



sphera

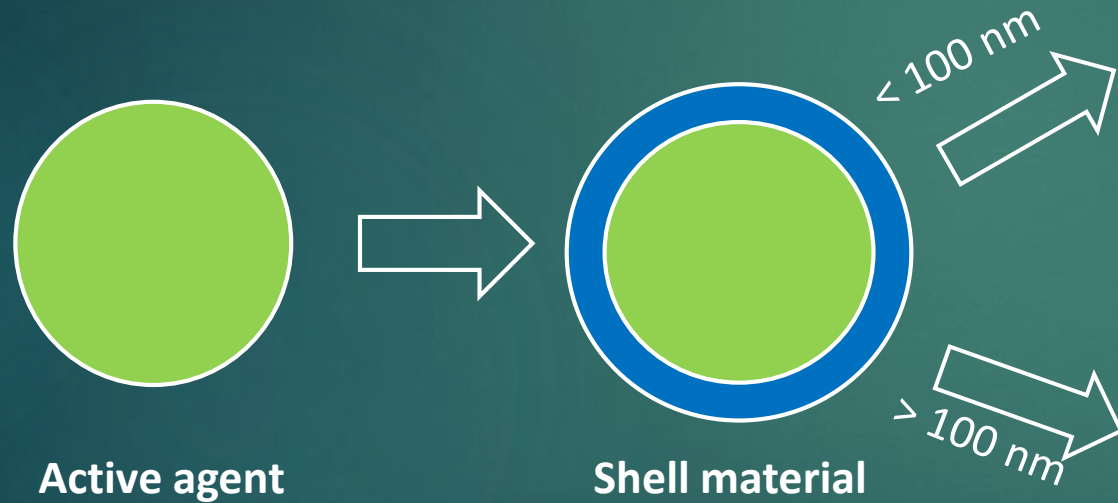
ENCAPSULATION

MICRO TECHNOLOGIES, MACRO RESULTS.

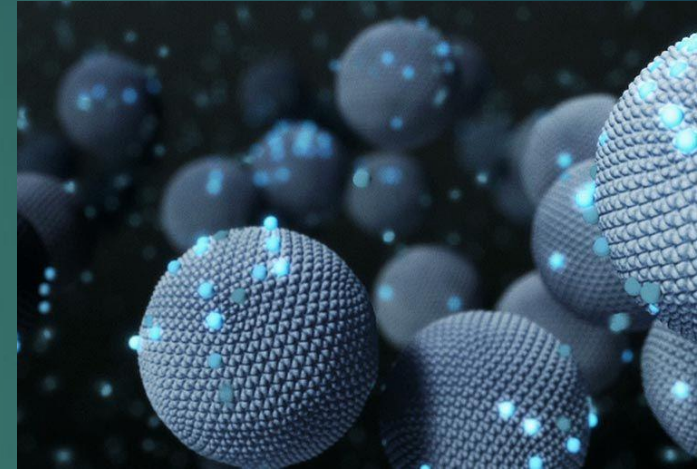
The Company

- ▶ Sphera is the first Italian company dedicated at 100% to the research and development in the field of **micro and nanoencapsulation**.
- ▶ The company was born in Verona in 2016, inspired by the scientific knowledge and work of three young researchers from the University of Verona.
- ▶ We operate successfully in the food, pharmaceutical, chemical, cosmetic and animal nutrition sectors, designing and developing formulations of encapsulated active ingredients for the realization of innovative and functional products.

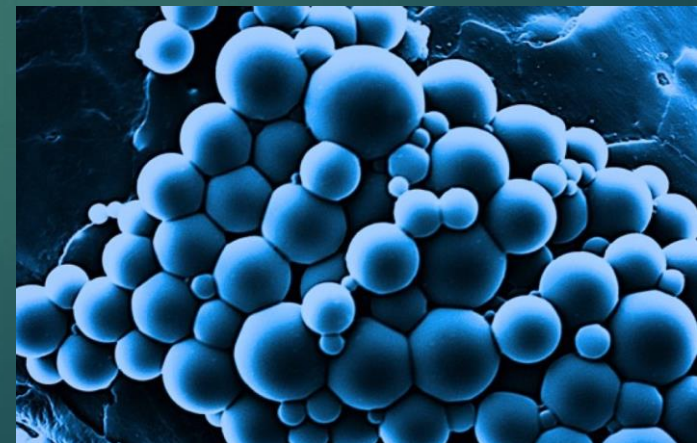
Encapsulation might be defined as the process of entrapping a bioactive compound into a material on a very small scale, in order to protect it from the surrounding environment.



What is encapsulation?

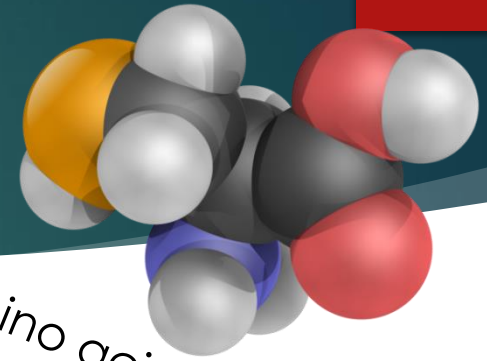


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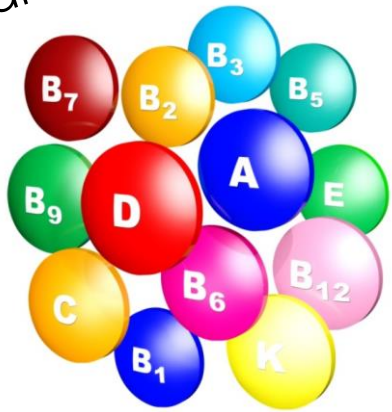


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What do we encapsulate? Well, everything.



