sphera encapsulation

Innovators by vocation

CRS Controlled Release Society

Martina Vakarelova, PhD, Co-CEO

THE PROBLEM

of valuable molecules

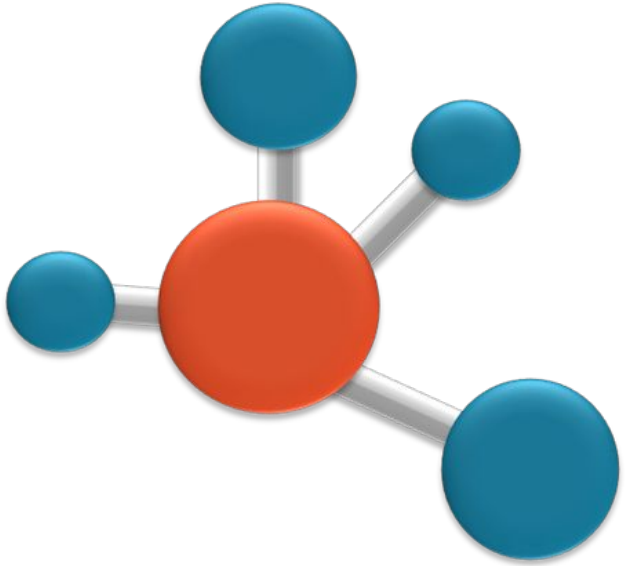
SCARCE BIOAVAILABILITY

INCOPATIBILITY WITH OTHER INGREDIENTS

LOW EFFICACY

POOR STABILITY

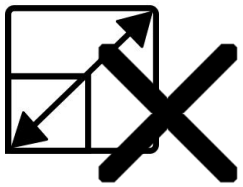
UNPLEASENT TASTE AND ODOR



Existing technologies …

Too expensive

Not scalable



Outdated

Too simple

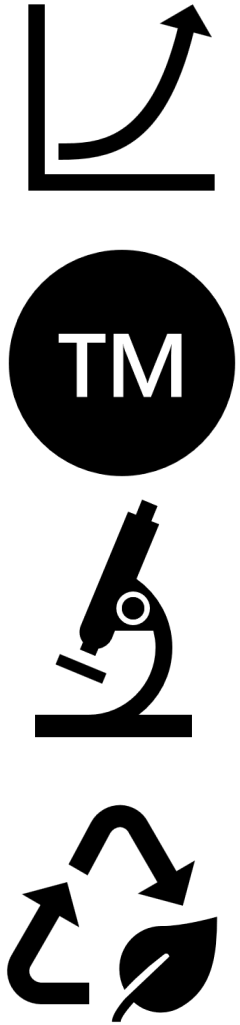
Scalable

Patentable

sphera encapsulation

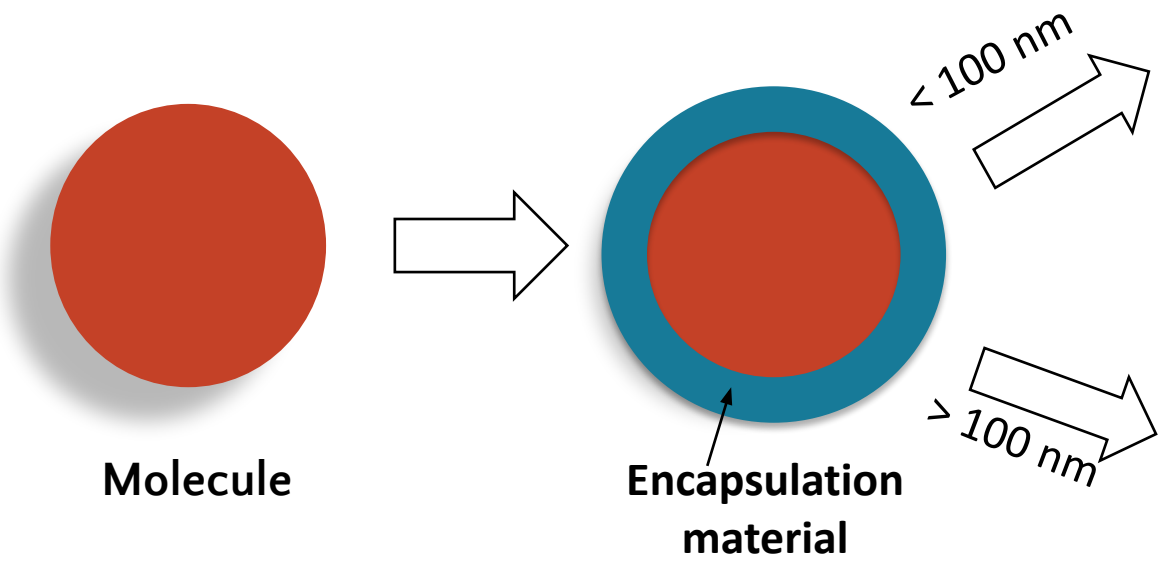
Sophisticated

100% Green

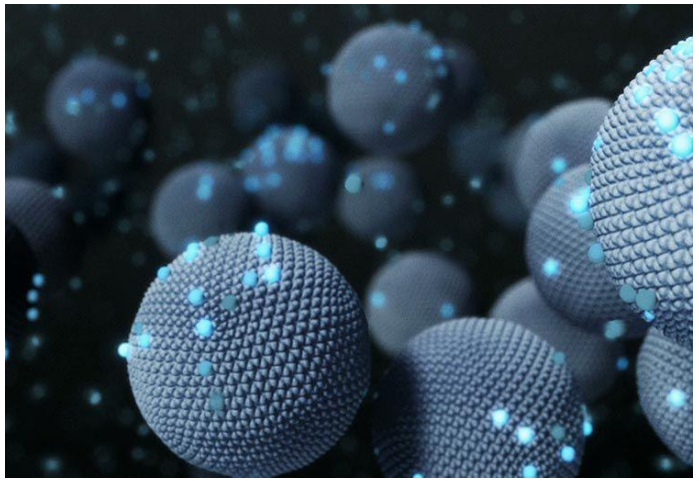


Sphera increase the value of your molecules using our sophisticated, patented encapsulation technologies through innovation, flexibility and unique expertise

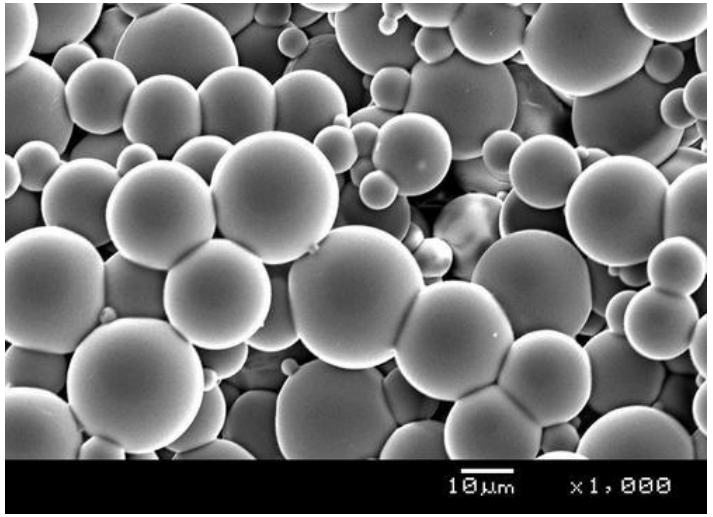
What is encapsulation?



NANO



MICRO



Why do we encapsulate?

