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Understanding the interactions between natural surfactant/co-surfactant of Alkyl polyglucoside/Fatty alcohol type through pseudo-ternary phase diagram

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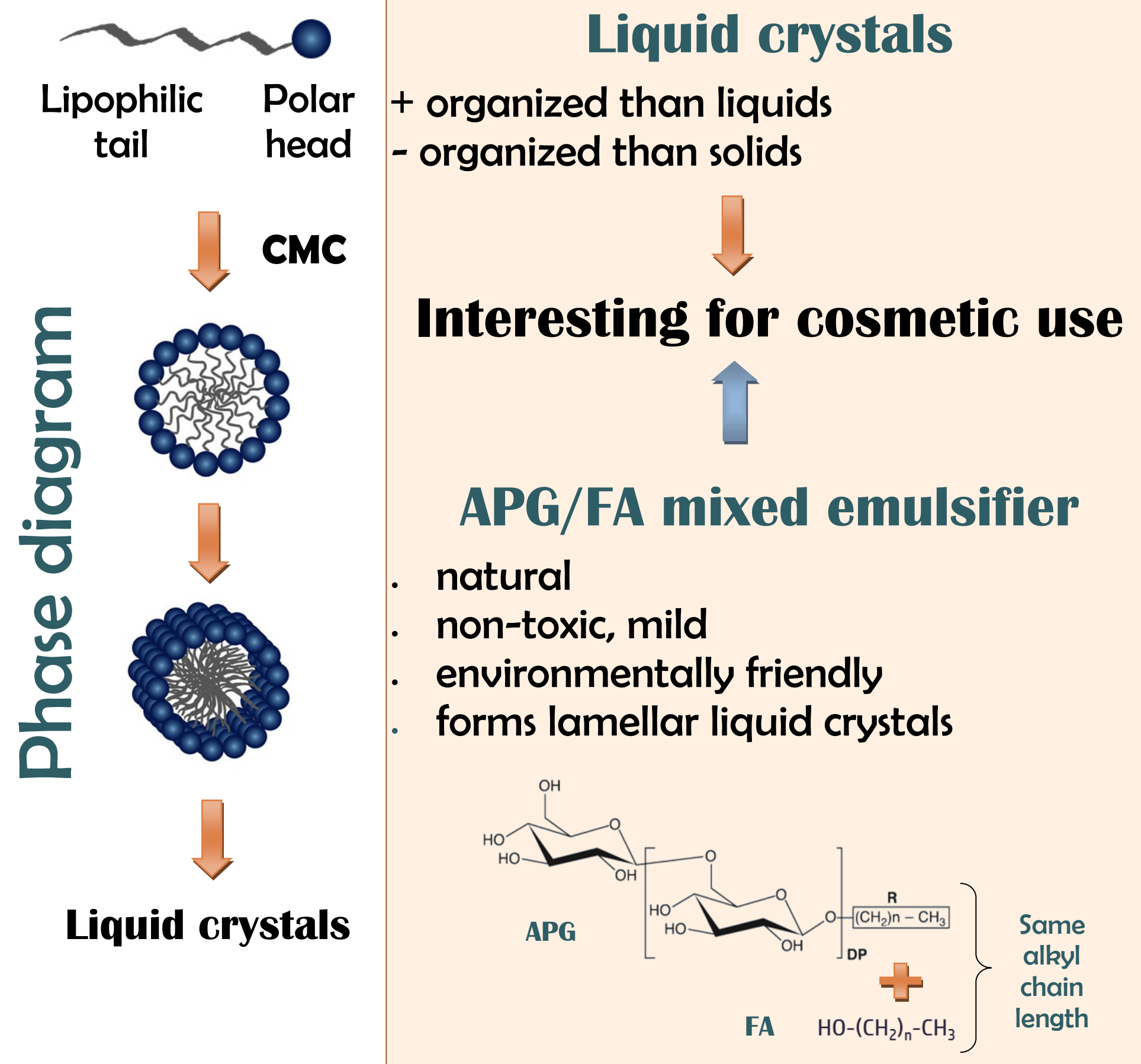
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Aim

