SCH Capsules: PCL & Alginate

Actives for the skin

Content

01. Introduction 3

The capsules 4

Chemical and physical properties 5

Structure 6

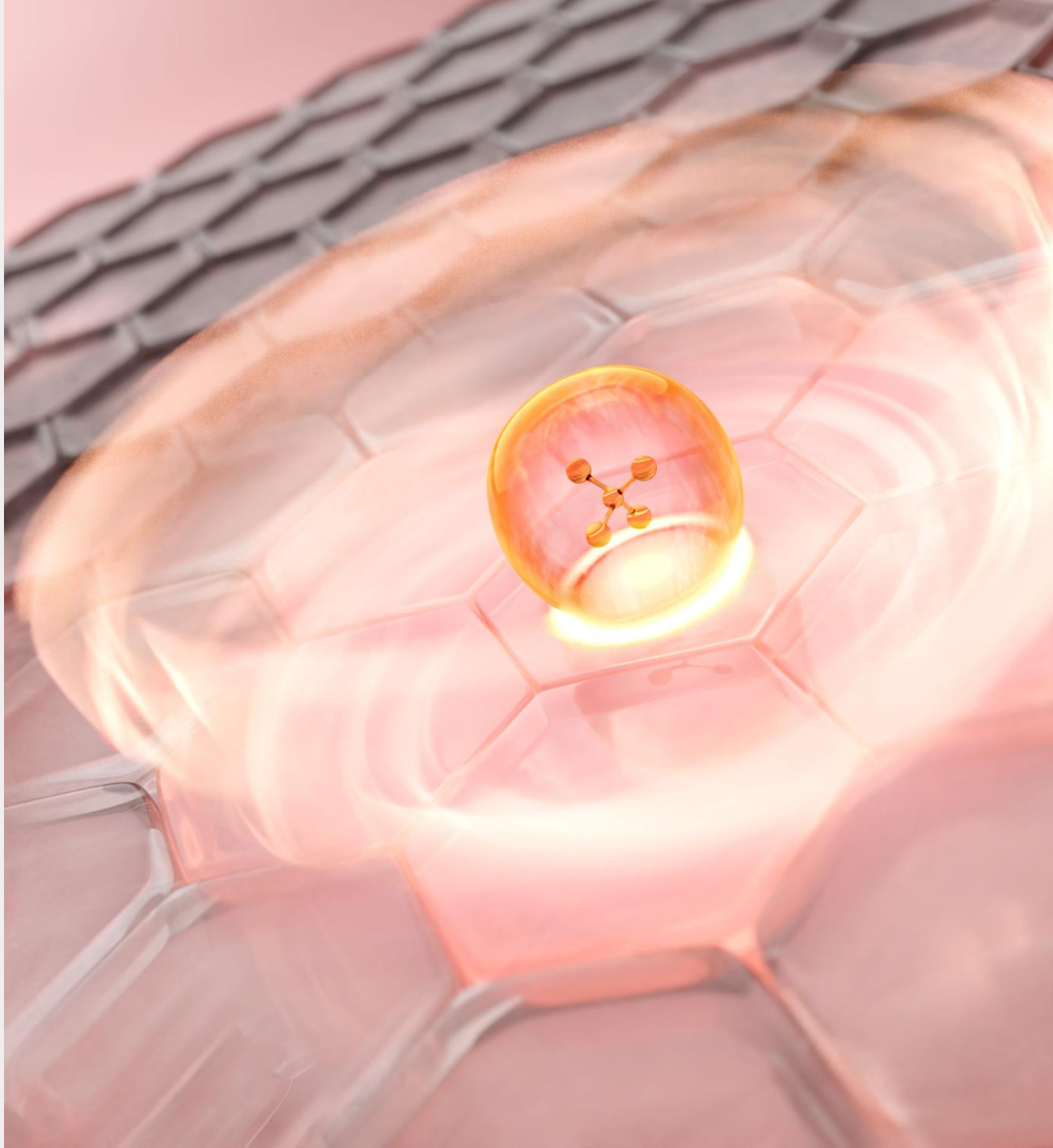
02. Encapsulation processes 8

Nanoemulsion 9

Microparticles formation by coacervation 10

03. Advantages 11

04. Study reports 13



01
Introduction

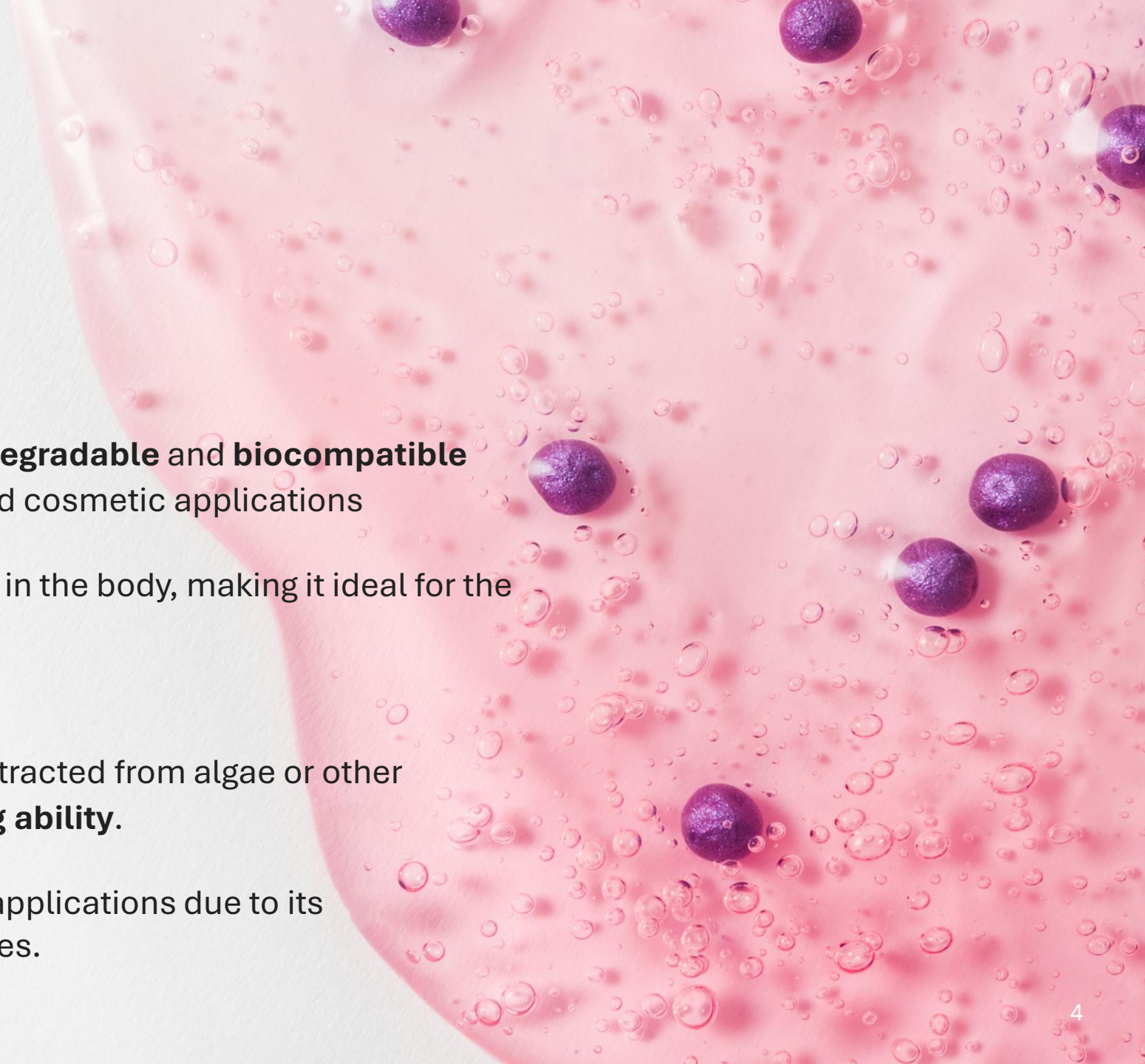
01
The capsules

Polycaprolactone (PCL) is a **biodegradable** and **biocompatible** polymer that is used in various medical and cosmetic applications

It is characterized by its **slow degradation** in the body, making it ideal for the **prolonged release** of active ingredients.

Alginate is a **natural** polysaccharide extracted from algae or other microorganisms, known for its **gel-forming ability**.

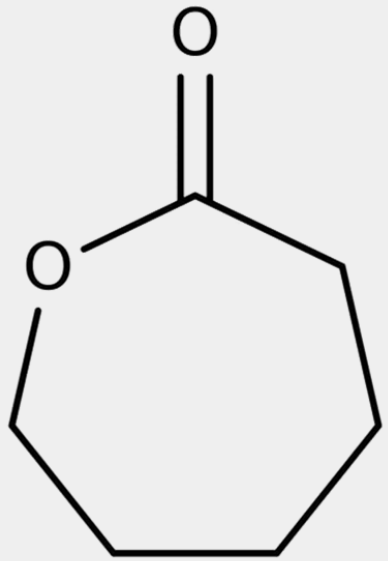
It is widely used in medical and cosmetic applications due to its **biocompatibility** and gel-forming properties.