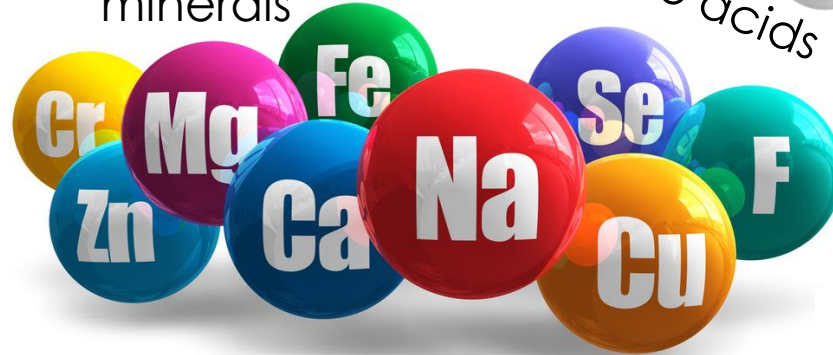
vitamins



Pesticides and fertilizers



minerals

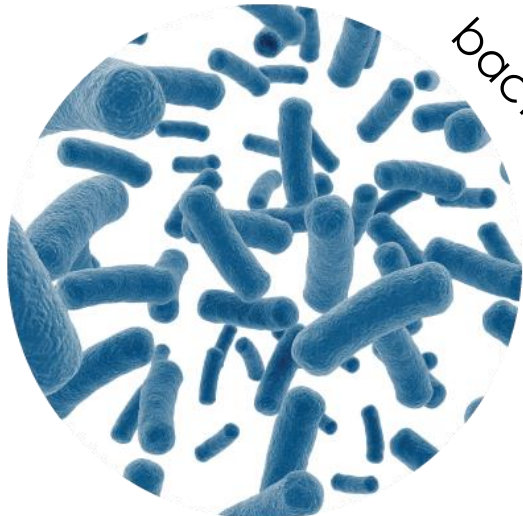


amino acids

enzymes



bacteria



pigments and dyes



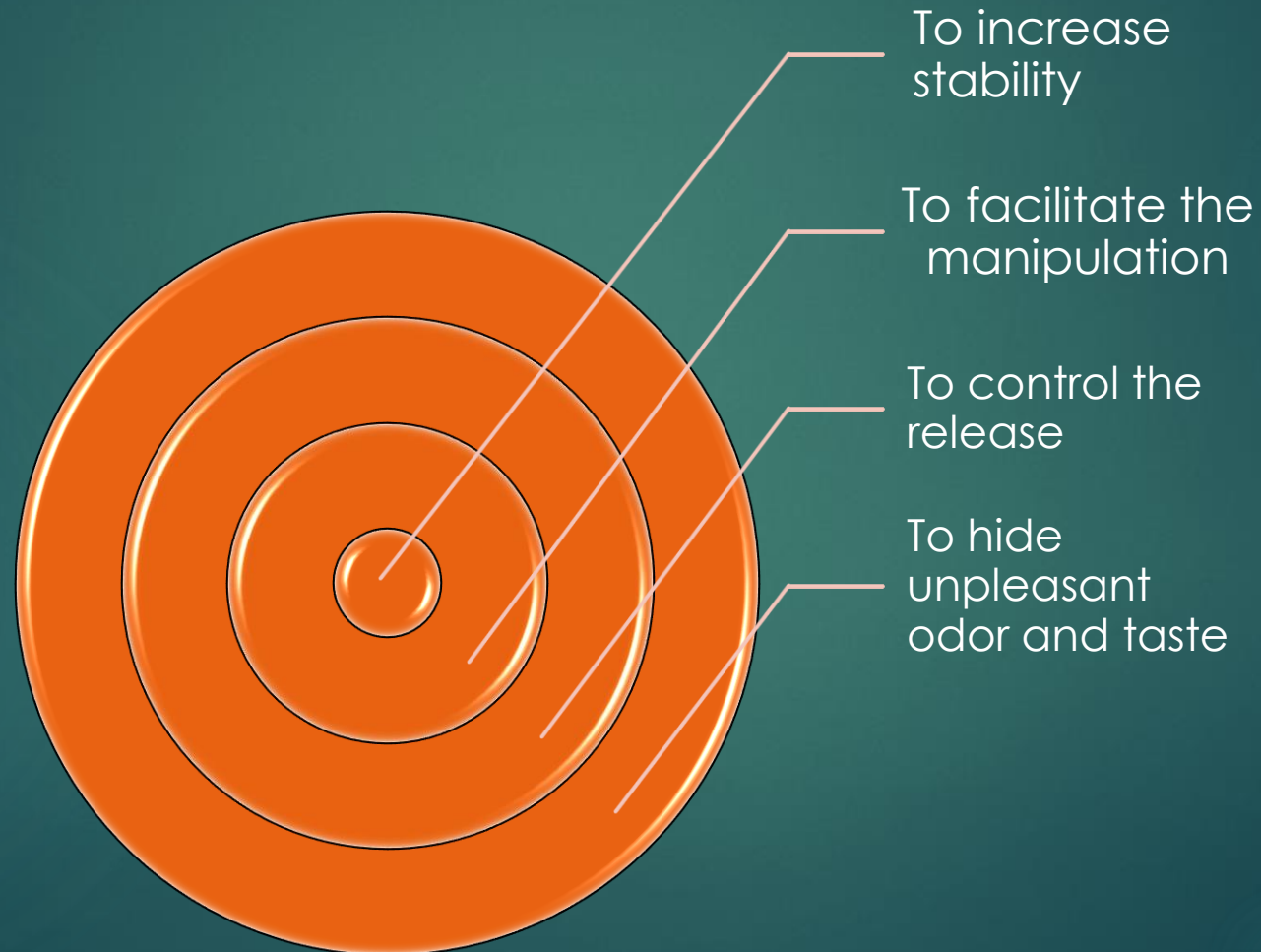
fragrances



flavors



Why do we encapsulate?



Our philosophy

- A company born in a Food Laboratory, Sphera Encapsulation uses only food grade materials in the creation of its formulation;
- Everything in our formulations is 100% biodegradable;
- We use polymers like alginates, pectin, proteins, starches, gelatins, chitosan and many other;
- Our formulations can be also vegetarian, vegan, Kosher and Halal.