Better stability

Increase bioavailability

Hide unpleasant taste and flavour

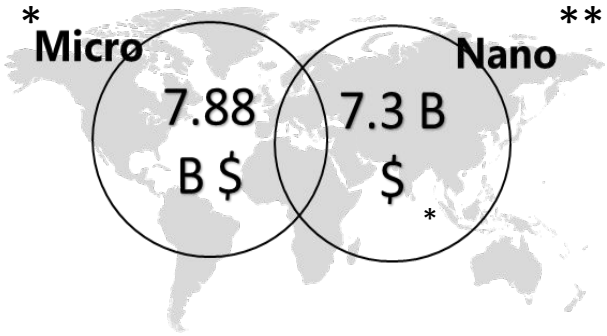
Easy manipulation

Tailored release

THE MARKET

Sphera Encapsulation concentrates in the development of products with high added value

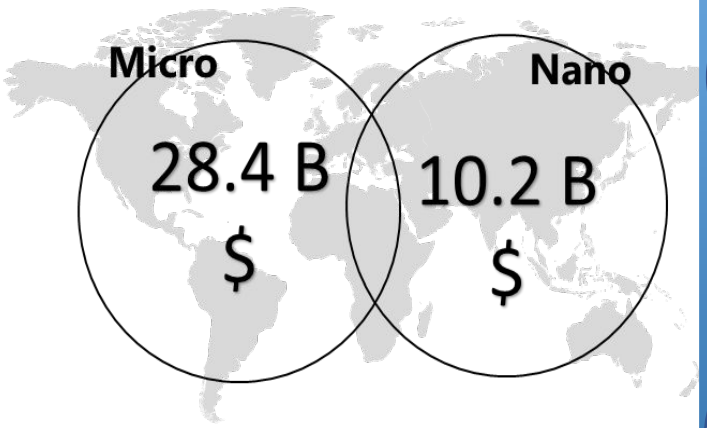
CURRENT DIRECTLY ADRESSED MARKET



MASSIVE & GROWING RAPIDLY

Fast growing market with a **CAGR** of:
-**13,7%** Micro
- **4,9%** for Nano

ESTIMATED TO GROW BY 2027

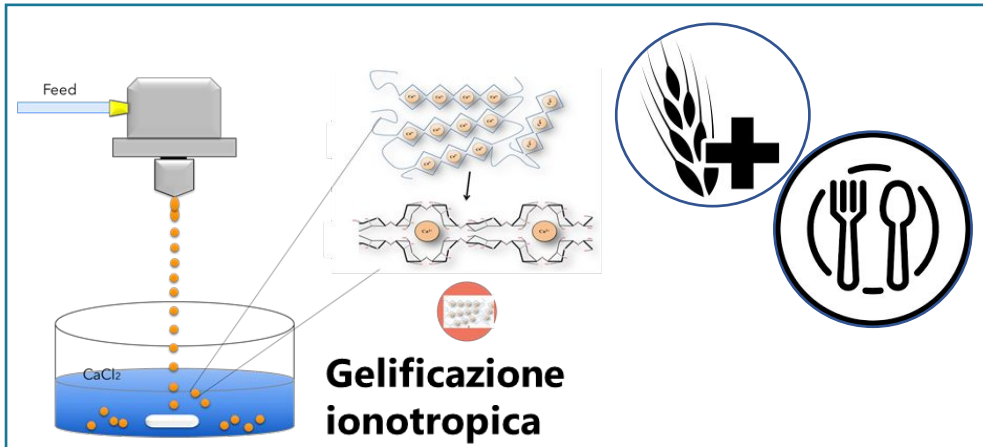


RELEVANT SECTORS

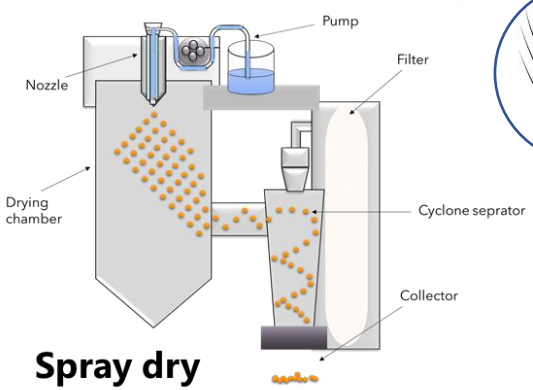
- Food
- Nutraceuticals
- Agro-chemicals

* https://www.grandviewresearch.com/industry-analysis/microencapsulation-market ** https://strategyr.com/market-report-nanoencapsulation-for-food-products-forecasts-global-industry-analysts-inc.asp

Our technologies

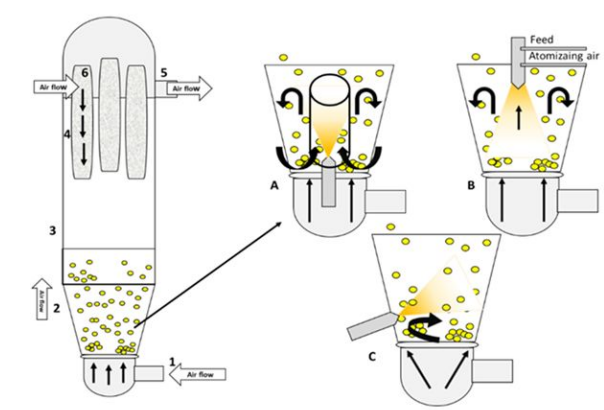


Gelificazione ionotropica

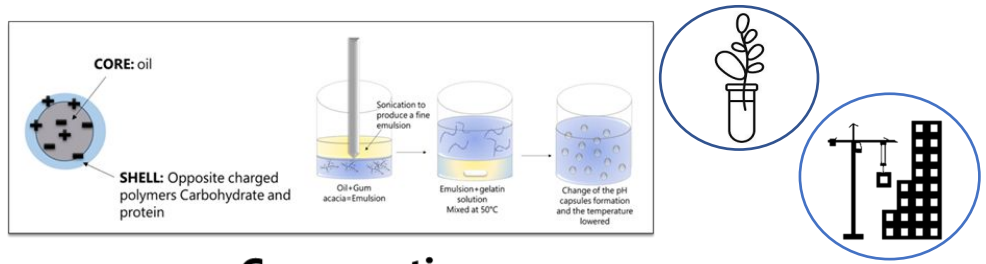


Spray dry

Spray Chilling



Letto fluido



Coacervation

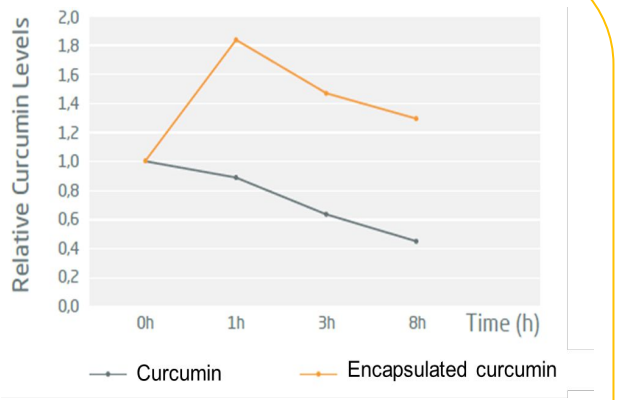
Nano-encapsulation

SpherAQ®- CURCUSHINE ™

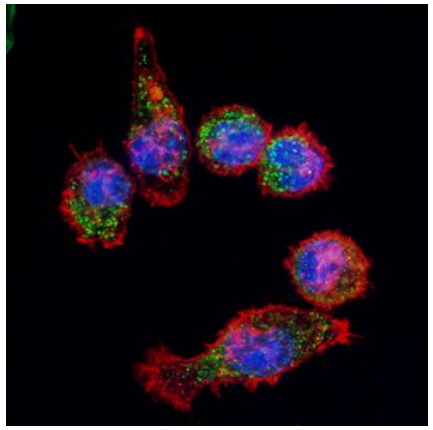
Lipofoods™
Nutraceutical Ingredients

Tasks

High solubility in water



Efficacy and higher absorption in the human body (2.5 times higher)



Cellular uptake was confirmed in in different type of cells (e.g. HeLa, CaCo2)

Food ingredients Europe
Innovation Awards 19

SpherAQ®- applicative example

After nanoencapsulation curcumin solubility in water was increased A) curcumin in water B) nanoencapsulated curcumin.

