

# Engineered Nanocarriers: SLN vs NLC and Phospholipid Liposomes (Engineering Review 2025)

Por Cristiano Ricardo · Publicado em 07/11/2025

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://professor.cristianoricardo.com/post/engineered-nanocarriers-sln-vs-nlc-and-phospholipid-liposomes-2025-11-07>

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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

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-erythema release over 24 hours.

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