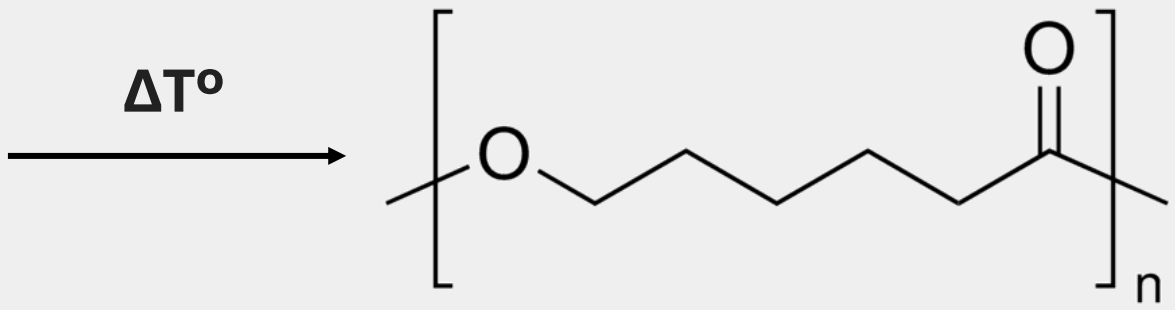
01
Chemical and physical properties

POLYCAPROLACTONE	ALGINATE
BIODEGRADABLE BIOPOLYMER Degradation in the epidermis through hydrolysis of its ester bonds	**NATURAL POLYSACCHARIDE** It can be synthesized from the cell wall of several species of algae or bacteria
BIOCOMPATIBLE Well tolerated by biological tissues	**BIOCOMPATIBLE AND NON-TOXIC** Safe for use on products that come into contact with the skin or are ingested (such as lip products)
HYDROPHOBIC It does not dissolve (acts as a carrier) in water-based formulas and provides a controlled release of the actives in oil-based formulas	**HYDROPHILIC** It will dissolve slowly in water-based formulas (controlled release) and be discontinued in oil-based formulas (protecting the actives)
PROTECTION Protects the active substance from adverse environmental conditions	**ADAPTABILITY** Its physicochemical properties can be adjusted according to formulation need