Solubility

Odor and taste

Stability

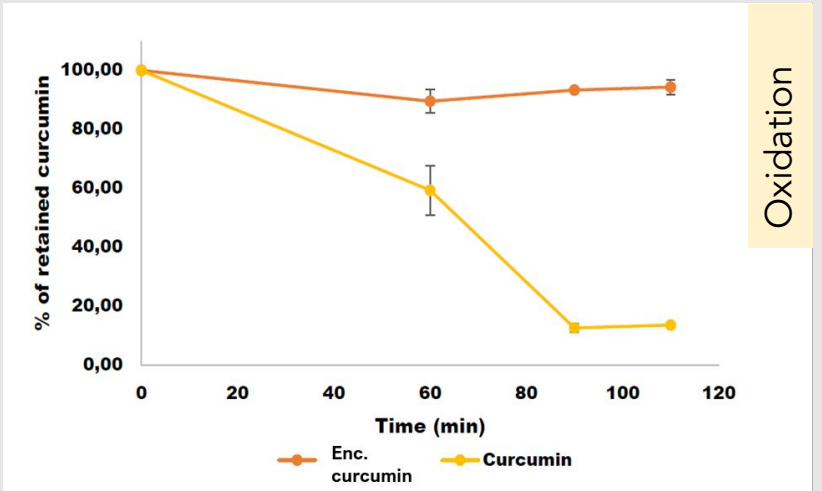


Fig.9 Comparison between the stability showed by the natural curcumin extract and Encapsulated cur. presence of H_2O_2.

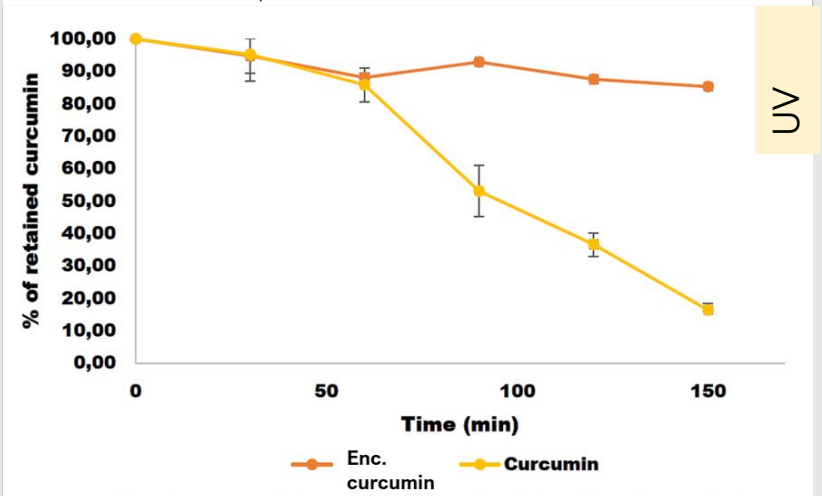
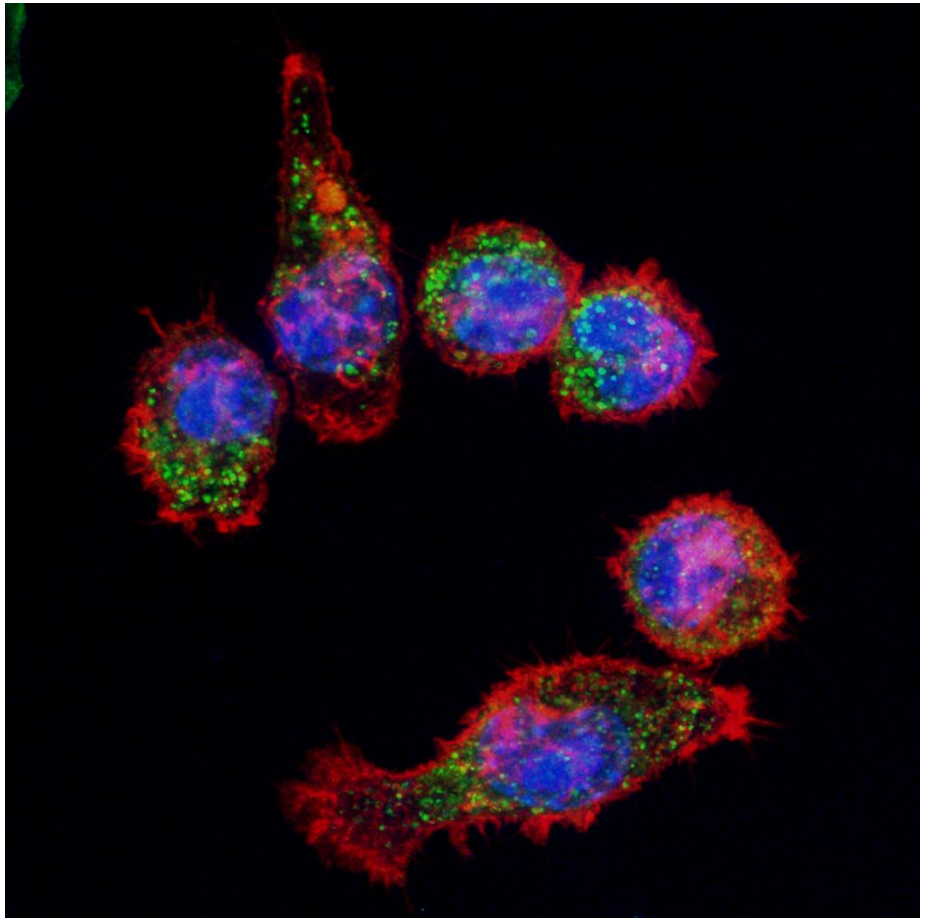


Fig.10 Comparison between the stability showed from the natural extract of curcumin anc Encapsulated cur. In presence of UV rays

SpherAQ®- applicative example

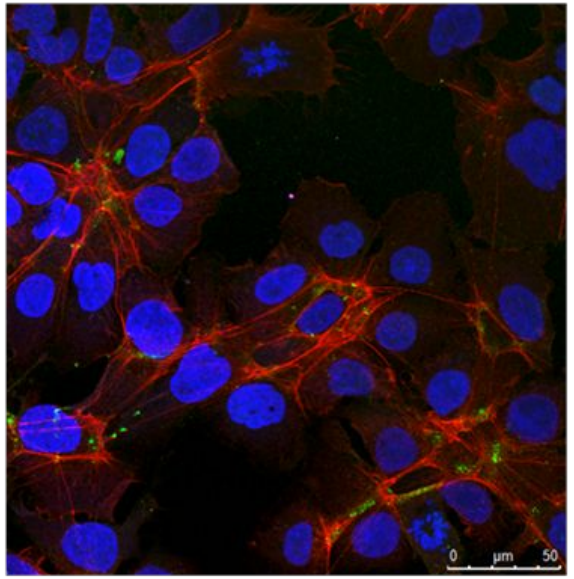
Murine macrophages



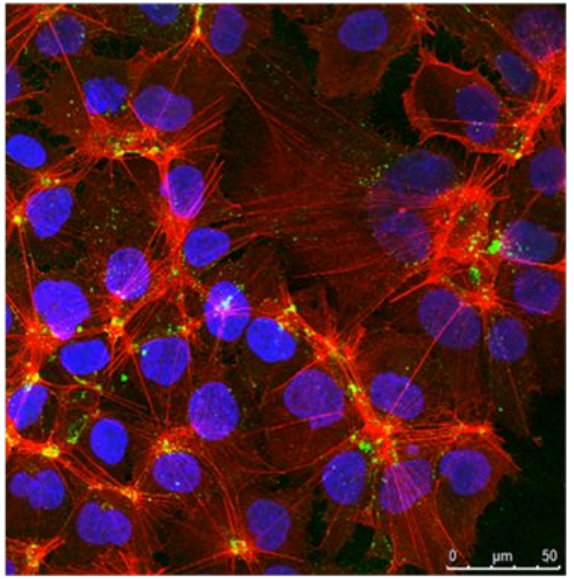
Blue cells nuclei; Red actin filaments;
Green Nanoparticles.