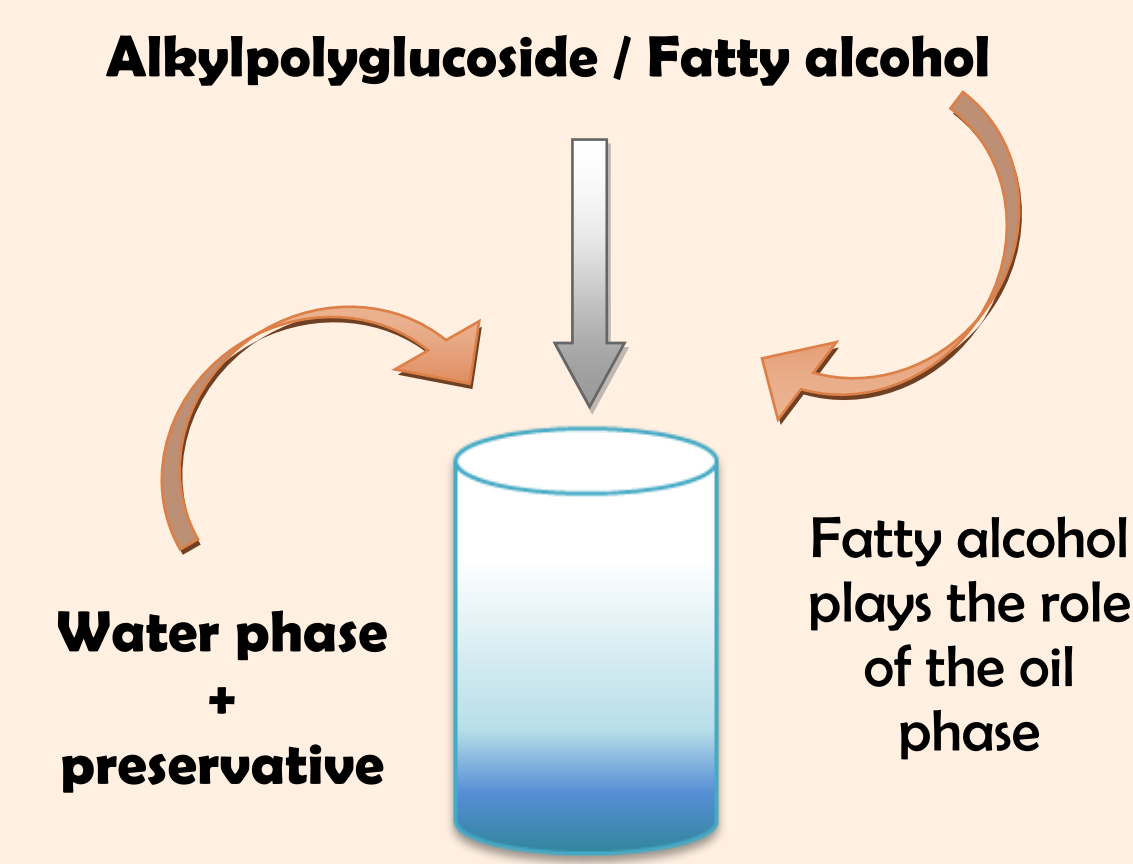
Investigation of possible interactions between the surfactant alkyl polyglucoside (APG) and the co-surfactant fatty alcohol (FA) through the pseudo-ternary phase diagram, mapped at 25°C. Transition between the fundamental research on the mixed surfactant behavior towards its interest in cosmetic field.

Introduction



Systems & Methods

Systems - auto emulsions



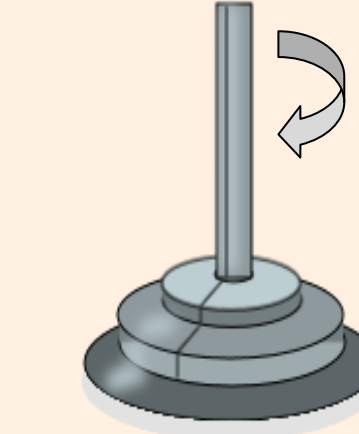
APG/FA	% of use in auto-emulsions
84.5/15.5	0.5% → 30%
20/80	0.5% → 30%

Rheology

Oscillatory tests:

