New technology offers simple, low-cost method for encapsulation

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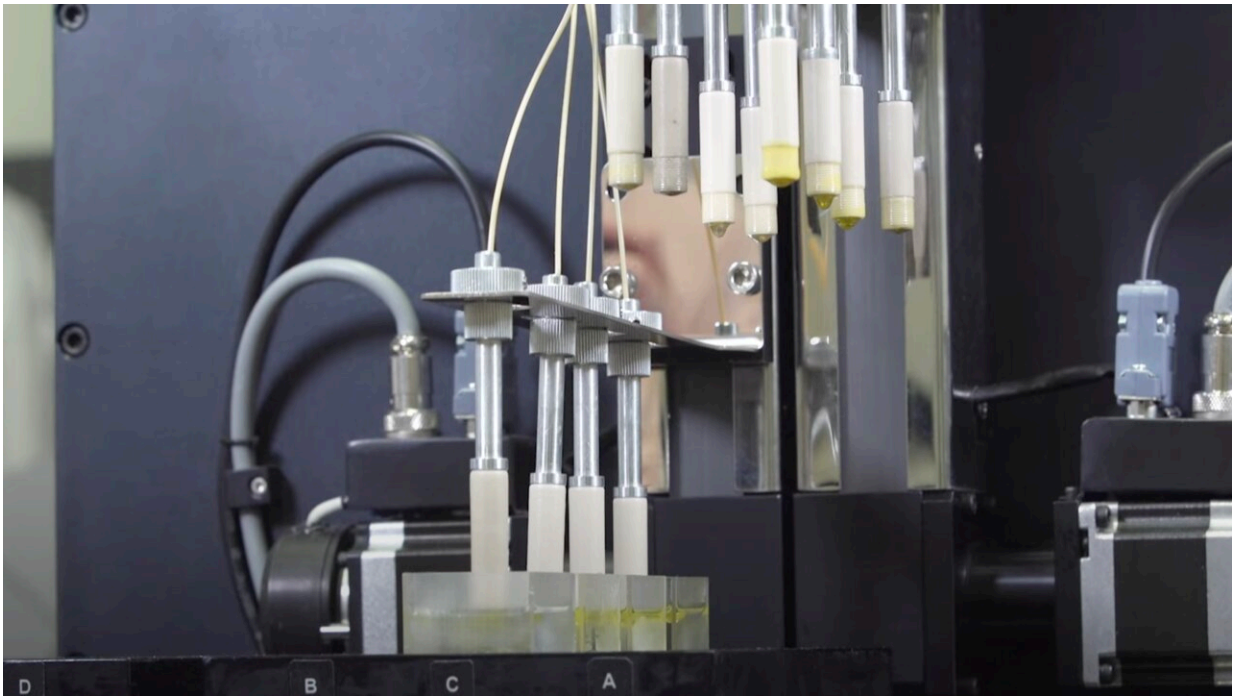

Credit: University of Waterloo

Researchers at the University of Waterloo have developed a simple, low-cost method for accurately encapsulating core materials (which could be pure liquid or liquid containing suspended functional ingredients) that could make important contributions to a wide range of industry applications.

The process, known as a liquid-liquid encapsulation system, introduces a drop of core material through a nozzle, which impacts on a host bath, containing a floating shell layer on the surface. When a complex interaction of the core material with the shell layer occurs, it creates a stable encapsulation which protects the core material and safeguards it from an aggressive environment enabling a timely release of the cargo material to a targeted area.

"The key to this technology is that everything is in liquid state—the core, the shell, and finally submerged inside a liquid bath. This provides extraordinary flexibility in terms of core shell combinations. At least 15 of these types of combinations have already been demonstrated," said Sushanta Mitra, executive director, Waterloo Institute for Nanotechnology and professor of Mechanical & Mechatronics Engineering at the University of Waterloo.

"It is ultrafast with each encapsulation taking only 50 milliseconds. This technology is at least 5,000 times less energy intensive and it avoids the introduction of any microplastics in the encapsulation process."

This technology could be useful in the nutraceutical, pharmaceutical, food and beverage, cosmetic and personal care industries. For example, the use of soft gel filling encapsulation machines in the nutraceutical industry could reduce operating costs and expand development and production of new products as multiple core materials can be encapsulated and delivered in the same parcel.

Dr. Mitra and his team have developed a robust prototype with four injection nozzles that can deliver up to 200,000 encapsulated cargo in an hour and are currently working with partners and product manufacturers in the Netherlands to integrate the curing stage with their prototype so the encapsulated cargo could be extracted as individual capsules on demand if needed.

"In the end we strive toward being a sustainable and innovative encapsulation entity that meets the UN sustainable development goals," Mitra said.

Provided by University of Waterloo