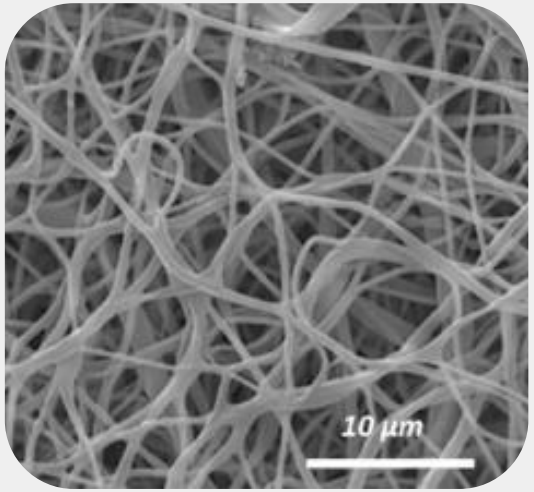
01
PCL structure



ε-Caprolactone

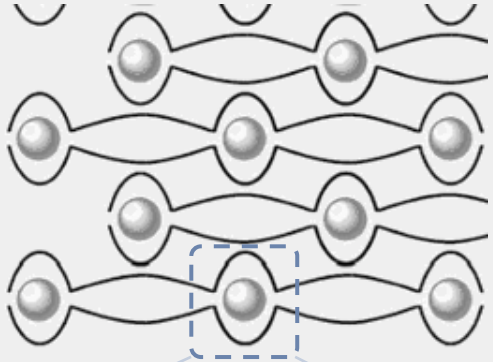


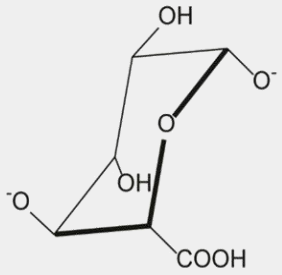
Polycaprolactone



PCL mesh

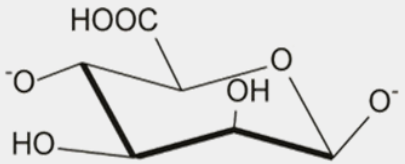
01
Alginate structure



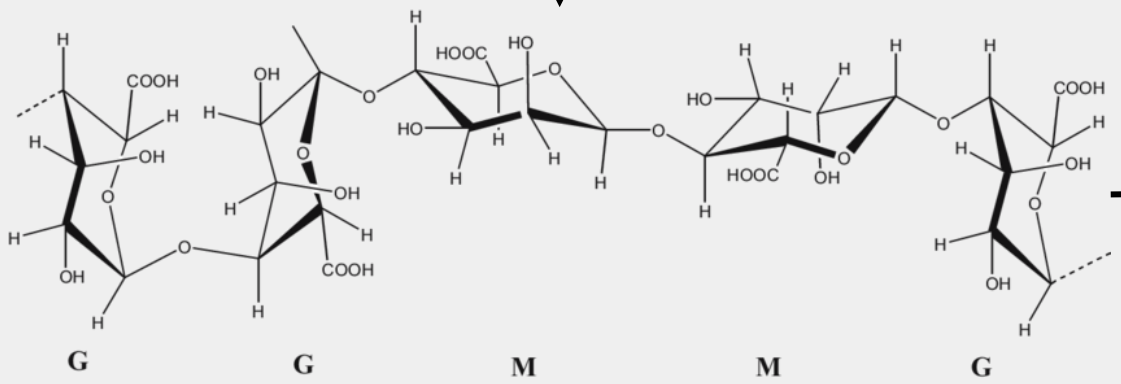


Guluronic acid (G)

+

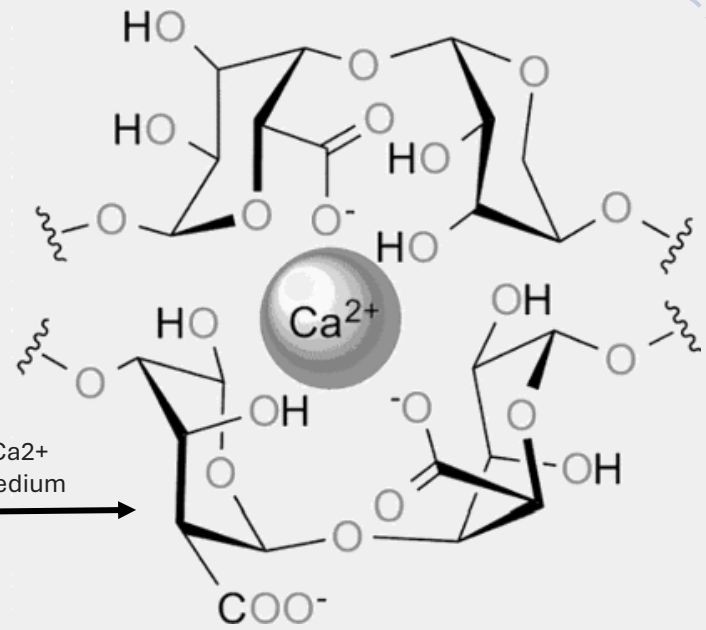


Mannuronic acid (M)