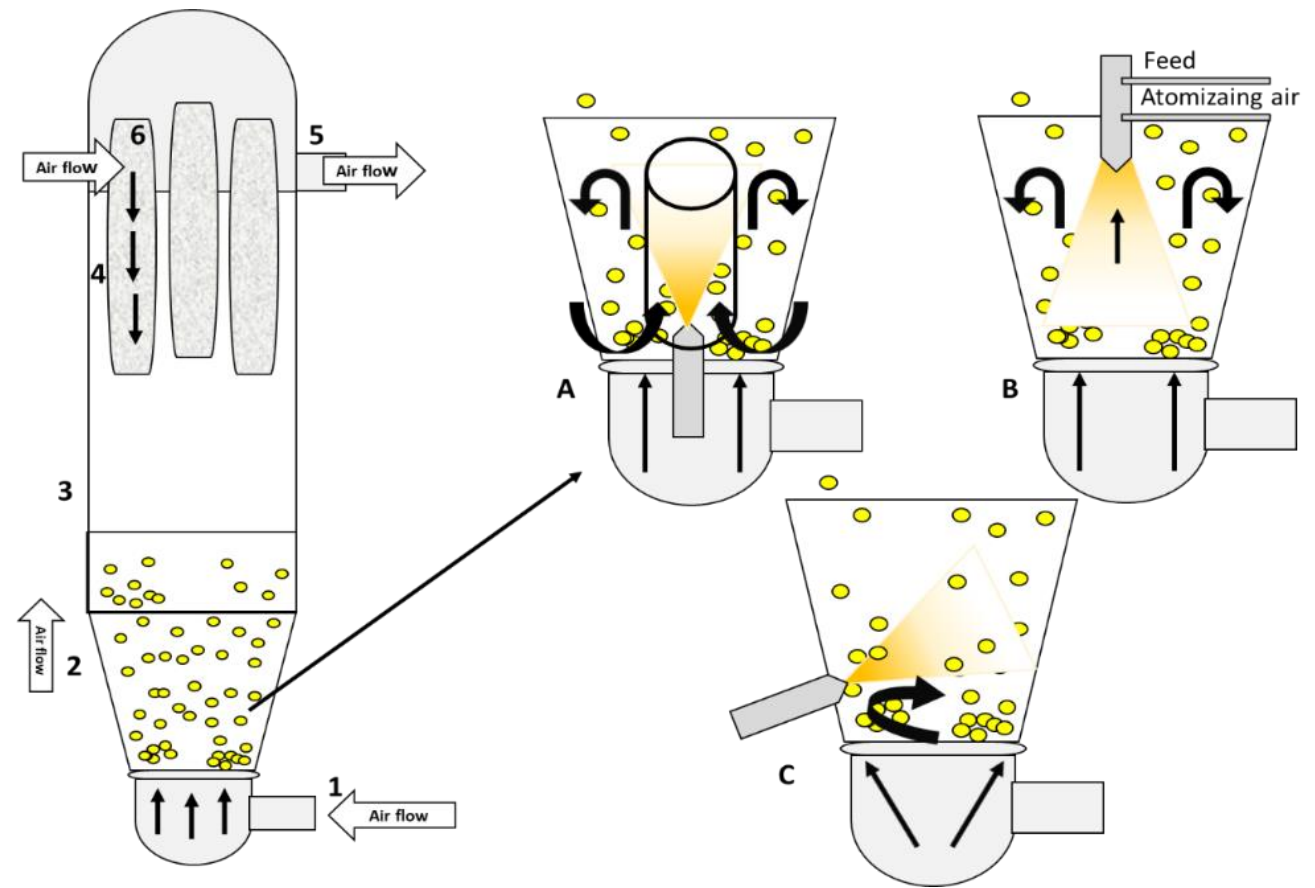


Fluid bed technology

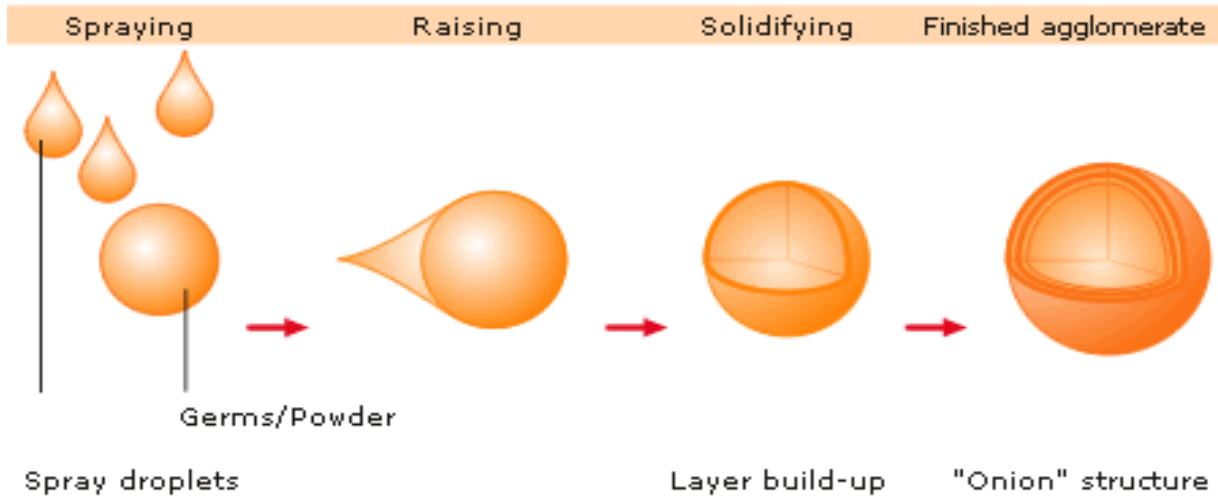
Principle:

A **fluidized bed** is a physical phenomenon occurring when a quantity of a solid particulate substance (usually present in a holding vessel) is placed under appropriate conditions to cause a solid/**fluid** mixture to behave as a **fluid**.