Strain sweep — viscoelastic domain

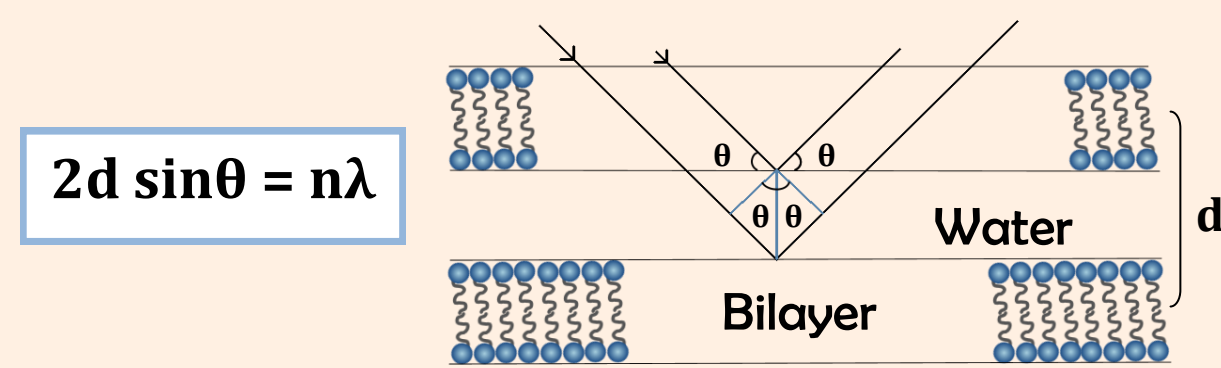
Frequency sweep — liquid crystal phases specific behavior



G' - storage modulus
 G'' - loss modulus
 $\tan \delta = G''/G'$

Wide-angle X-ray diffraction

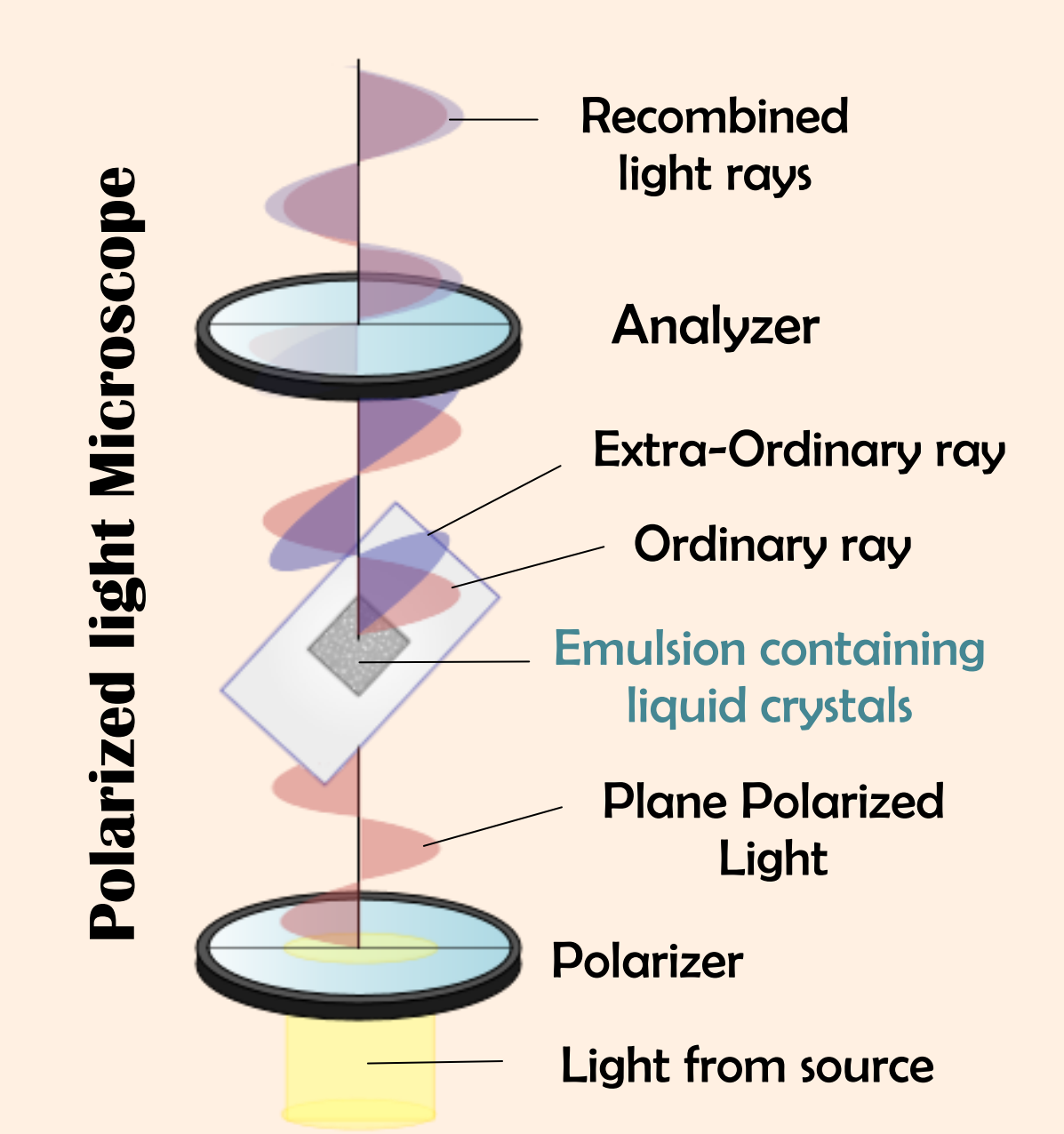
d → the liquid crystal organization.
WAXD was mostly applied to lamellar phase analysis