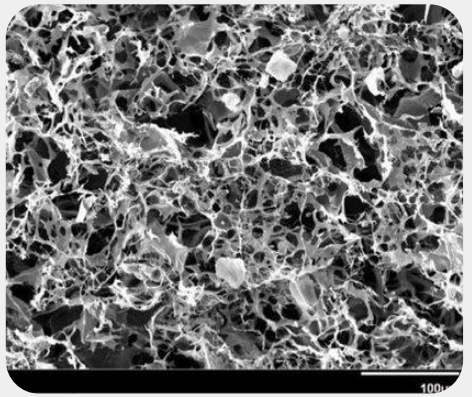


MMMMMMGGGGGGMGMGGGGGGGMGMGMGMGMG

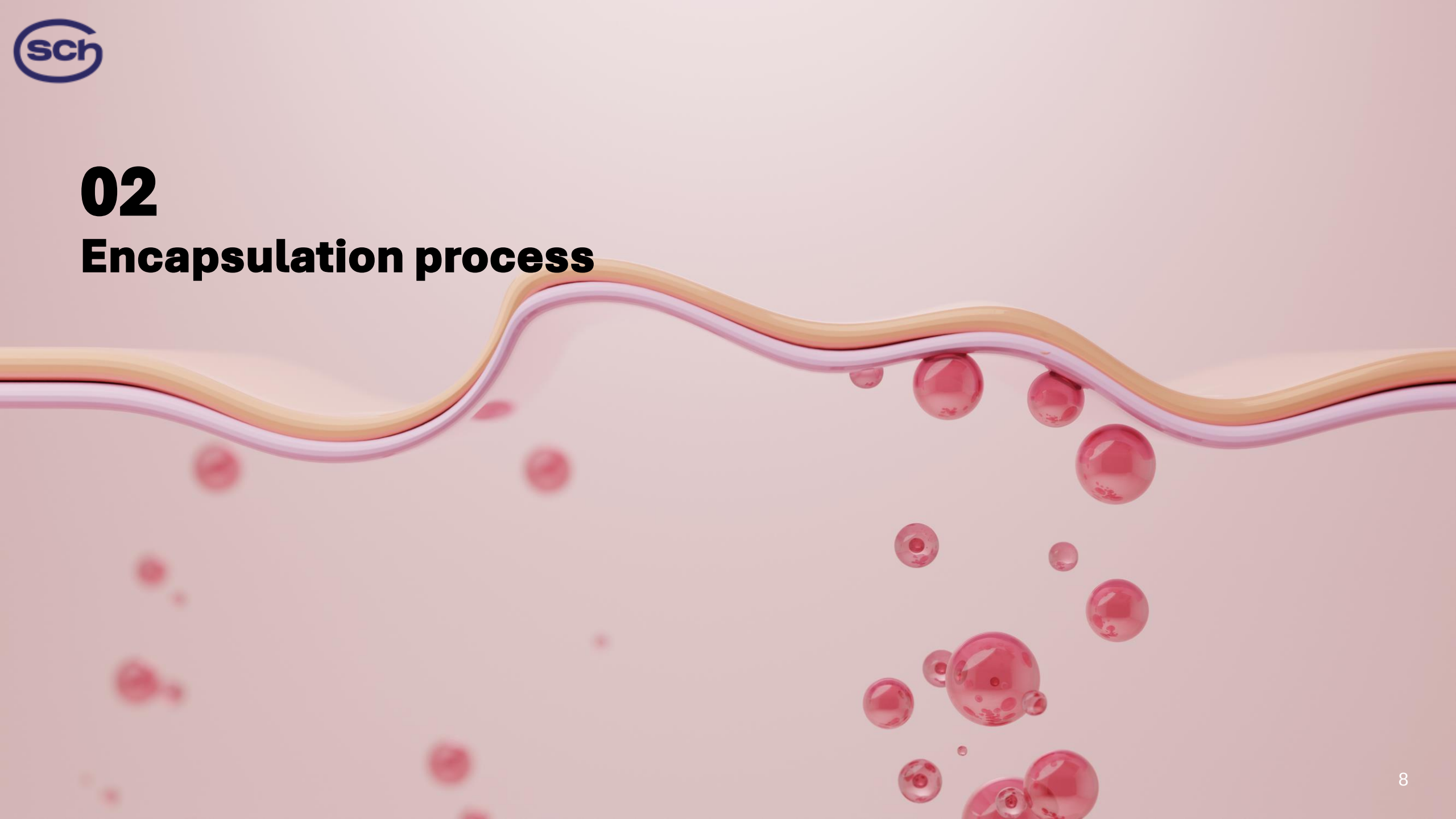
Ca2+ medium



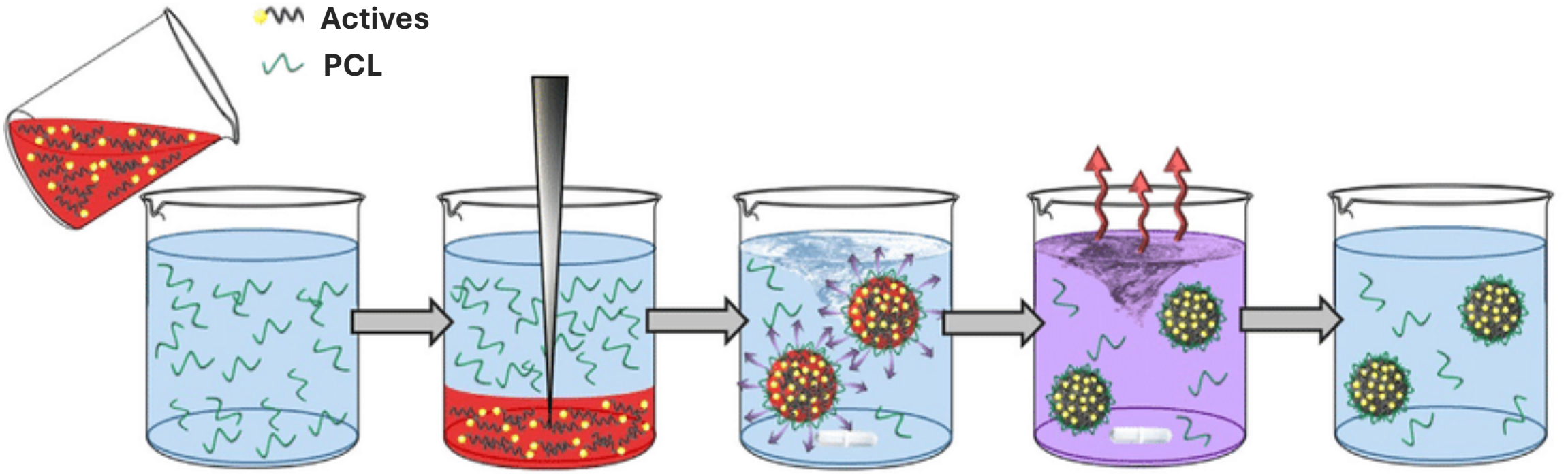
Alginate mesh



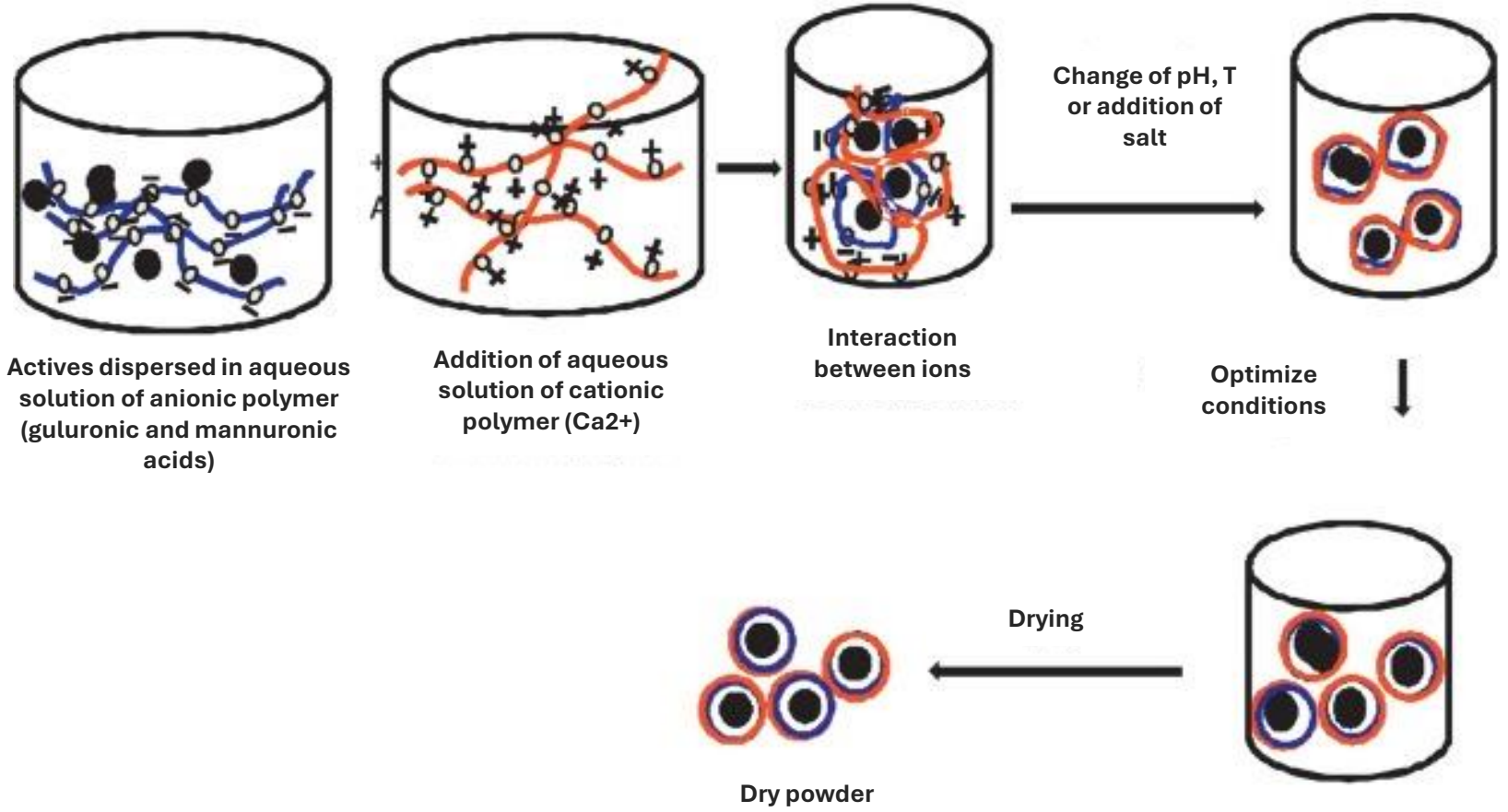
02
Encapsulation process



02 PCL - Nanoemulsion



02 Microparticles formation by coacervation



03
Advantages

03 Advantages

Biocompatibility and biodegradability

Both capsules are **well-tolerated** by the skin, reducing the risk of irritations.

Their ability to degrade without leaving toxic residues makes it **eco-friendly** and safe.

Stability and controlled release of active ingredients

Provide sustained and **controlled release** of cosmetic active ingredients.

Protect sensitive actives from premature degradation, increasing their shelf life.

