

Private Company 

# Continuous production processes for encapsulation systems

 MATERIALS

## Background

Encapsulation technology is used for protecting and controlling the release of active ingredients in industries such as pharmaceuticals, food, agriculture, and chemicals. It enhances product stability, prolongs shelf life, and ensures precise delivery under specific conditions, supporting applications like drug delivery systems, agrochemical formulations, and food preservation. Traditionally, encapsulation has been performed using batch processes. While effective, batch production involves high energy consumption and downtime between batches, reducing overall efficiency. Continuous or semi-continuous production methods could improve productivity, reduce energy use, and shorten processing times. However, transitioning from batch to continuous processing presents several challenges. Encapsulation processes often demand precise control over temperature and pressure, requiring careful management of stability throughout the system. Additionally, some process steps require longer residence times, necessitating consideration of flow dynamics and system design. Moreover, the high viscosity and complex rheological behavior of certain systems can create flow issues, leading to material buildup and fouling, such as insoluble resin deposits on reactor surfaces. These deposits can result in inefficiencies, flow stagnation, and potential process disruptions. To overcome these challenges, we are seeking experts in process optimization and reactor design to assist in the transition to continuous or semi-continuous encapsulation production. The goal is to improve productivity and energy efficiency while making sure flow dynamics, temperature and pressure conditions are kept optimum throughout operation.

## What we're looking for

We are looking for partners who can provide end-to-end expertise in transitioning from batch to continuous or semi-continuous encapsulation production. This includes designing, implementing, and optimizing the production process. Interdisciplinary teams and organizations offering comprehensive solutions are encouraged to apply, but specialists focusing on specific aspects of the process will also be considered.

## Solutions of interest include:

- Modifications of off-the-shelf installations for tailored process needs.
- Modular reactor design for flexible scaling and process optimization.
- Experts in continuous flow reactors, energy-efficient designs, and scaling chemical processes.
- Automation and control systems specialists for continuous production.
- Thermal management and energy-efficient design experts.
- Teams with advanced encapsulation expertise, particularly in continuous or semi-continuous systems.
- Specialists in handling high-viscosity materials and optimizing flow for challenging conditions.

**Our must-have requirements are:**

- Applicants must have expertise in reactor design, process optimization or production of encapsulation systems (e.g. oil-in-water systems).
- Systems, once developed, must be easy to clean to prevent contamination/fouling.
- Production capacity at pilot scale or larger (above 100 kg per day).

**Our nice-to-have's are:**

- Continuous process designs that have been successfully tested under similar conditions (e.g., using viscous materials up to 1 Pa.s, temperatures below 100 °C, and pressures below 2 atm).

**What's out of scope:**

- Non-customizable solutions.

**Acceptable technology readiness levels (TRL): Levels 3-9**

1. Basic principles observed
2. Concept development
3. Experimental proof of concept
4. Validated in lab conditions
5. Validated in relevant environment
6. Demonstrated in relevant environment
7. Regulatory approval
8. Product in production
9. Product in market

**What we can offer you****Eligible partnership models:**

- Sponsored research
- Supply/purchase
- Material transfer

**Benefits:****Gift (Unrestricted grant)**

The level of funding could be in the range of 15000€ to 150000€, depending on the work plan and milestones.

**Sponsored Research**

The level of funding will be consistent with ranges typical of those for postgraduate or post-doctoral research, and could be between 25000€ to 150000€ depending on the work plan.

**Expertise**

As a selected partner, you will work in connection with company experts towards providing a best-in-class solution. Regular meetings will ensure project success and alignment throughout the project.

Please contact the University of South Florida Technology Transfer office representative for submission – Karla Schramm at [kschramm@usf.edu](mailto:kschramm@usf.edu)