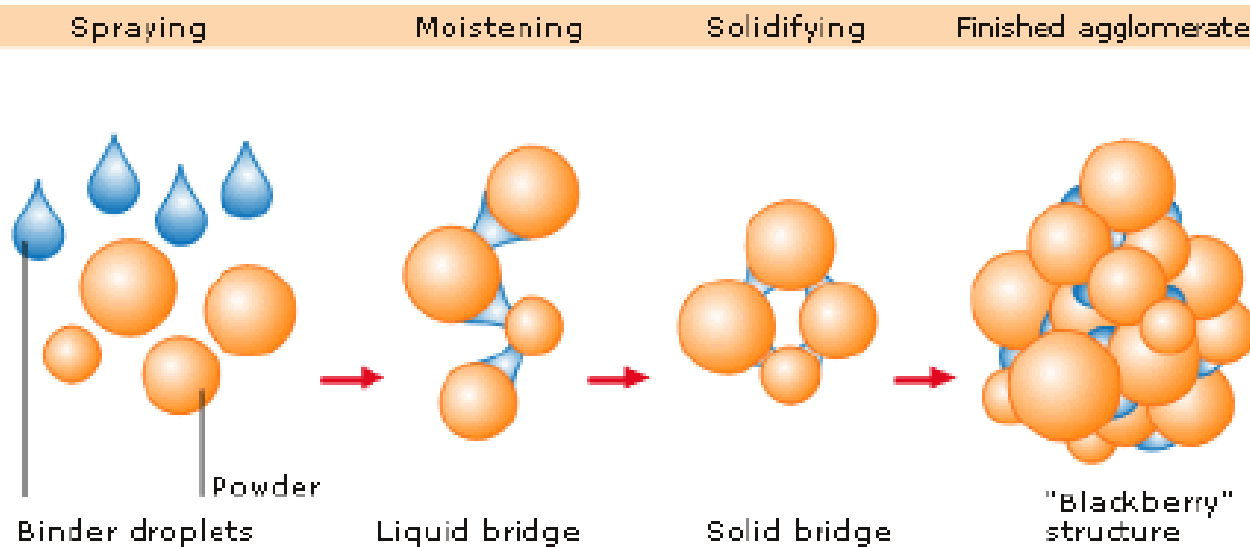
In House: Mini Glatt fluid bed



Granulation



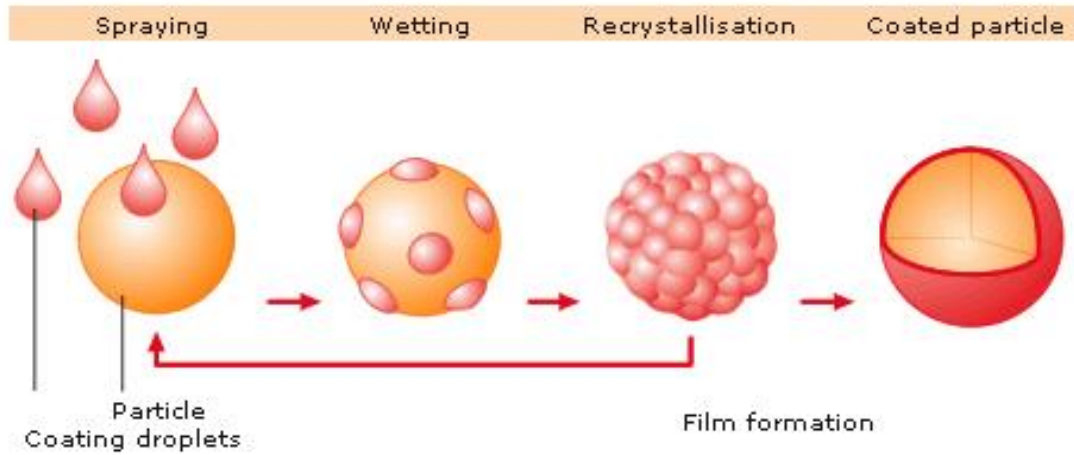
Agglomeration



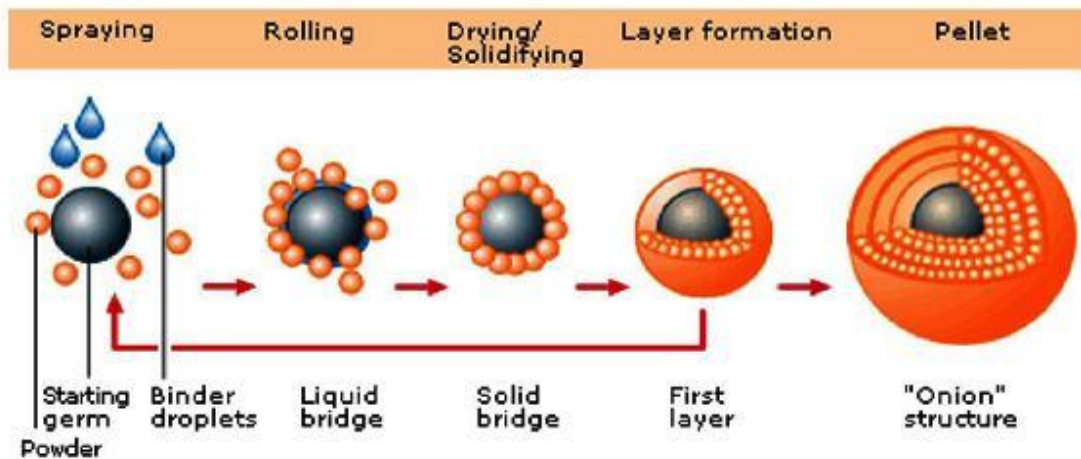
How do we encapsulate?

Fluid bed drying, spraying, agglomeration and granulation

Coating



Layering



How do we encapsulate?

Fluid bed coating and layering