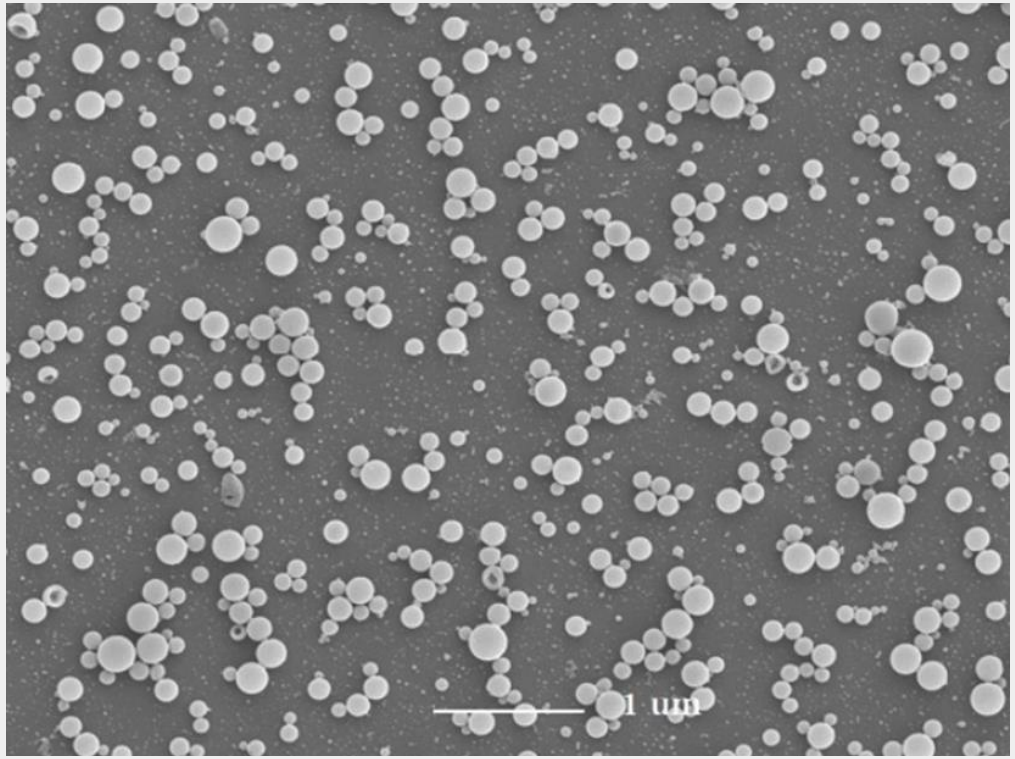
Safety and efficacy

Clinical studies have confirmed the **safety** of both capsules for cosmetic use.

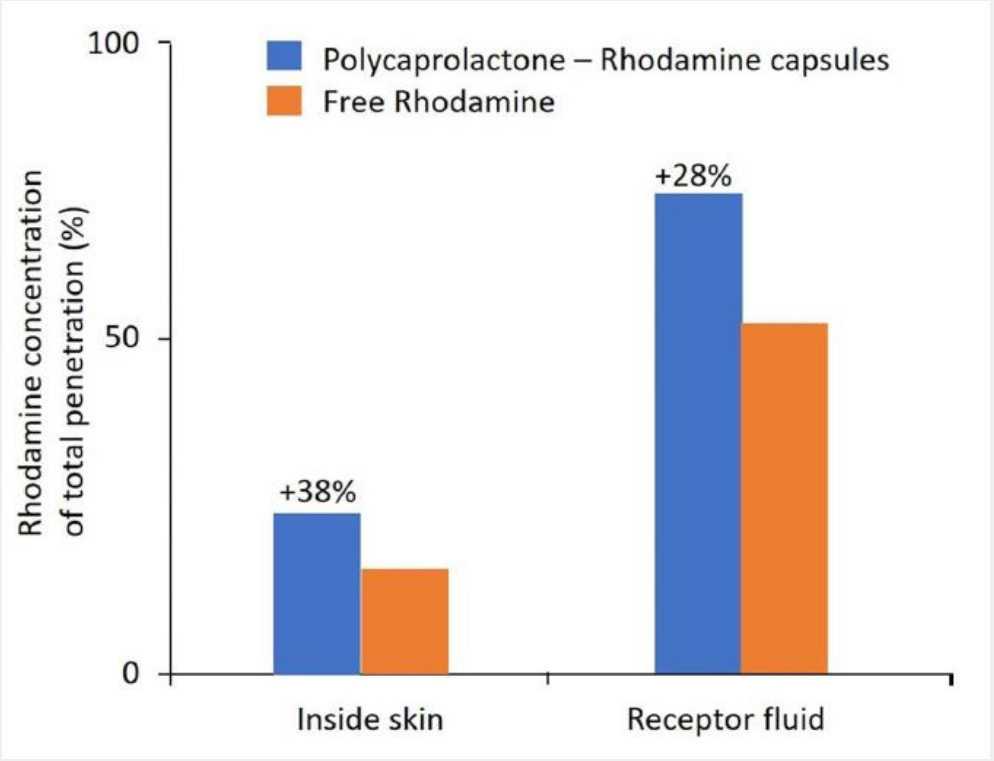
Enhances the penetration of active ingredients into the skin, maximizing benefits.

