Background

BASF is an industry leading chemicals company creating solutions for a sustainable future. The company is seeking biodegradable micro-encapsulation technologies for active ingredients.

BASF is particularly interested in non-microplastic core / shell particles to encapsulate hydrophobic active ingredients, where microplastic is solid particle >1 nm containing a non-biodegradable polymer.

Scientific challenges associated with developing a biodegradable capsule with extended release include lack of methods to adjust tightness of capsules without compromising of biodegradability. Conventional approaches, such as capsule size, shell wall thickness, shell wall polymer MW, may impact capsule tightness to less extend as desired, while chemical bonding through crosslinking (most effective way) may eventually compromise polymer biodegradability. Additionally, it is difficult to achieve desired capsule size (e.g., around 2 micron), which poses potential commercialization limitations, such as product shelf life and drone applicability.

What we're looking for

BASF is seeking a biodegradable encapsulation material for hydrophobic active ingredients. Core-shell morphologies are of high interest, but relevant matrix capsules and other morphologies will be considered.

Solutions of interest include:

- Active ingredients could be assumed as hydrophobic liquid at 25C
- Capsule sizes should ideally be d(50) < ~ 6 µm and d(90) < ~15 µm
- The active ingredient concentration to be encapsulated is >10%
- The tightness of capsules / active ingredient release profile is adjustable
- A >90% encapsulation efficiency is ideal
- Cost-effective solution: ideally <~20 $/kg for the capsule material and < ~2 $/kg for manufacturing
- Biodegradable as per ISO 17556:2012: 90% ultimate degradation in soil at 12 °C within 24 months

Our must-have requirements are:

- Safe chemistry that doesn’t introduce hazardous substances or generate microplastics
- Suspension in water or oil

Our nice-to-have requirements are:

- Green chemistry approaches: polymers from natural sources/resources
- TRL3 technology has been developed for licensing / commercialization

What's out of scope:

- PU/PA based chemistries
- Dry/powder encapsulants

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**
- **Material transfer**
- **Supply/purchase**

Benefits:

Sponsored Research

We will screen the potential ideas and depending on the maturity level, set up a sponsored research collaboration (typically $50k-$150k for a one-year collaboration).

Expertise

Decades of industrial expertise and institutional knowledge

Tools and Technologies

Trials with experimental materials, support with BASF raw materials and active ingredients, and characterization/testing of encapsulant materials.

Reviewers

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Collaboration & Scouting NA

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