Advantages

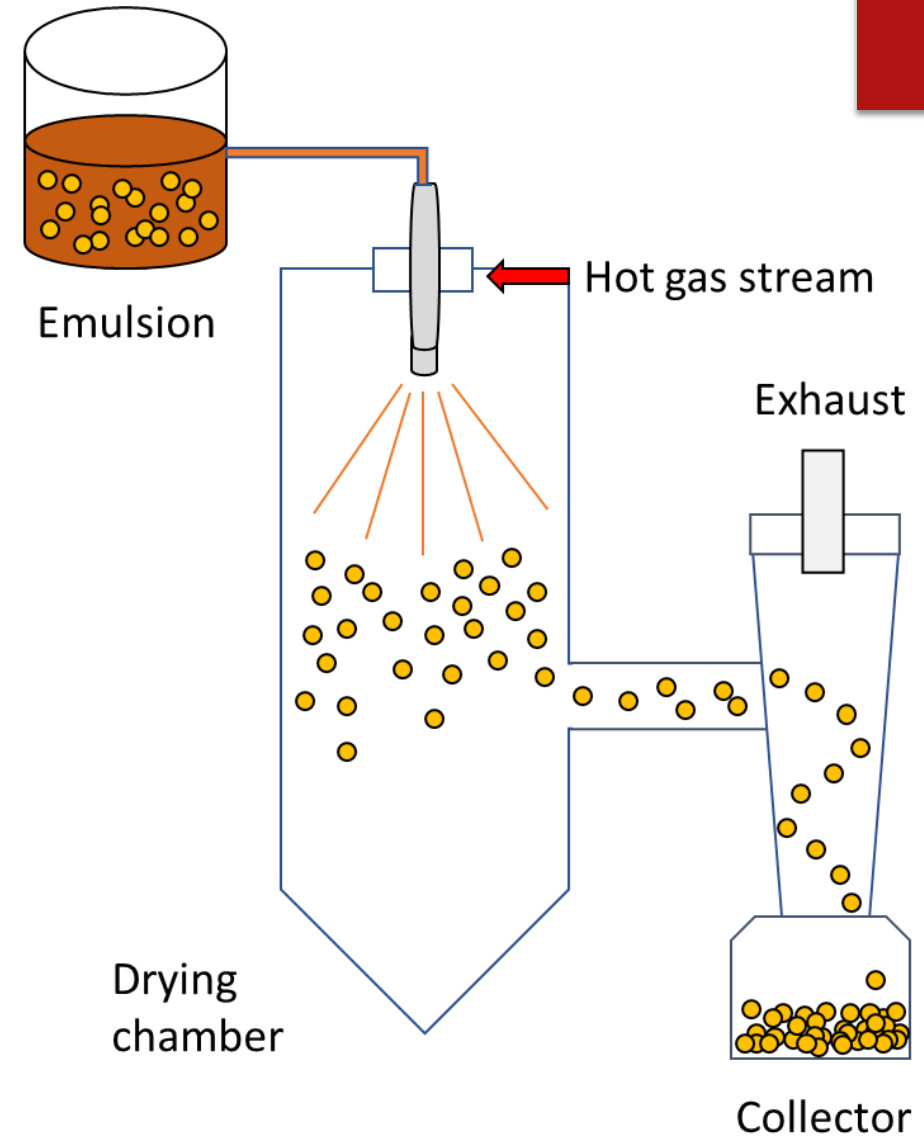
- ▶ Ensures Efficiency in Material Drying, fast and homogeneous drying;
- ▶ **Fluid Bed** is suitable for dealing with heat sensitive products;
- ▶ Wide range of applications and capacities;
- ▶ Suitable for both continuous and batch material processing;
- ▶ Low maintenance cost hence, reduces downtime.