04
Study reports

04 Skin penetration of PCL capsules for a long-lasting effect



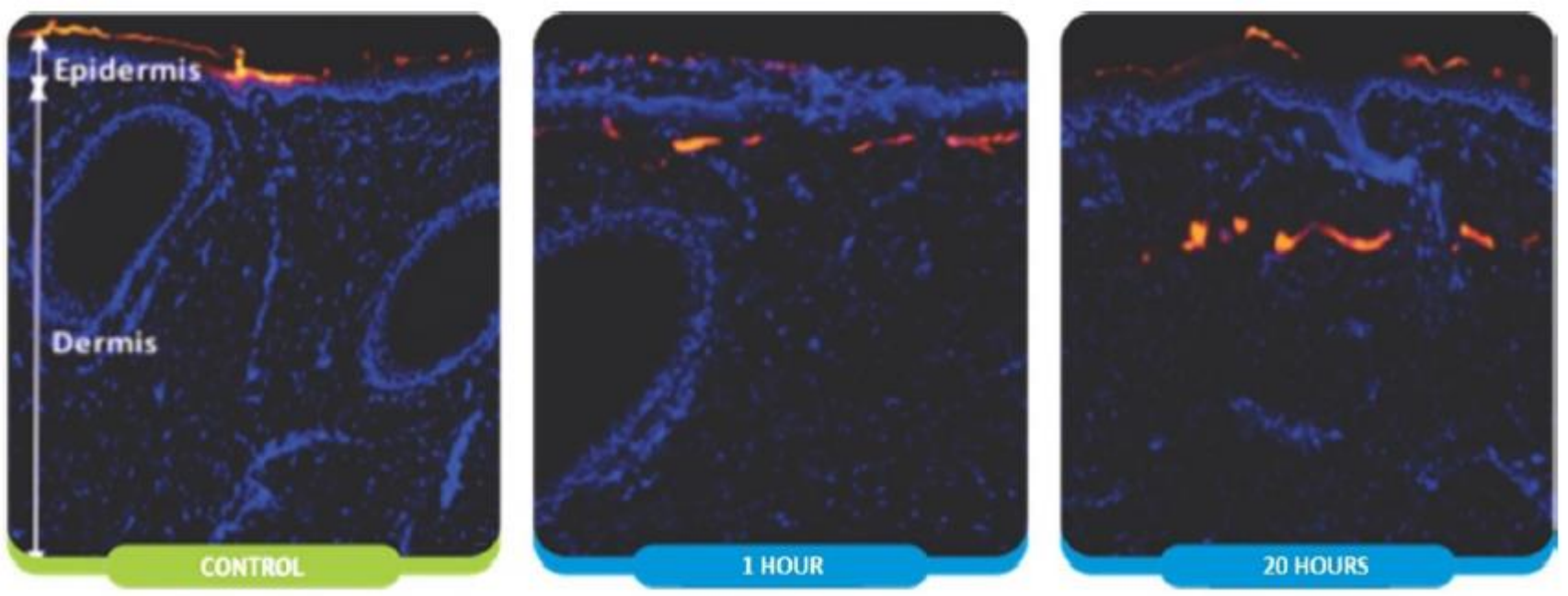
PCL-Rhodamine SEM Capsules



Rhodamine penetration at 20 h after application of PCL-RC and free rhodamine

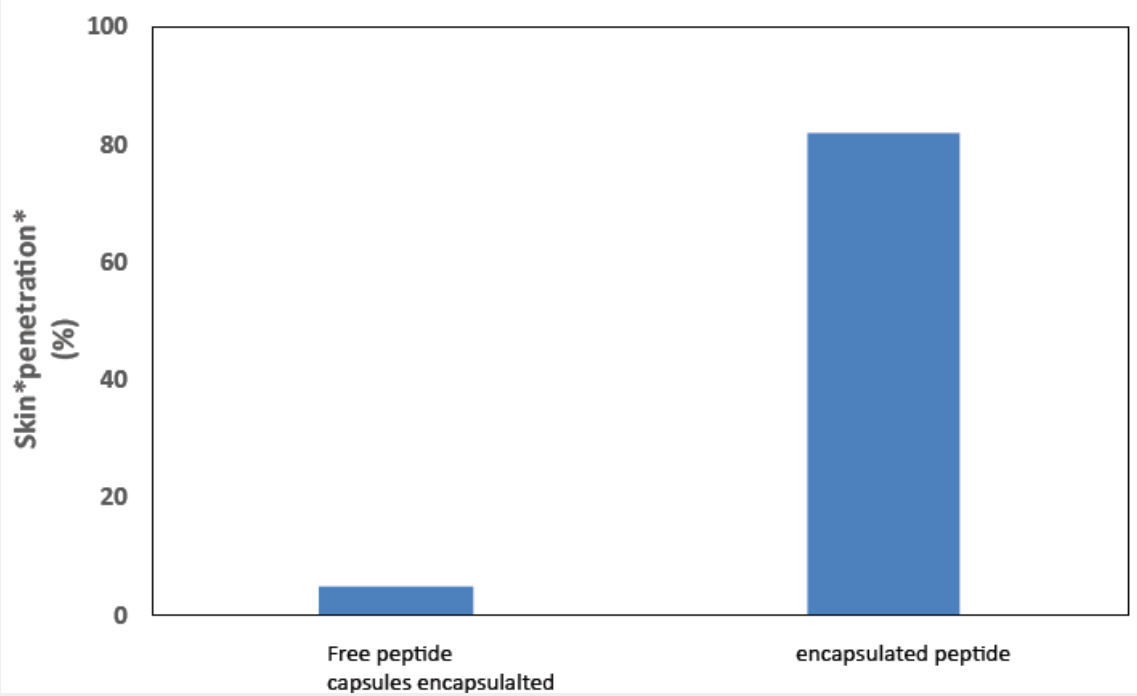
04 Skin penetration of PCL capsules for a long-lasting effect

Speed and depth of penetration into the skin



Confocal microscopy images of skin slices at 0h, 1h and 20h

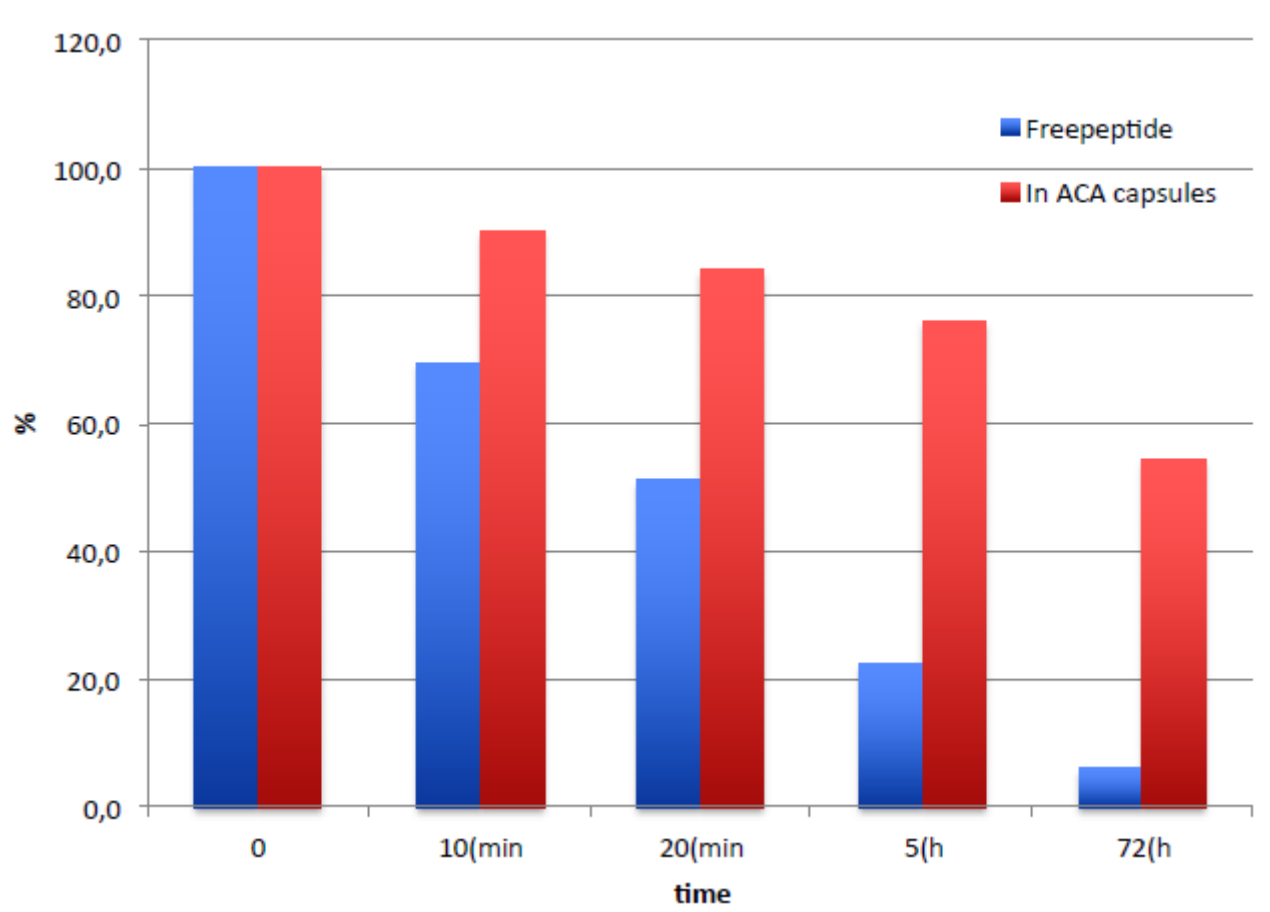
04 Skin penetration of active-loaded alginate capsules