Microscopy

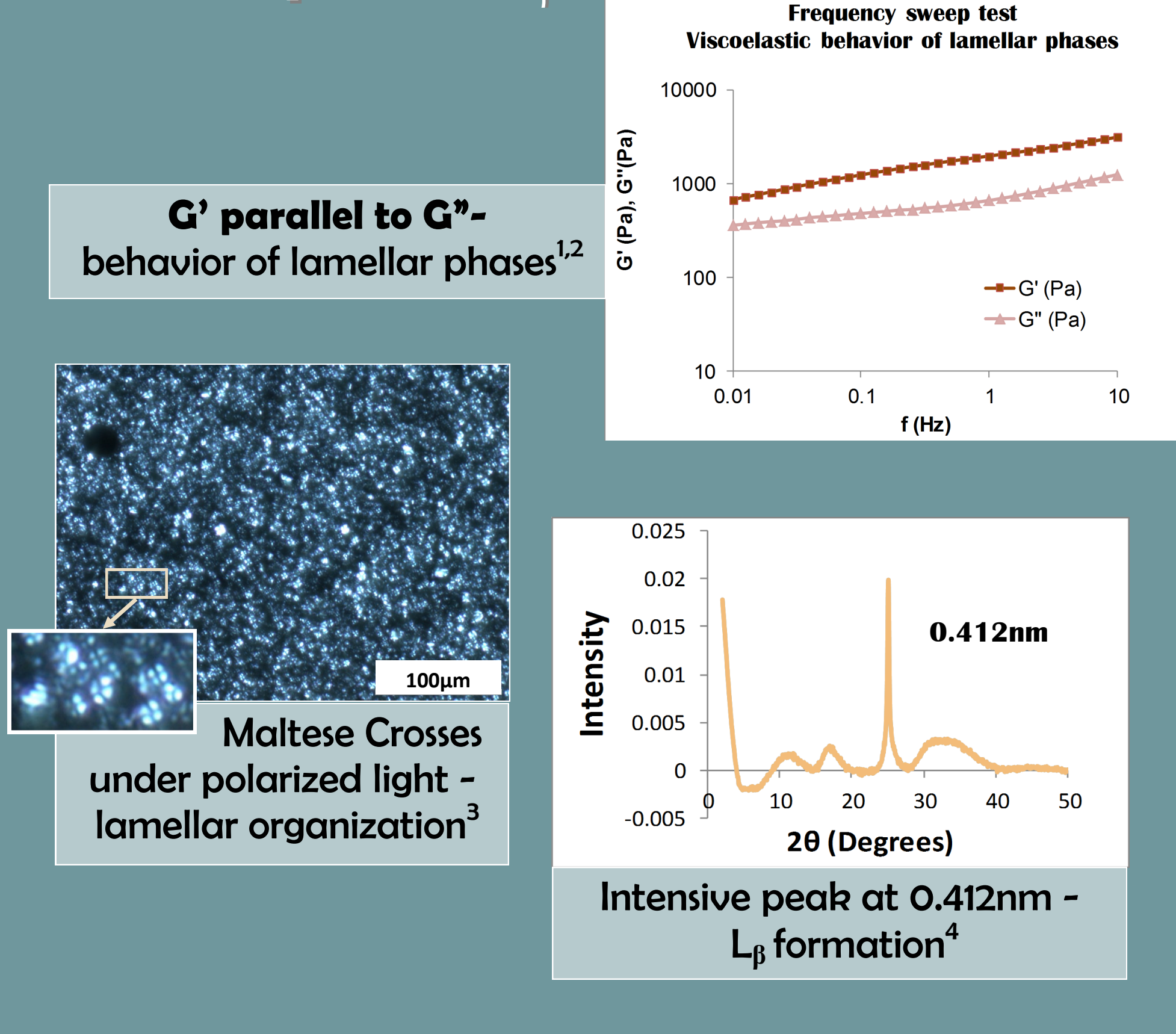
Bright light microscopy

Cross-polarized