

# MICROENCAPSULATION TECHNIQUES

HOW AND WHEN TO CHOOSE EACH TECHNIQUE?



TECHNIQUES	APLICATION	SUITABLE COMPOUNDS	PROCESS CONDITIONS	ADVANTAGES	CONSIDERATIONS
IONIC GELATION	Food, Cosmetics, Pharmaceuticals.	Thermosensitive, water-soluble, bioactive compounds (probiotics, plant extracts, vitamins).	Aqueous medium, ambient temperature.	Mild encapsulation, controlled release, diverse formats (microspheres, capsules, beads), high biocompatibility.	Requires particle size control and efficiency. Can be combined with drying or agglomeration.
SUPERCRITICAL FLUID ENCAPSULATION	Highly sensitive ingredients, antioxidants, volatile compounds.	Substances easily oxidisable or unstable even at low temperatures.	Controlled pressure and temperature, solvent-free process.	Oxygen protection, solvent-free residues, encapsulation and extraction in a single step.	Requires specialised equipment, suitable for high value-added applications.
SPRAY CHILLING	Pharmaceuticals, food (baked goods, heat-triggered release ingredients).	Lipophilic compounds, sensitive to gastric conditions.	Cooling of molten materials (water-free), moderate temperatures.	Protection against gastric conditions, heat-triggered release, good lipid stability.	Requires specific industrial equipment design; challenging with hydrophilic actives.
SPRAY DRYING WITH SOLVENTS	Water-insoluble products or compounds dissolved in organic solvents.	Actives requiring non-hydrophilic coating materials.	Inert medium, organic solvents, low-temperature evaporation.	Allows the use of non-water-soluble materials, useful in specific formulations.	Requires safe handling of solvents and controlled conditions.
AGGLOMERATION OF MICROCAPSULES	Preservatives, natural additives, powdered formulations.	Very fine-sized microcapsules.	Dry or wet process, performed after encapsulation.	Improves industrial handling, reduces aerosol formation, facilitates redispersion in water.	Complementary technique, useful for adapting the final product to industrial processes.