HepG2 cells

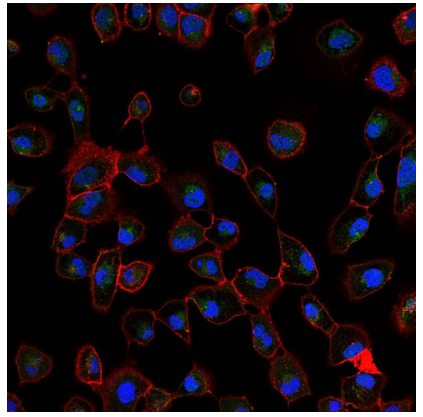
15 minutes



1 hour



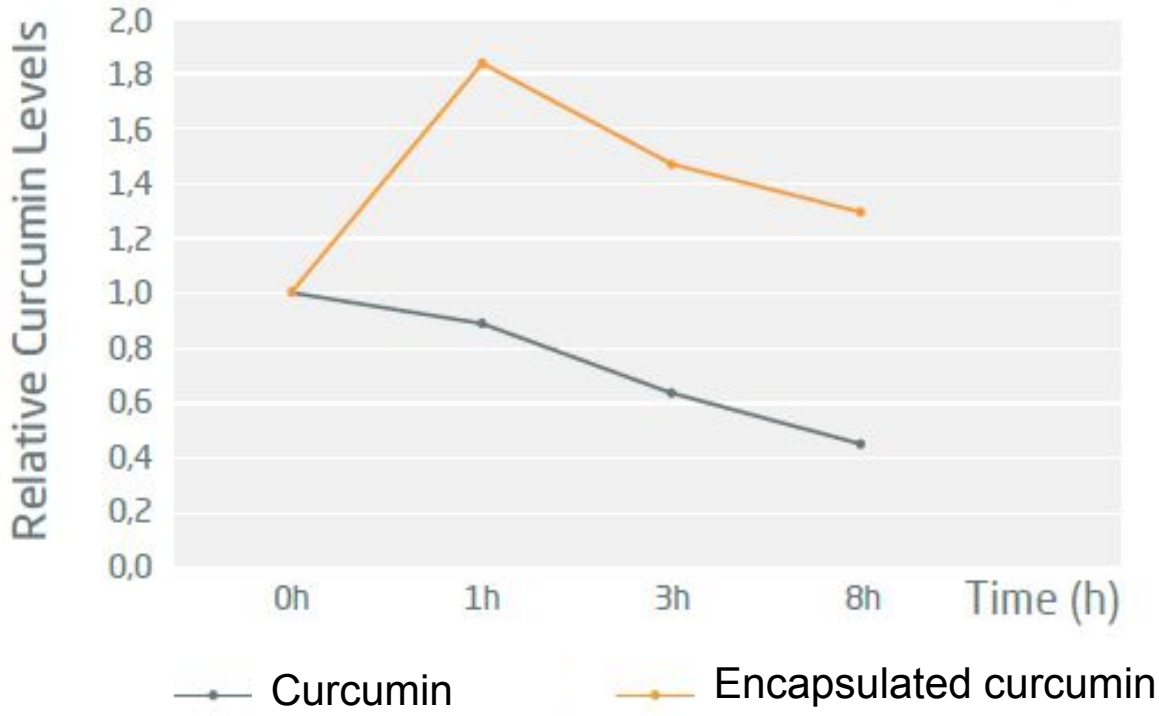
Ongoing research conducted from



New tests on pulmonary epithelial and Osteosarcoma cells

SpherAQ®- applicative example

A panel of volunteers ingested the equivalent of **750 mg** of curcuminoids in the non encapsulated and encapsulated form. Blood samples were collected and analyzed through UPLC-Q/TOF in order to evaluate curcumin level in the serum.



Encapsulated curcumin showed to be **1.8 times more bioavailable** than the non encapsulated form. The pharmacokinetics of the encapsulated form was slower ensuring in this way a **longer half-life** of the molecule.

SpherAQ™– OMEGA3

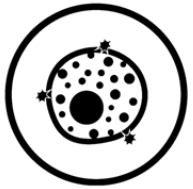
Work in progress

Our Solution

Biological activities

Cardiovascular system protection

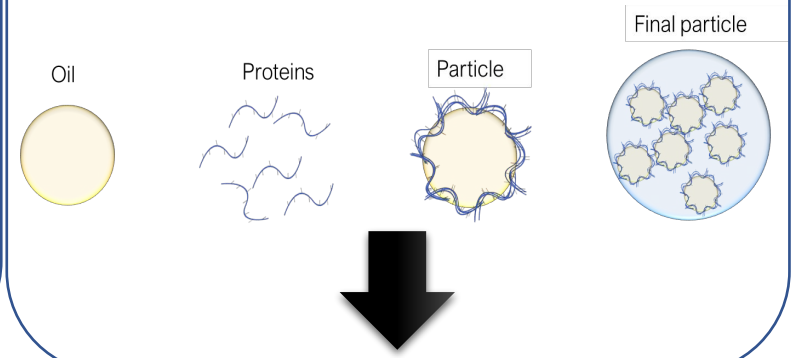
Amelioration of cognitive functions



Anti-inflammatory

Different omega-3 sources

SpherAQ® encapsulation technology



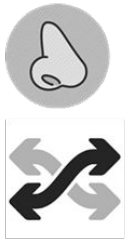
What we want to achieve?

- Higher biovailability
- Soluble in water
- 30-40% of oil payload
- Stability between 1-2 year
- Maximum 4 ingredients in the label
- Vegetarian and vegan version