light microscopy — observation of birefringent structures

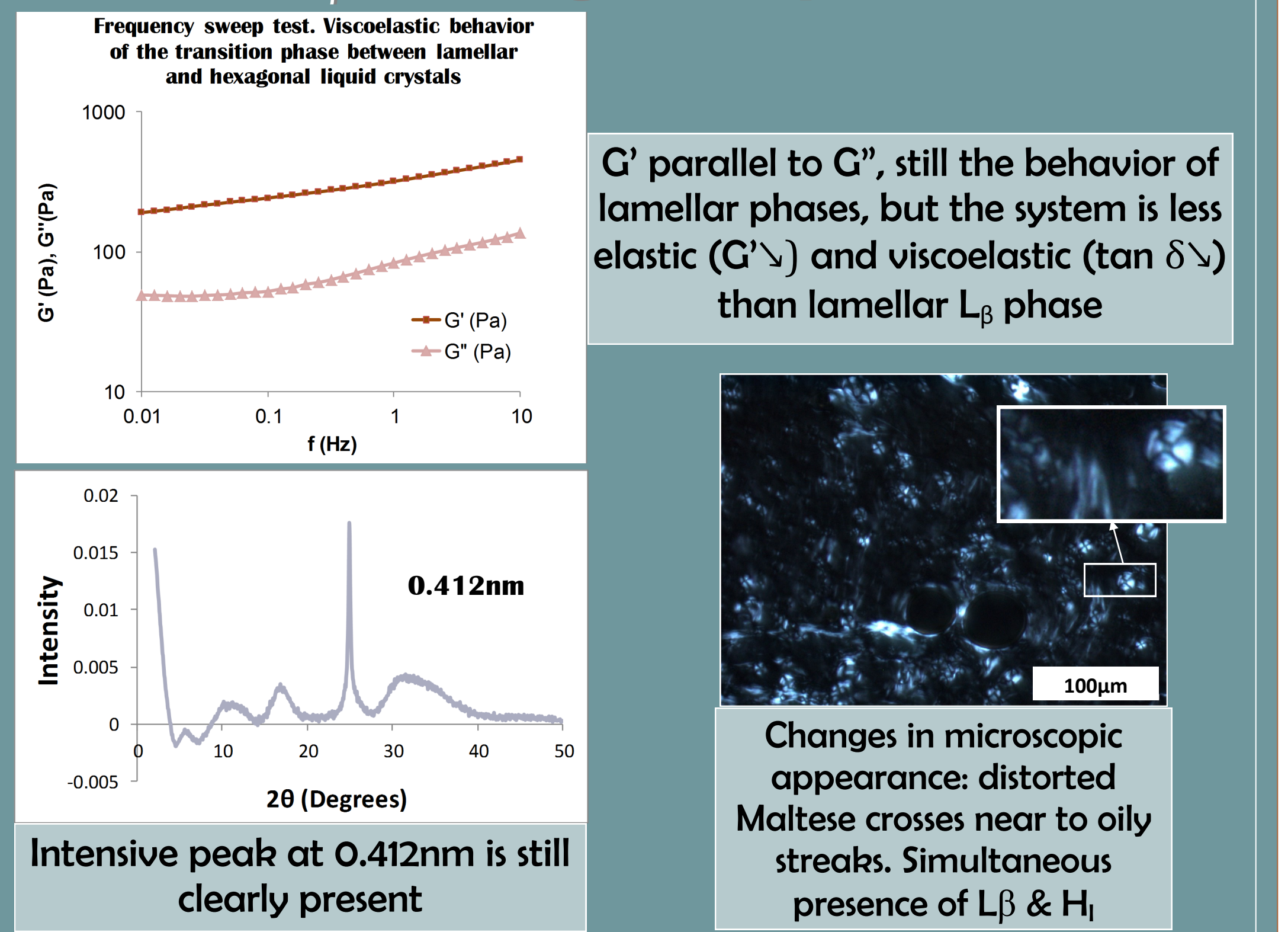


