of lamellar liquid phase)**
- **Viscoelastic behavior (tanδ polar oils < tanδ nonpolar oils)**

Perspectives

- Sensory analysis of the emulsions. Are the differences between polar and nonpolar oils perceptible?
- Determination of the emollient impact on lamellar phases hydration capacity.

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