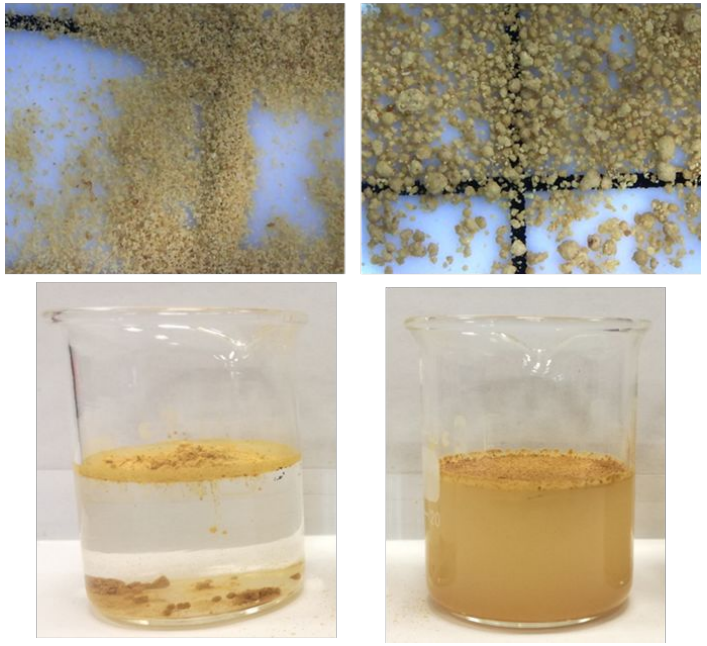
FloraSpher- applicative example

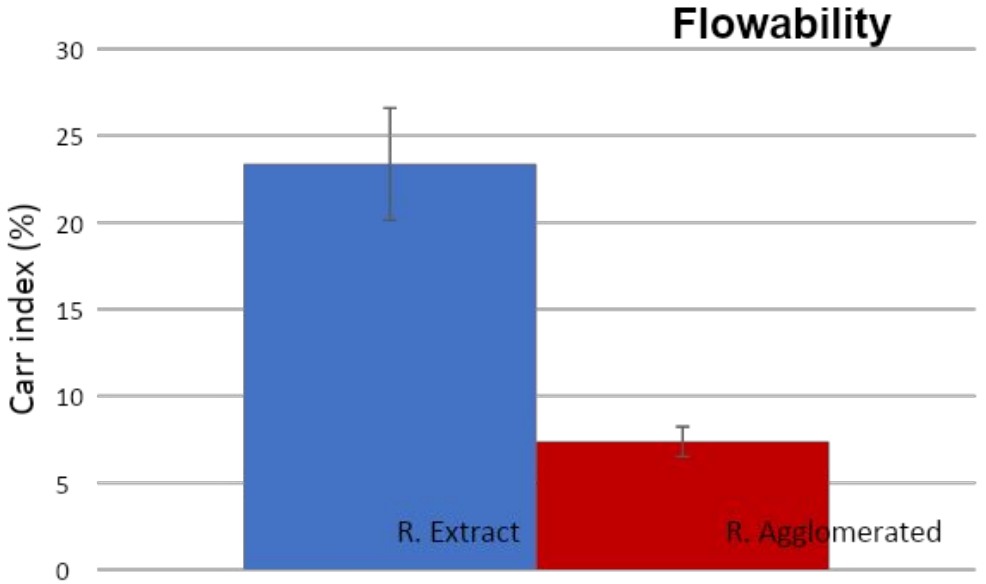
Goal: increase the stability of pastry through the use of Rosemary extract

- Insolubility and difficult manipulation
- Scarce acceptance from the customer



Starting ingredient **FloraSpher**





Agrochemicals

The term agrochemicals refers to different products used in agriculture such as pesticides, chemical fertilizer, bio-stimulants, manure and other growth agents.

Problems

Degradation caused by:
- Sun light
- Microbial degradation
- Reaction with the soil

