Engineered Nanocarriers and SLN vs NLC and Phospholipid Liposomes — Engineering Review 2026

Por Cristiano Ricardo · Publicado em 26/11/2026

Technical dermocosmetic engineering lecture by Prof. Cristiano Ricardo on engineered nanocarriers: sln vs nlc and phospholipid liposomes (Nanobiotechnology & Controlled Delivery Systems), featuring colorful schematic diagrams and clinical data.

Versão online e eventuais atualizações:
https://cristianoricardo.com/post/engineered-nanocarriers-sln-vs-nlc-and-phospholipid-liposomes-2026-11-26

Nanobiotechnology & Controlled Delivery Systems · Cosmetic Engineering & Science

Penetrating the lipid-rich stratum corneum while preserving active molecular stability requires customized nanocarrier architectures.

Engineering Mechanism & Kinetic Flowchart

Liposome Vesicle

Hydrophilic Core

Solid Lipid (SLN)

Perfect Crystal Matrix

Nano Lipid (NLC)

Unstructured Oil/Fat

Phospholipid Vesicular Envelopes

Liposomes consist of concentric phosphatidylcholine bilayers capable of entrapping water-soluble actives (e.g., Vitamin C, peptides) in internal compartments and lipophilic actives (e.g., Retinol, CoQ10) within lipidic membranes, increasing transfollicular transport.

Solid Lipid Nanoparticles (SLN) vs Nanostructured Lipid Carriers (NLC)

SLNs utilize solid fats (cetyl palmitate, tristearin); however, during storage, lipid recrystallization into the low-energy beta-polymorph can expel the active ingredient. NLCs overcome this by incorporating spatially incompatible liquid lipids (e.g., medium-chain

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triglycerides), forming disordered crystal matrices that accommodate substantially higher active payloads.

Controlled Release & Irritation Dampening

Encapsulation in lipid nanoparticles mitigates peak concentration bursts of irritating molecules (such as Retinoic Acid and Benzoyl Peroxide), sustaining continuous sub-erythemal release over 24 hours.

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