Results - Phase diagram

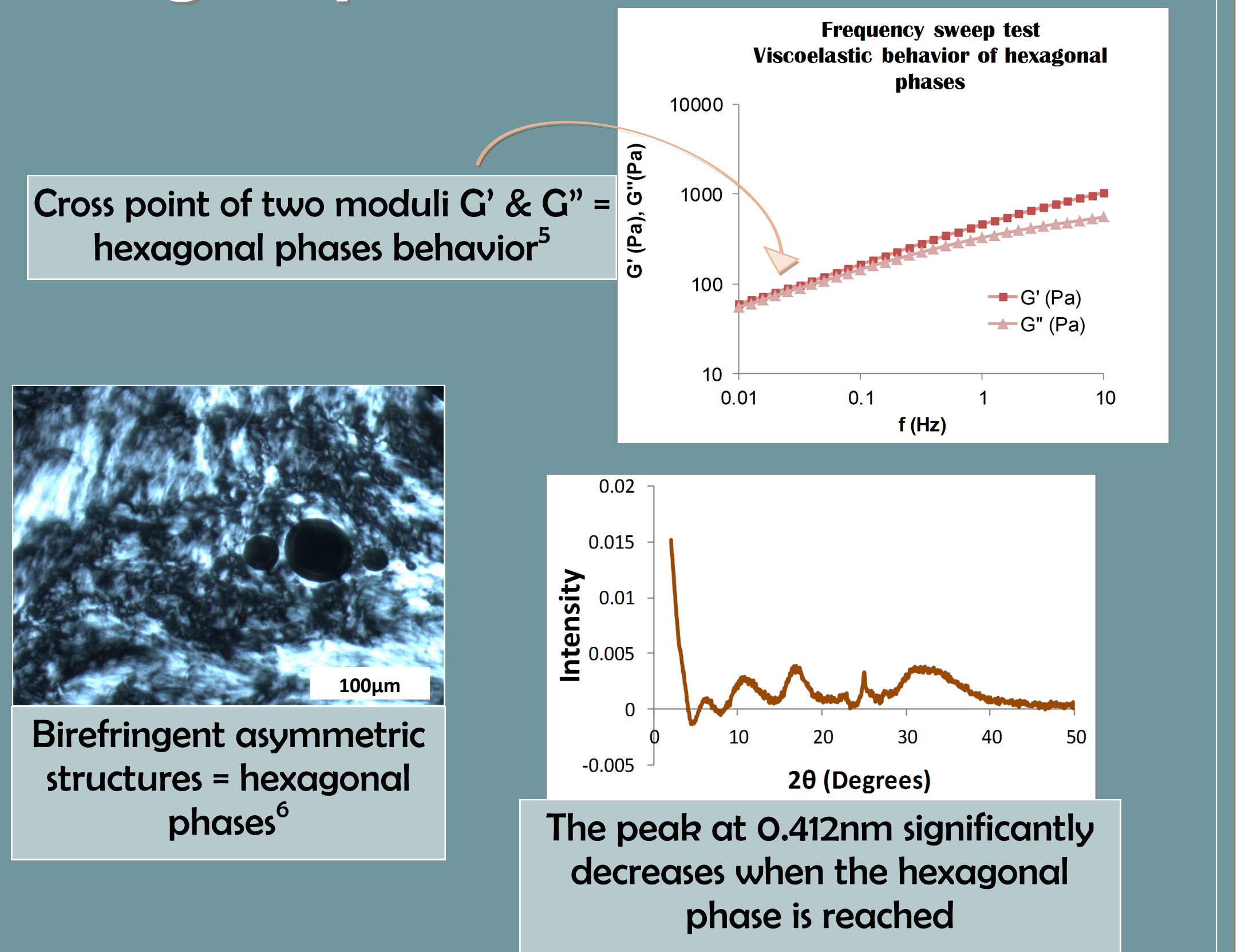
Lamellar phase - L_β