Lost generated by:
- Leaching
- Evaporation
- Volatilization

Solution

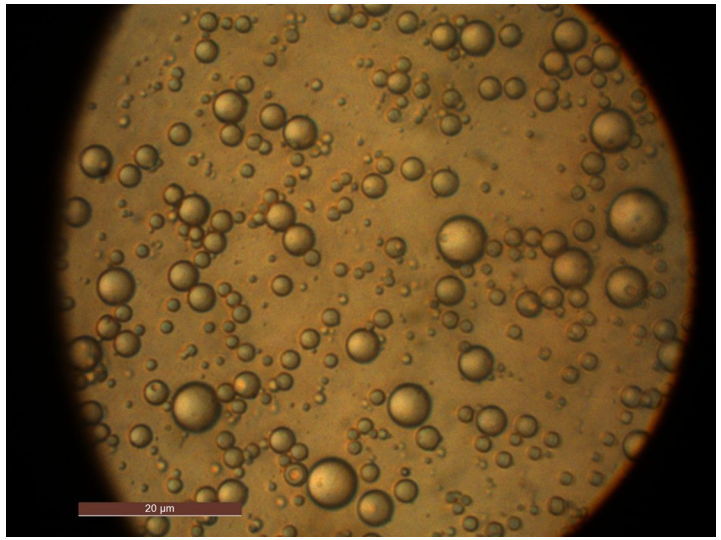
Encapsulated systems

Field application

ACTIVE INGREDIENTS

Innovative and green encapsulation solutions for the agro-chemical sector

Emulsion based technologies

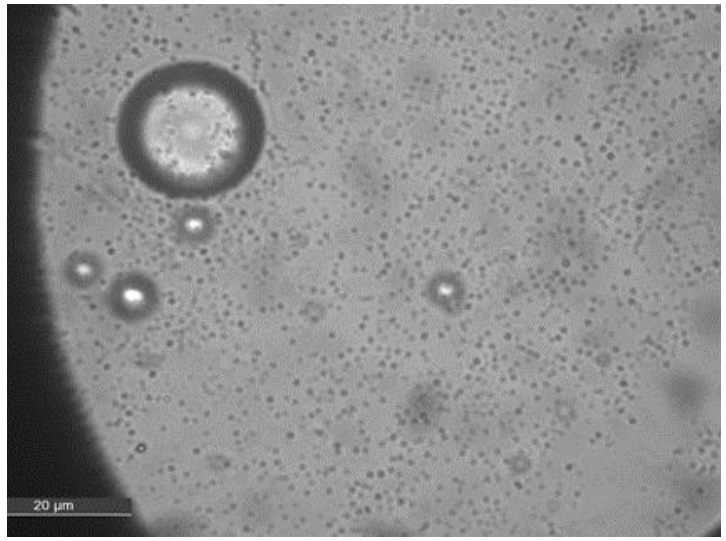


Optical microscope image, scale bar 20 µm

Coacervation

Optical microscope image, scale bar 50 µm

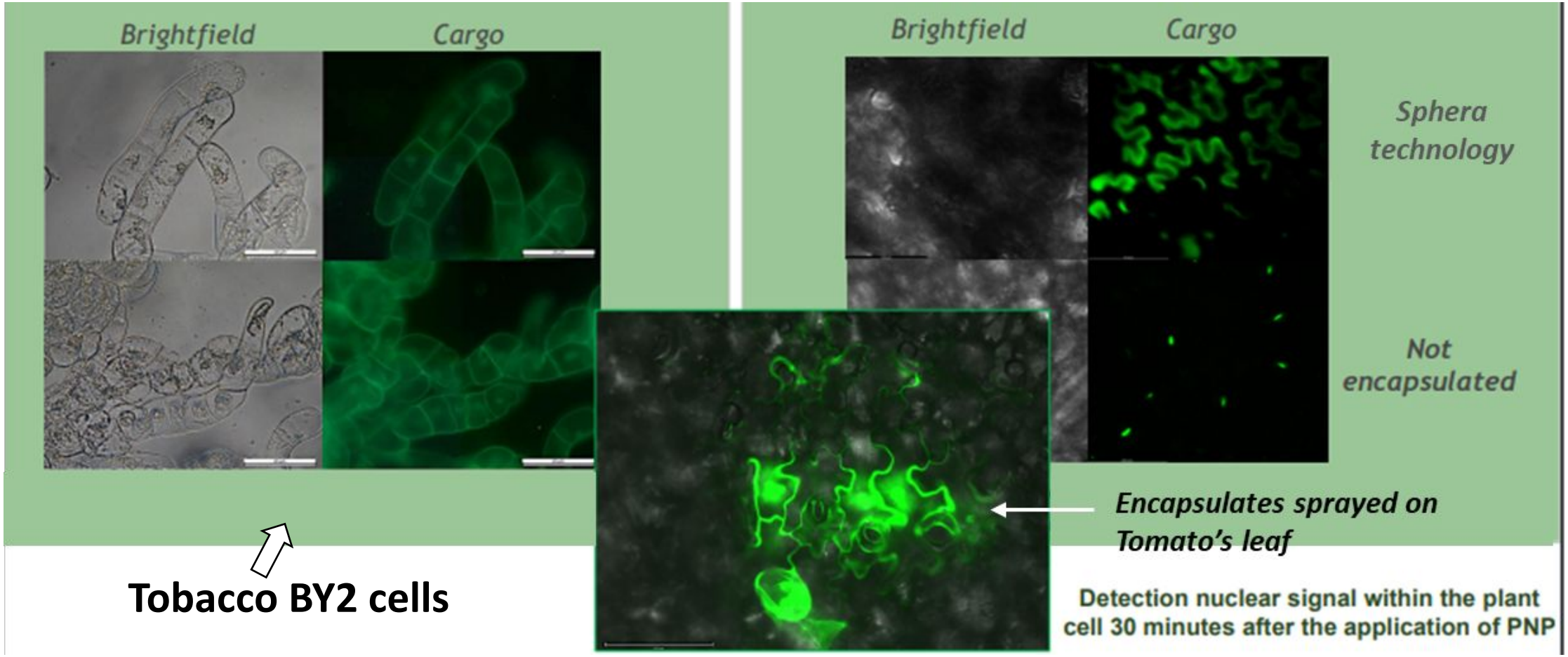
PlantERA™ technology



Optical microscope image, scale bar 20 µm

PlantERA™ Result obtained in plant

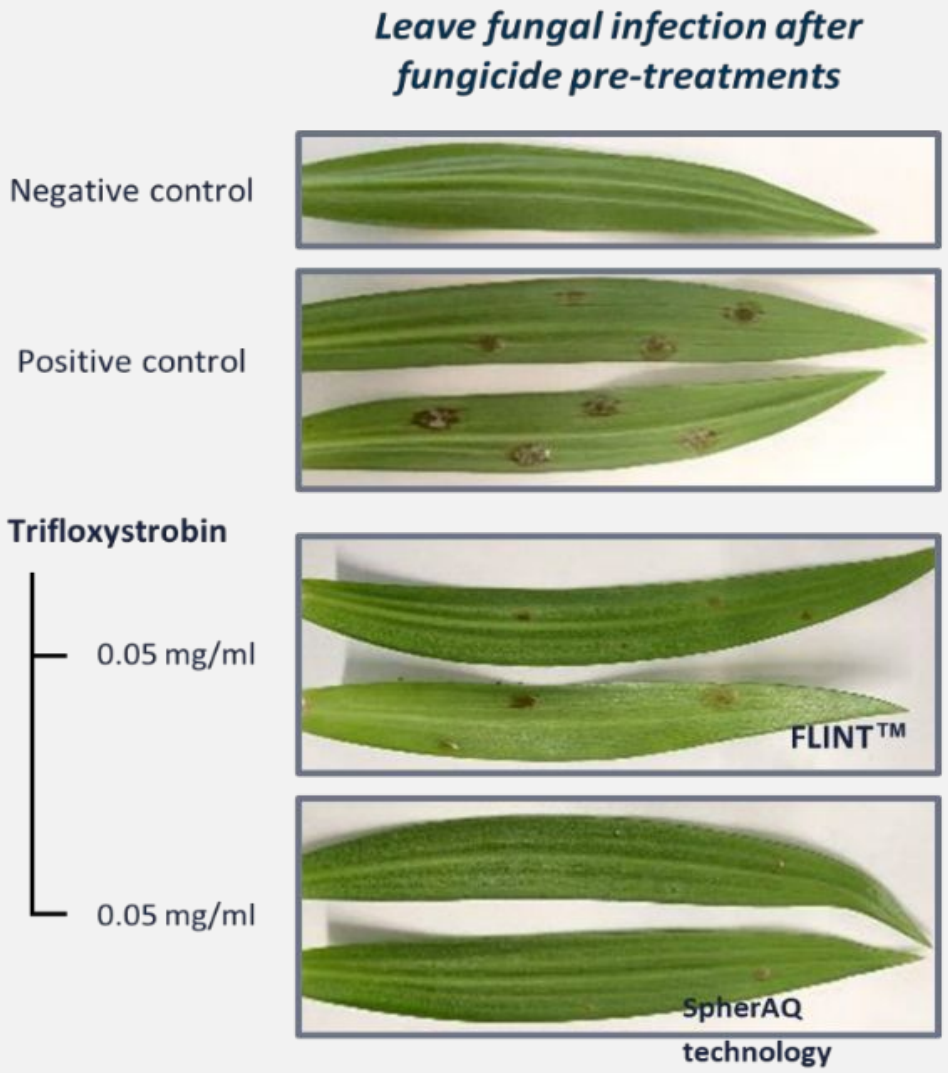
- The system was tested in different plants (Tobacco, tomatoes, Lilies, lentils and Fig).
- Showing a fast absorption on leaves (15 min) also in the case of foliar spray (some example using a florescent dye are reported in the next slides) and in pollen and roots.
- The system was tested also for the delivery of Glyphosate (herbicide) and Calcium (micronutrien) registering better performances when compared to commercial products.



- Uptake of encapsulated GFP with a nuclear tag in tobacco cells with vegetal wall and leaves of tomato plant.

In this case the encapsulated compound was a fungicide active against *Botrytis cinerea*.

- **Lilies**, most important flower bulb crop in the world
- **Botrytis leaf blight**, most common disease in lilies
- Pre-treatment (up to 6 applications before harvesting)
- Experiment - pre-treatment leaves with fungicide (Trifloxystrobin, 25%)
- 24h later, infection with Botrytis spores
- Pictures were made at 3 days post inoculation