Spray Dry Technology

► Principle:

Spray-drying is a unit operation by which a liquid product is atomized in a hot gas current to instantaneously obtain a powder.

In House: BUCHI Mini spray dryer B-290.



Advantages

- ▶ **Spray-drying** is a rapid, continuous, cost-effective, reproducible and scalable process for the production of dry powders from a fluid;
- ▶ Spray-drying is a technique widely used in the pharmaceutical, chemical, materials, cosmetic and food industries;
- ▶ Possibility to dry a broad spectrum of compounds including heat-sensitive substances without major detrimental effects.



Ionic gelation technology

Principle:

► Involves the interaction of an ionic polymer with oppositely charge ion to initiate cross linking, producing in this way hydrogel beads. Possibility to obtain beads with different structures.

► In House: BUCHI Encapsulator B-390.



Source: Hoad et al., 2011

Advantages

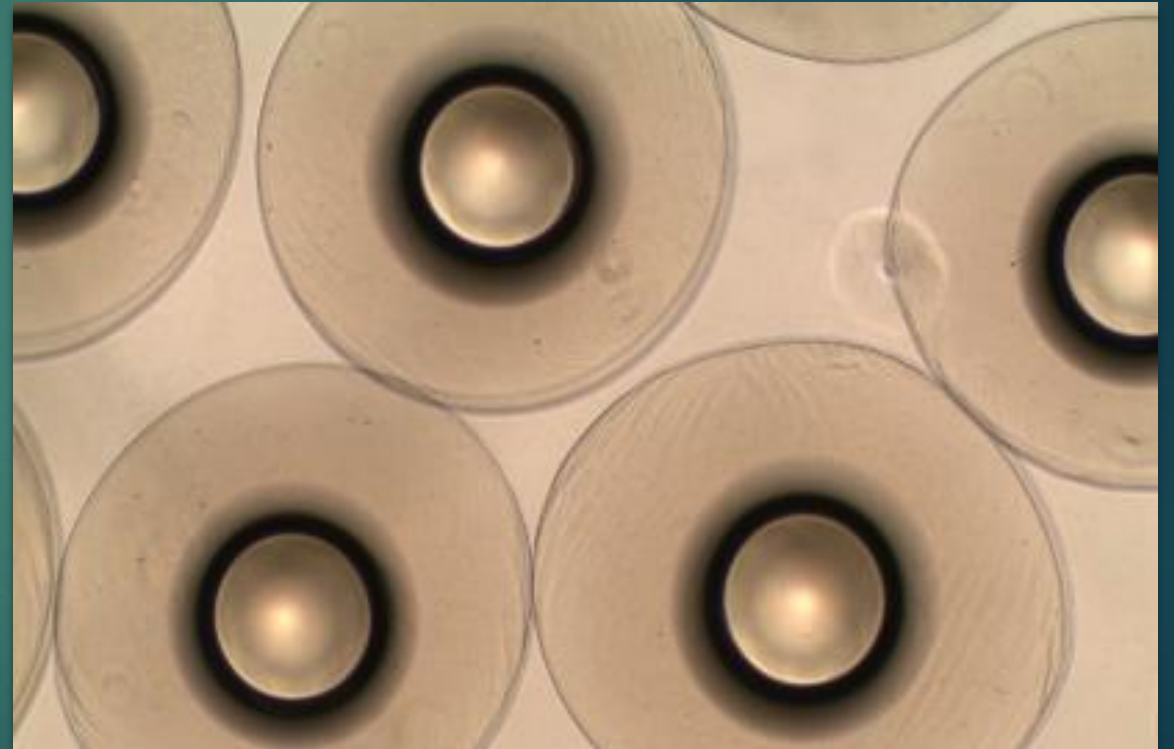
- ▶ A very mild technique;
- ▶ The microencapsulates are not water soluble;
- ▶ Very high % of loading of the active ingredient;
- ▶ Very good taste and odor masking.



Coacervation

Principle:

- ▶ Coacervates are organic-rich droplets formed via liquid-liquid phase separation, mainly resulting from association of oppositely charged molecules or from hydrophobic molecules/ proteins. Coacervation is a phenomena that produces coacervate colloidal droplets.