Penetration of encapsulated peptide at 20h

Alginate encapsulated peptides showed both **higher penetration and higher rate of penetration** as compared to free peptide.

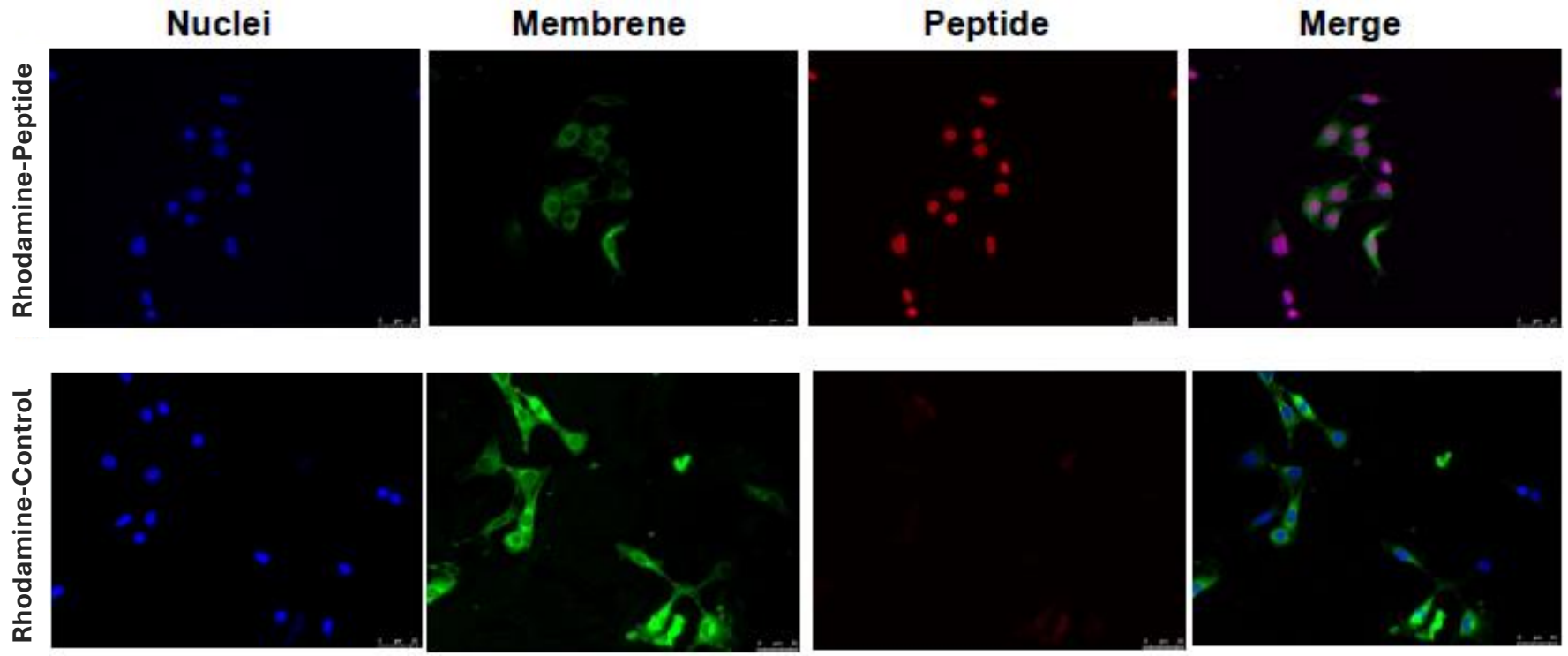
04 Comparative degradation of free VS encapsulated peptide by proteases



Degradation of peptide free or encapsulated in alginate induced by proteases

04 Peptide internalization in dermal fibroblasts by confocal microscopy

The objective of this study was to demonstrate that the encapsulated peptide can internalize inside fibroblasts



Capsule-peptide vs free peptide uptake after 4 h incubation at 37°C towards fibroblast by confocal microscopy

Special chemicals

SCH Capsules: PCL & Alginate

Actives for the skin