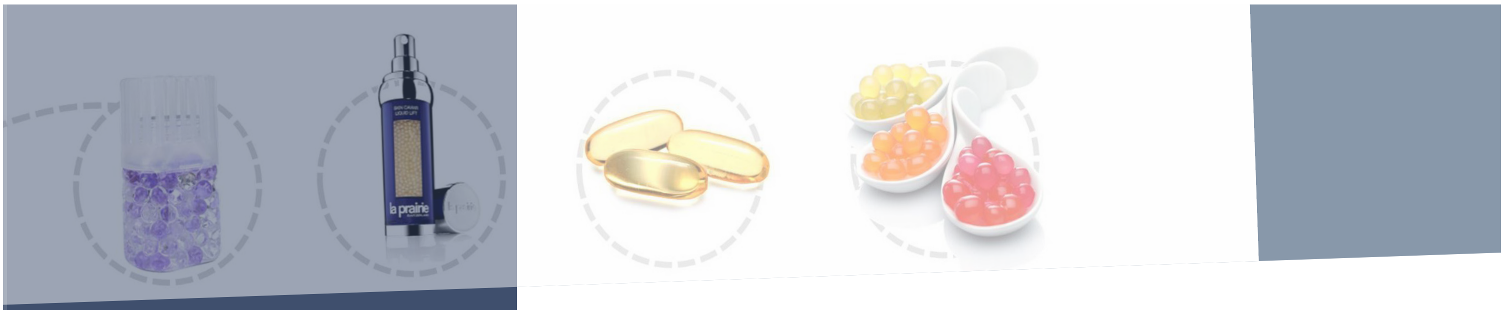

Innovative processes for oil encapsulation

Participants

- ONIRIS,
- Science without Borders (Brazil)

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A novel method of oil encapsulation in core-shell alginate microcapsules by inverse gelation technique

(2017) Reactive and Functional Polymers

Martins E, Poncelet S, Renard D

Monodisperse core-shell alginate (micro-)capsules with oil core generated from droplets millifluidic

(2017) Food Hydrocolloids

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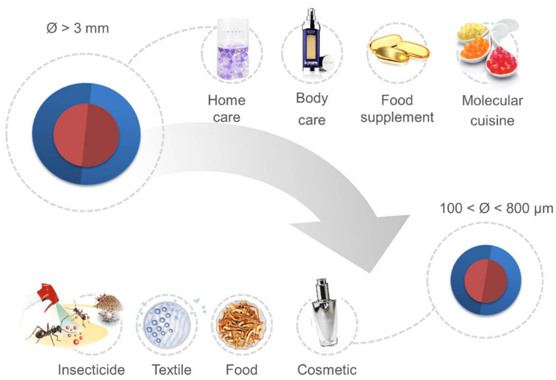
Encapsulation of active compounds is already a mainstream process in all kinds of industries, where it is used to shield often-fragile compounds like oils from manufacturing/storage process-induced degradation and decay. We have produced microcapsules whose size is such that they minimize these process interferences with the texture or appearance of the final product.

▸ RESULTS

Oil encapsulation by inverse gelation works by dropwise addition of a calcium chloride/oil emulsion into an alginate bath. The calcium ions inside the emulsion then migrate out towards the bath and cross-link the alginate chains (inverse gelation). This technique can thus form millimetre-scale capsules (3–7 mm) with core–shell morphology. However, sub-millimetre-size capsules had never before been produced by inverse gelation. In an effort to get smaller-sized capsules, we developed a process that consists of forming droplets by dispersing the emulsion in a stirred alginate bath, and that works with either oil-in-water emulsion or water-in-oil emulsion. Alginate crosslinking to form the membrane then produced microcapsules at sizes in the range of 370 to 500 µm. The dispersion protocol was then re-engineered for a millifluidics process in order to control microcapsule size. We thus managed to produce monodisperse capsules size-bracketed to within diameters of 140 µm up to 1.4 mm.



Use of micro/millicapsules in several industrial applications ©Thesis Evandro Martins (2015) Université de Nantes

▸ FUTURE OUTLOOK

Moving forward from this successfully engineered process, we still have to optimize the release of calcium ions from the capsule core so as to increase membrane thickness —because a thicker membrane will offer greater mechanical strength after drying while at the same time delivering near-90% encapsulation rates for the dry capsules. The capsule sizes generated also pave the way to applications in non-food sectors (textiles, cosmetics).