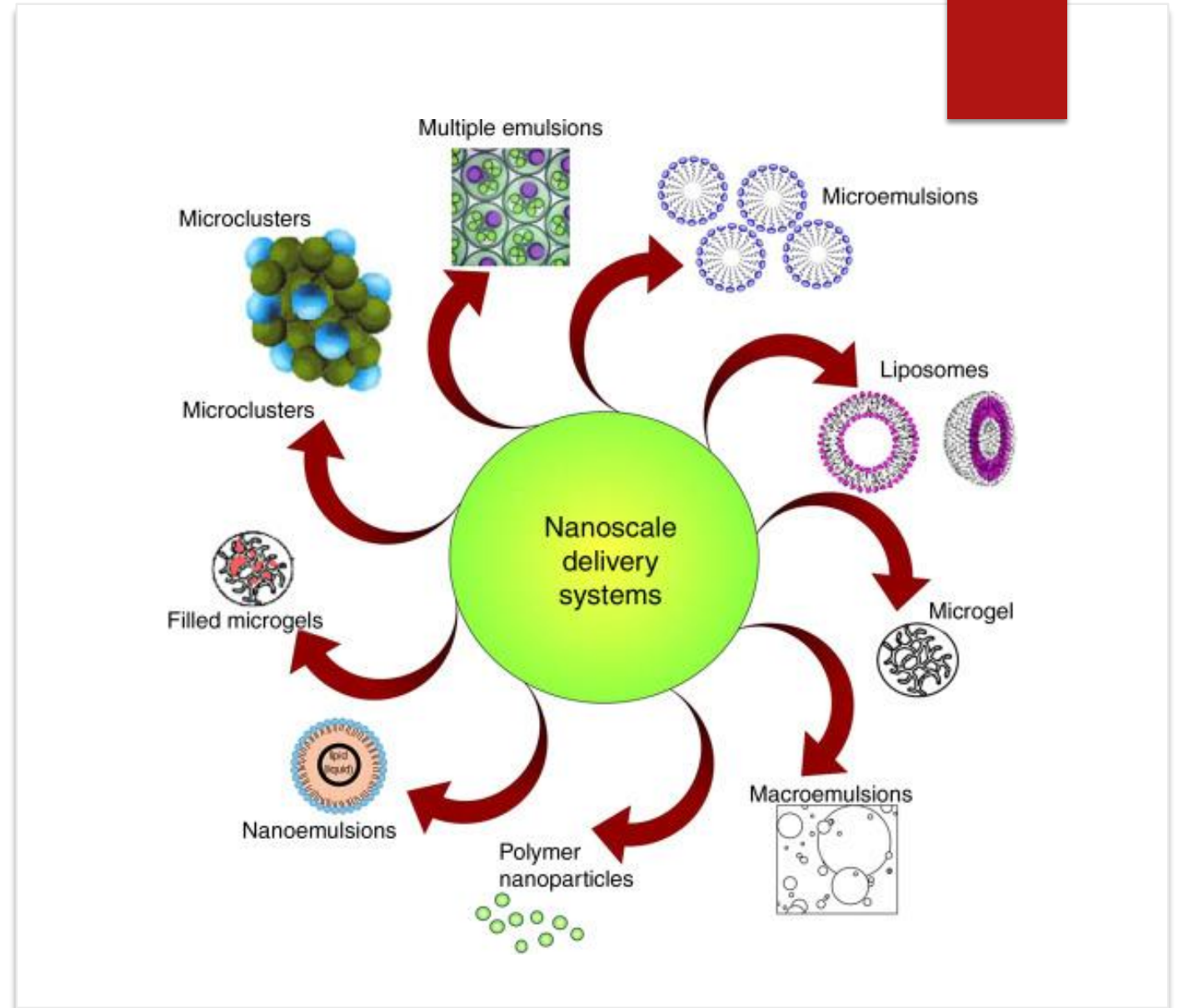
Advantages

- ▶ Simple coacervation can be a cheap technique as the materials used are inexpensive organic salts;
- ▶ The polymers used for this technique are inexpensive as well;
- ▶ Some of the wall materials used for coacervation are not viscose even at high % making it easier to increase the solid content and the strength of the capsule

Nanotechnology

Principle

- ▶ **Nanoencapsulation** is defined as the technology of packaging nanoparticles of solid, liquid, or gas, also known as the core or active, within a secondary material, named as the matrix or shell, to form nanocapsules.



Patent pending technology

US Provisional Patent

Application No. 62/769,642

Entitled: MULTI-LAYERED PARTICLES



**Encapsulant
polymer:**

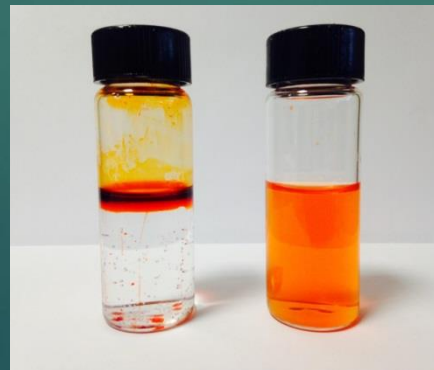
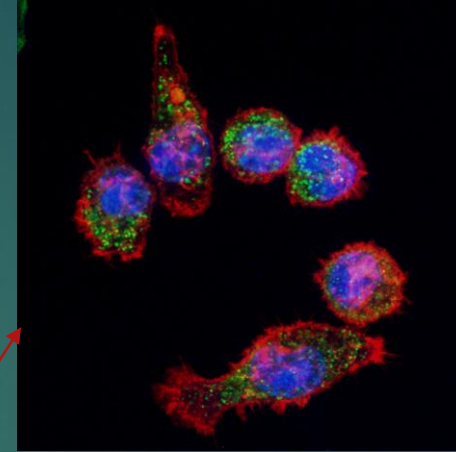
- Natural 100%
- Biodegradable



