

Lamellar Liquid Crystals (LLC): Biomimetic Stratum Corneum Intercellular Lipids (Engineering Review 2025)

Por Cristiano Ricardo · Publicado em 21/04/2025

Technical dermocosmetic engineering lecture by Prof. Cristiano Ricardo on lamellar liquid crystals (LLC): biomimetic stratum corneum intercellular lipids (Colloidal Chemistry & Stratum Corneum Biomimetics), featuring colorful schematic diagrams and clinical data.

Versão online e eventuais atualizações:

<https://professor.cristianoricardo.com/post/lamellar-liquid-crystals-llc-biomimetic-stratum-corneum-intercellular-lipids-2025-04-21>

Colloidal Chemistry & Stratum Corneum Biomimetics · Cosmetic Engineering & Science

Unlike spherical droplet emulsions, lamellar liquid crystalline networks form layered bilayers that mirror human epidermal architectures.

Engineering Mechanism & Kinetic Flowchart

Standard Emulsion Droplet

Isolated Oil Core

Lamellar L-? Bilayer Network

Swollen water layers trapped between lipid sheets

Thermodynamic Self-Assembly in the L-alpha Phase

Combining non-ionic alkyl polyglucosides (e.g., Cetearyl Glucoside) with fatty alcohols (Cetearyl Alcohol) creates lamellar gel networks. Swollen interlamellar water sheets prevent solvent evaporation, creating an in-reservoir reservoir that continuously releases moisture to the stratum corneum.

Clinical Reduction of Transepidermal Water Loss (TEWL)

Because their spacing matches the 13-nm repeat periodicity of native human epidermal lamellae, LLC formulations fuse spontaneously with corneocyte lipid envelopes, restoring impaired skin barriers in atopic dermatitis and chemical peel recovery without occlusive comedogenicity.

Polarized Light Microscopy Diagnostics

Under cross-polarized microscopy, lamellar liquid crystals exhibit distinctive birefringent 'Maltese Cross' optical patterns, serving as an in-process quality control fingerprint of successful multi-lamellar vesicle assembly.

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