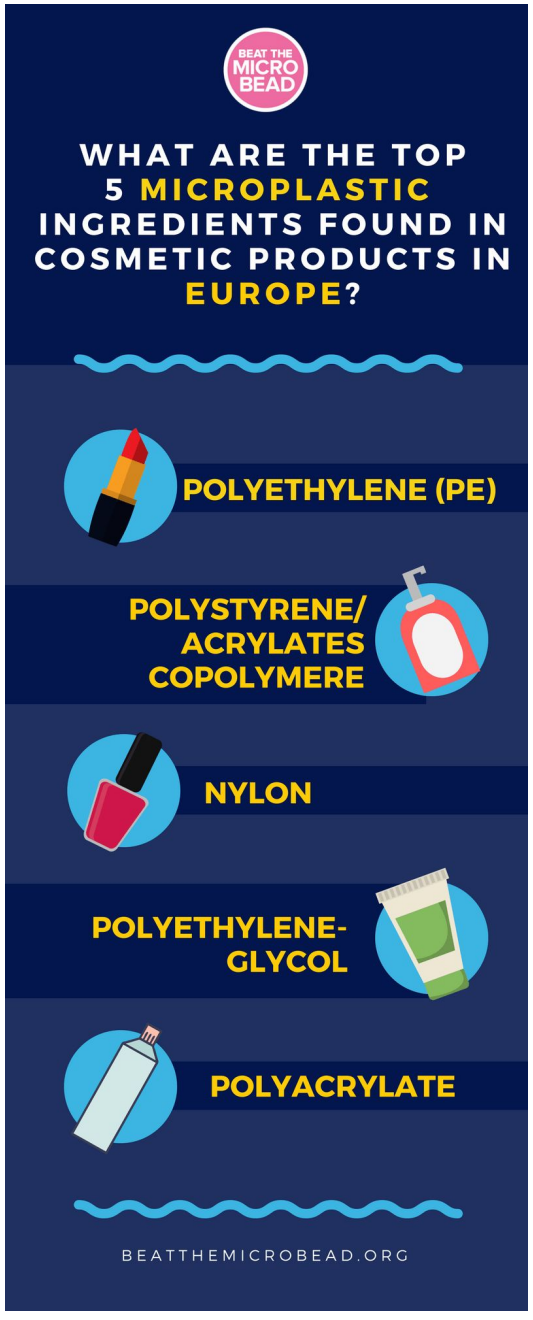


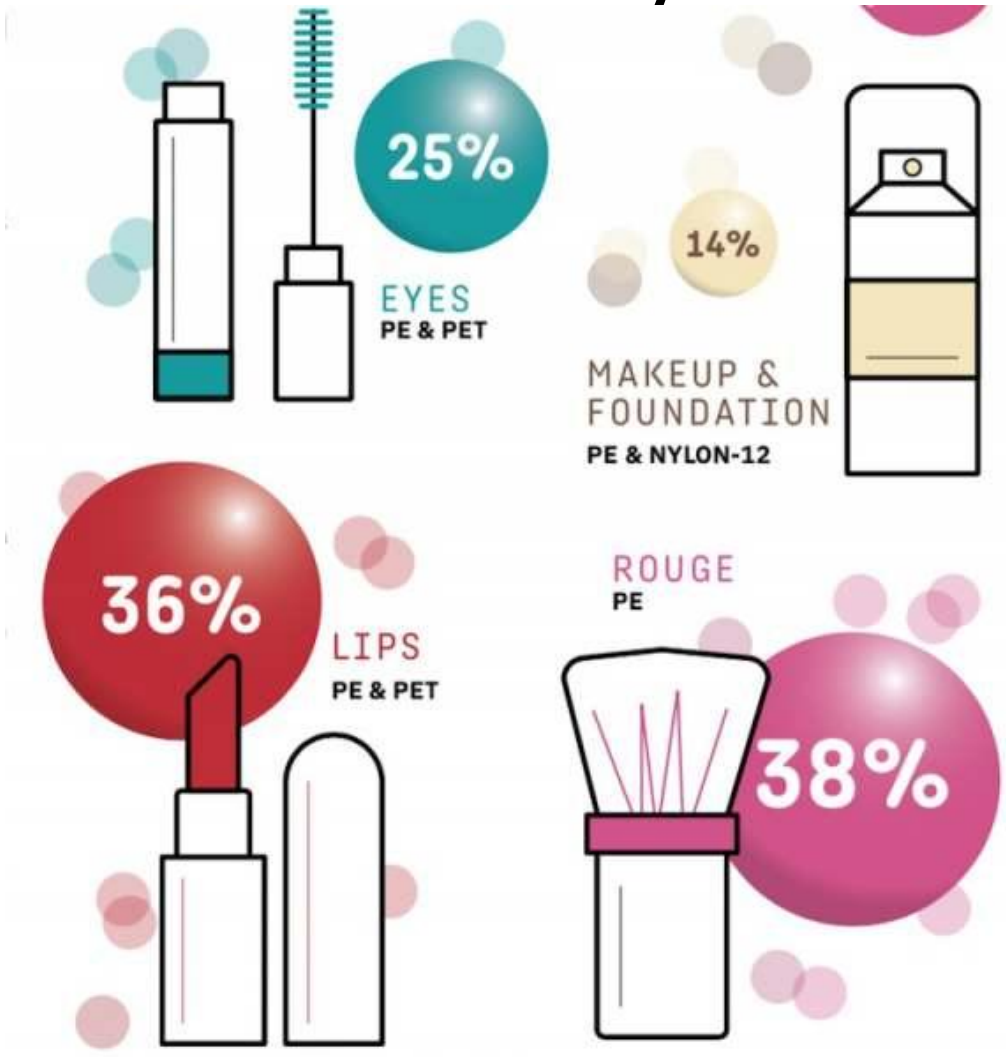
Commercial product

Encapsulated Commercial product

PlantCUre project *Curcumin NPs for the treatment of Botrytis in tomato plant during harvest and post-harvest*

Fighting microplastics in the cosmetic industry

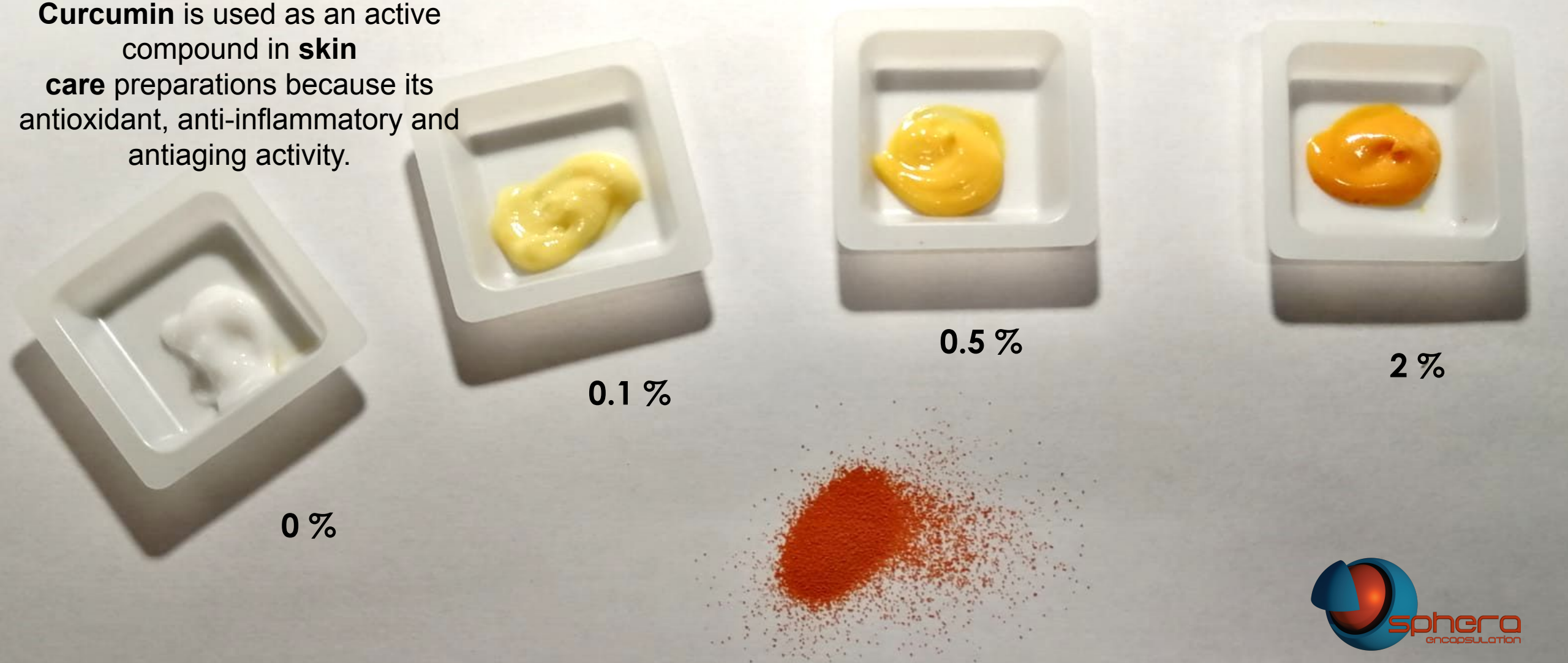




Percentage of products containing microplastics per category.

Curcushine dissolved in standard body cream

Curcumin is used as an active compound in **skin care** preparations because its antioxidant, anti-inflammatory and antiaging activity.