Encapsulated
active
ingredient



- ✓ Cellular uptake in human cell line
- ✓ Stability to acidic environment;
- ✓ Enhanced strength and resistance in respect to the one wall technology;
- ✓ Cationic charge

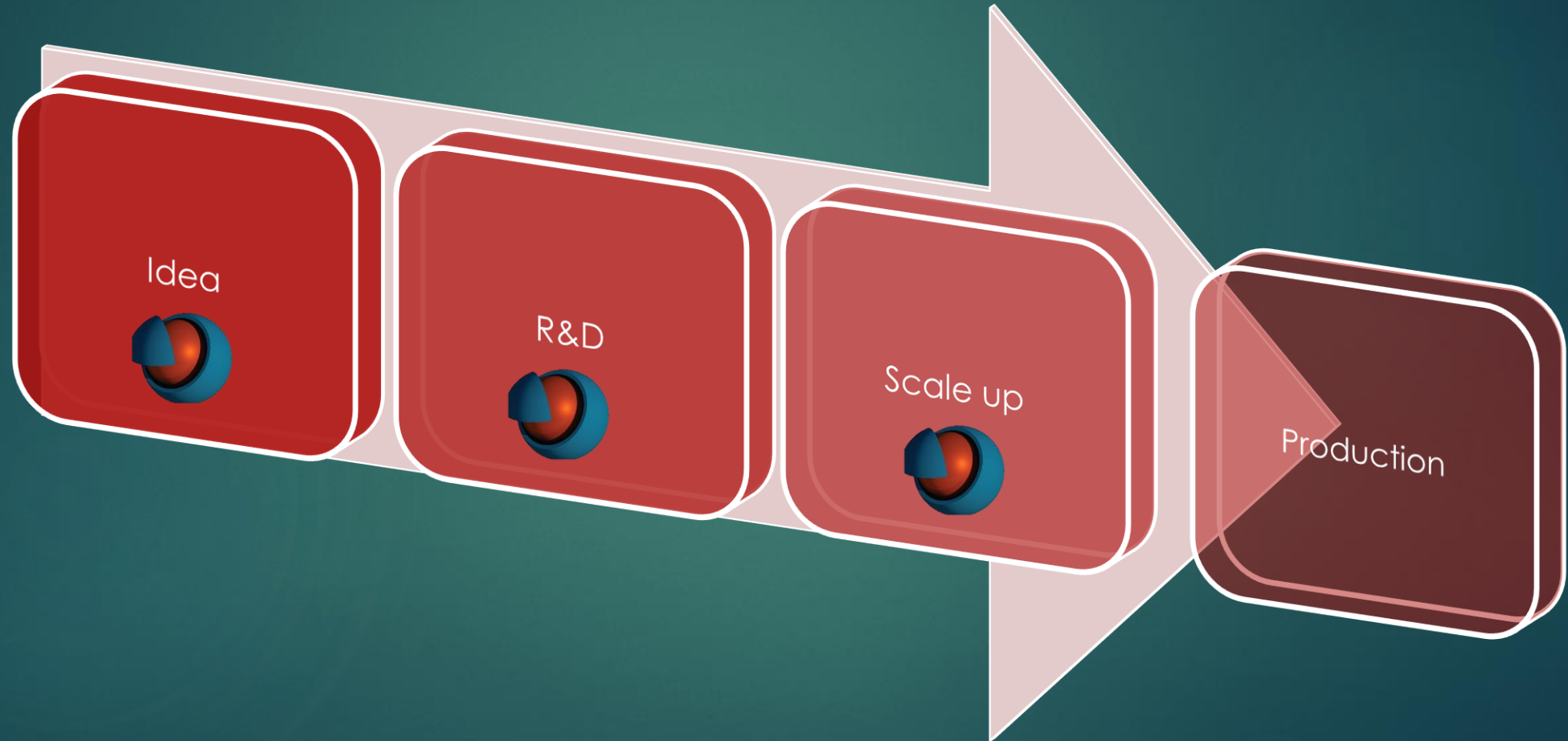



- ✓ 100% water soluble;
- ✓ Biocompatible;
- ✓ Enzyme and pH sensible;
- ✓ In powder, granules and liquid forms

Advantages

- ▶ Protection of sensitive ingredients from the ambient and processing conditions with the aim of extending their shelf life;
- ▶ Controlled release of encapsulated ingredients;
- ▶ Increasing the bioavailability of food ingredients;
- ▶ Modification of the physicochemical properties by converting solutions to fine powders and cutting down on the production costs as well as advancing easier handling of the bioactive component by improving flowability, preventing agglomeration and altering the particle density.
- ▶ Masking the unpleasant aromas and tastes, such as the undesirable taste of fish oil;
- ▶ Preventing the unnecessary interactions with other chemical structures.

Our business model





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37134, VERONA,
ITALY