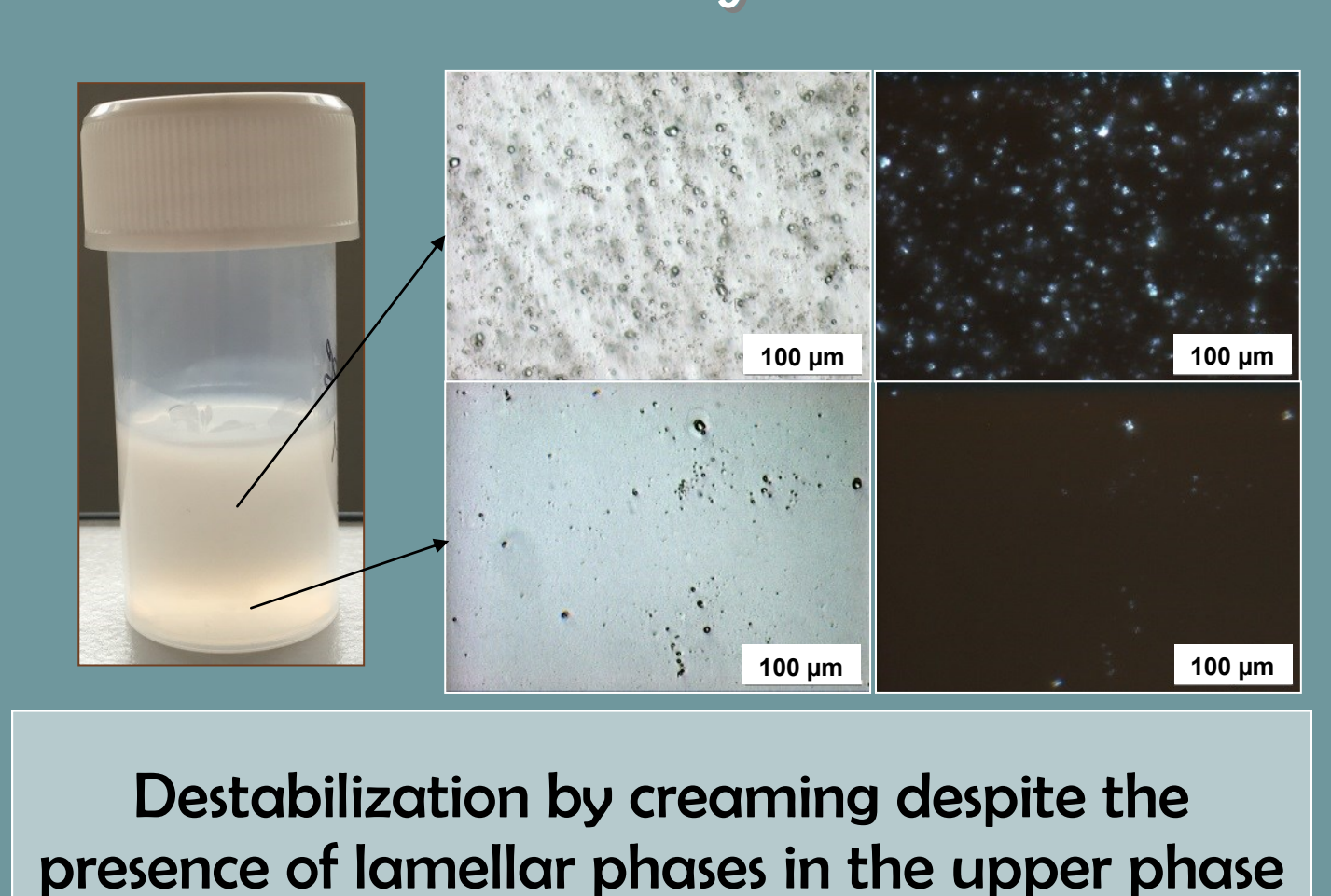
Lamellar L_β to hexagonal H_1 phase transition