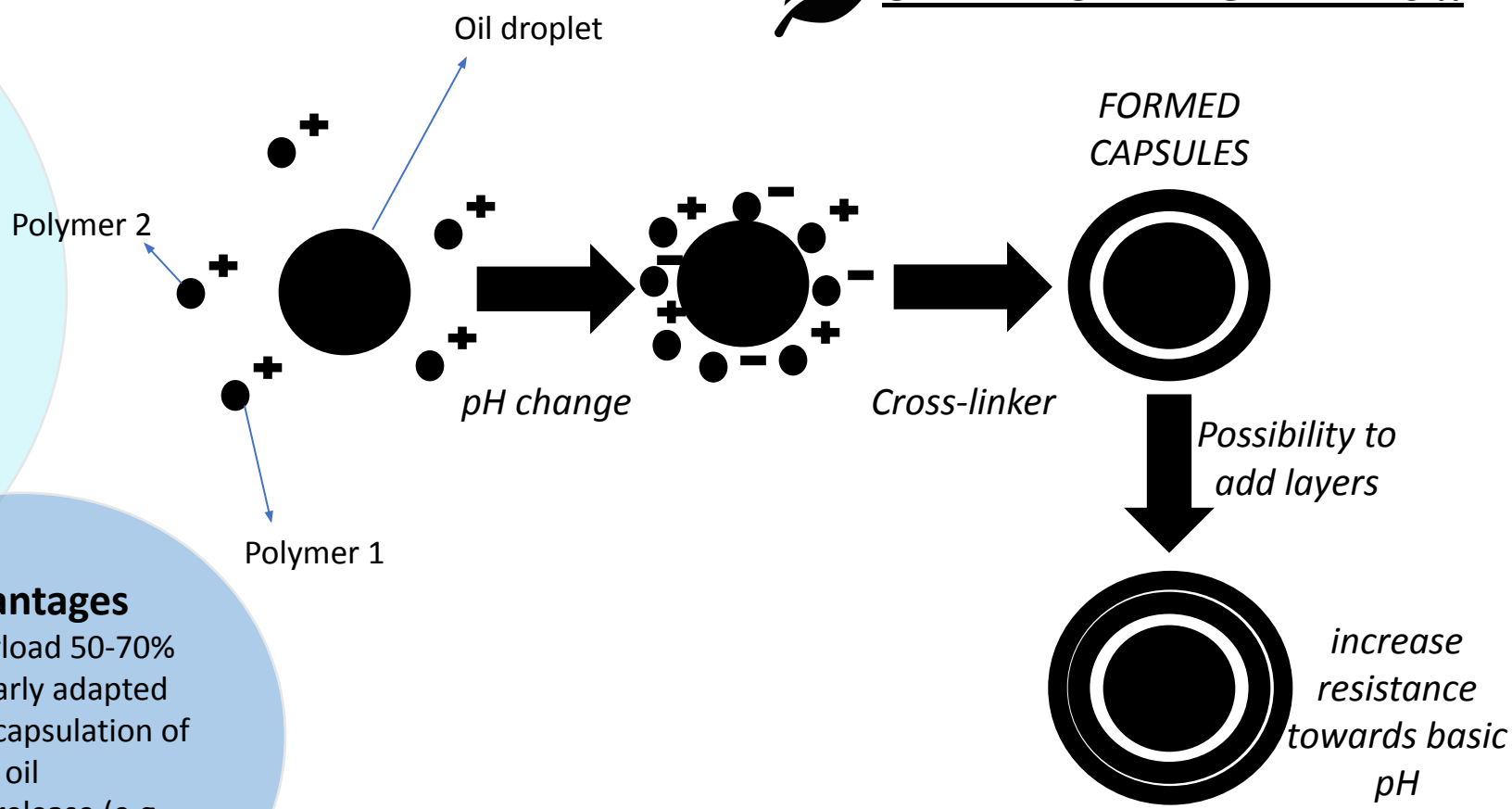
SpheraC ™

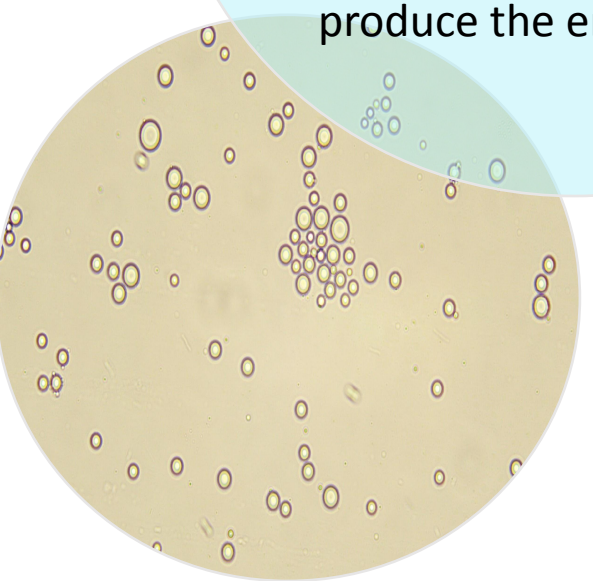
ONLY NATURAL INGREDIENTS !!

The technique

Phase separation between the liquid containing the polymers and the organic phase containing the active ingredient (essential oils, lipophilic active)

pH, temperature and ionic force are used in order to produce the encapsulates.

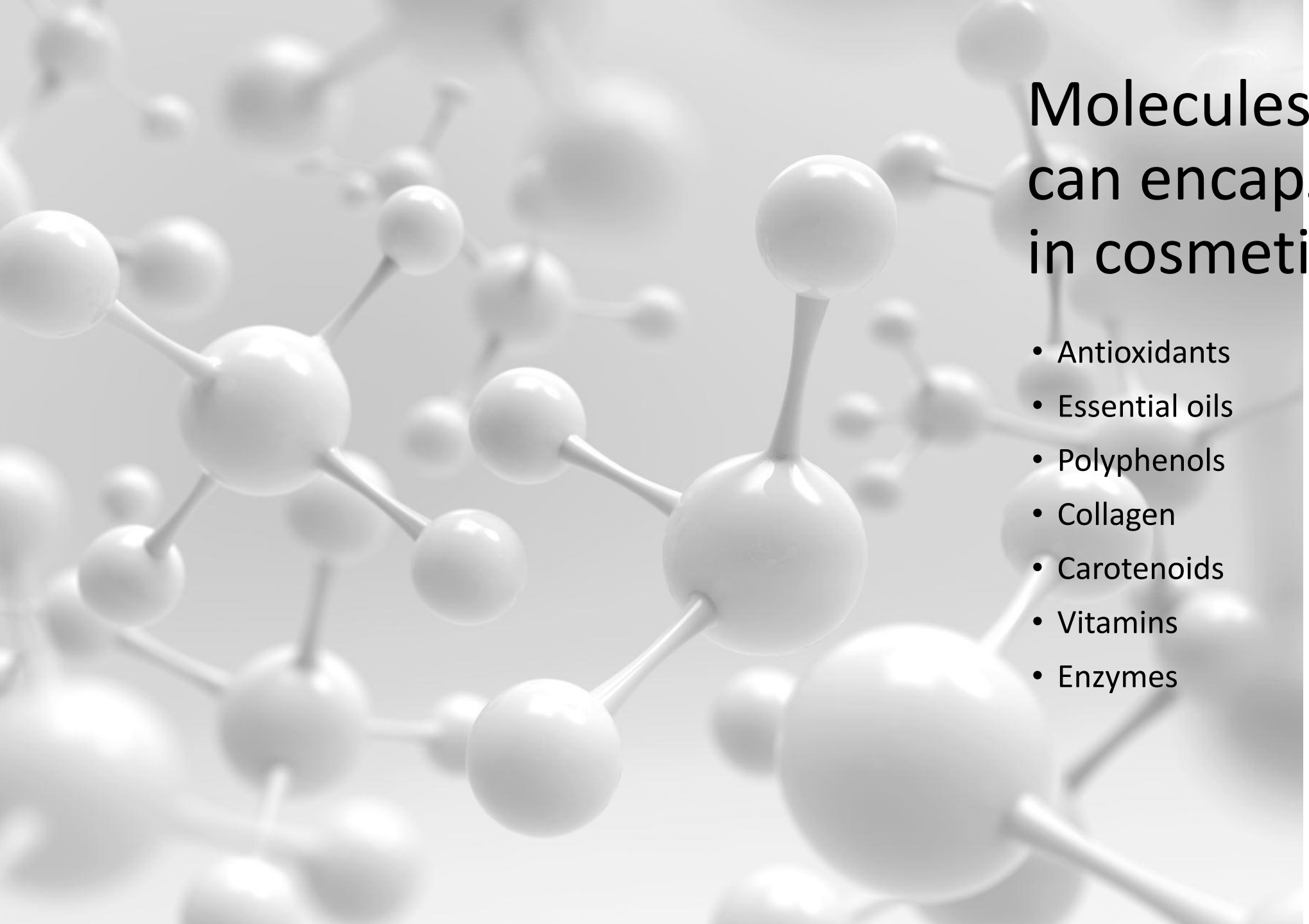




Advantages

-High payload 50-70%
-Particularly adapted for the encapsulation of oil
-Target release (e.g temperature, pH)

Coacervate encapsulates in water



Molecules we can encapsulate in cosmetics

- Antioxidants
- Essential oils
- Polyphenols
- Collagen
- Carotenoids
- Vitamins
- Enzymes

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