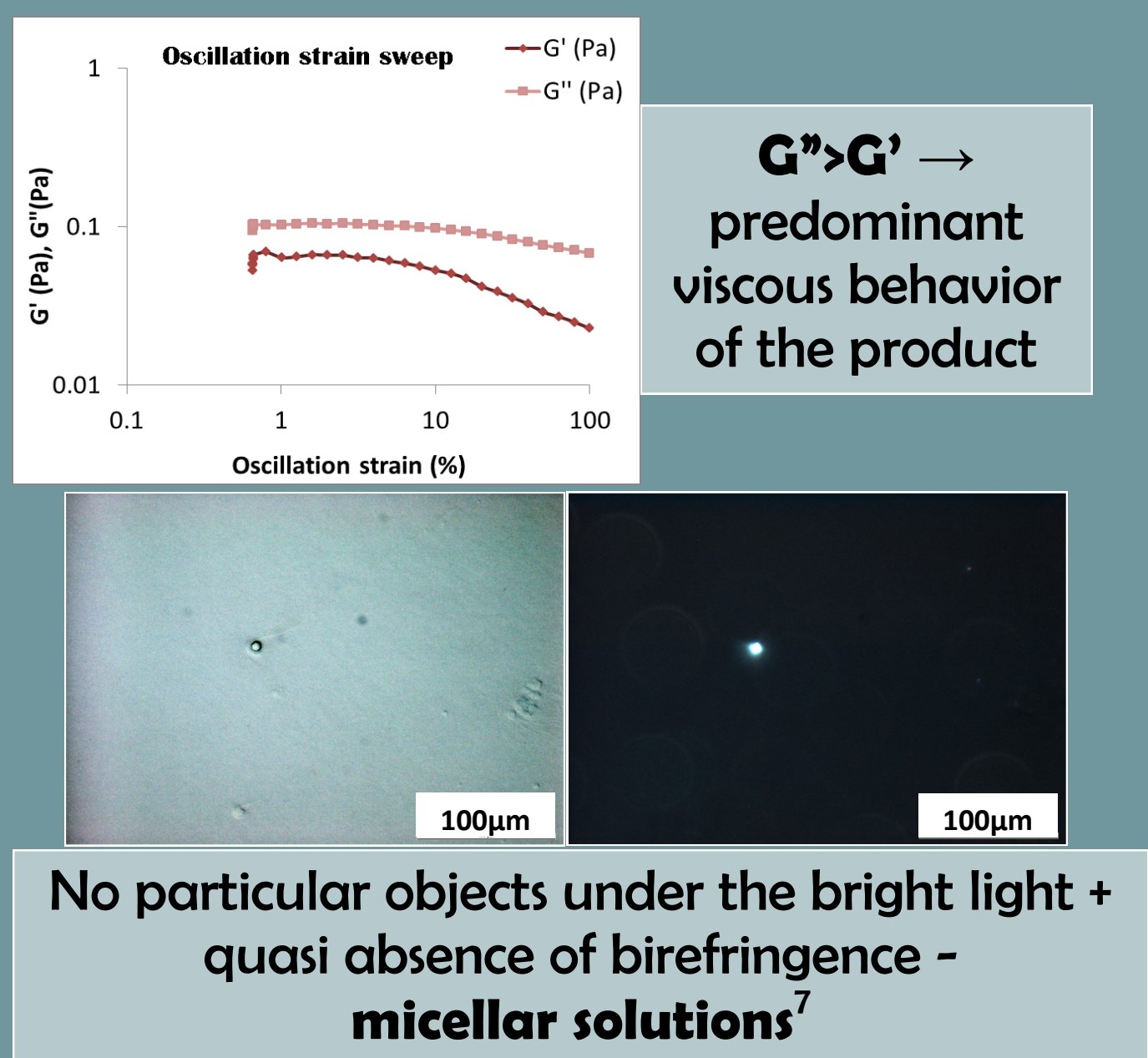
Hexagonal phase H_1



Instability zone



Micellar solution - L_1



Conclusion

From fundamental and industrial point of view:

- Controlling the ratio of an emulsifier/co-emulsifier mixture = controlling the liquid crystalline form(s) of the system;
- Controlling the liquid crystalline forms of the system = controlling the microscopic & macroscopic properties of final formulations.

References

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