

Bath Monash Global PhD Programme in Sustainable & Circular Technologies

Project Title:	Biodegradable cellulose microcapsules for nutraceuticals delivery in food
Supervisors at Bath:	Davide Mattia (lead), Karen Edler
Supervisors at Monash:	Antonio Patti
Home Institution:	Bath
Indicative period at Host Institution:	Minimum 2x 6 months periods over the duration of the PhD.

Project Summary

Nutraceuticals are food and beverage products enriched with vitamins, antioxidants and minerals. They represent a major market, worth USD 380 billion in 2019 and set to expand further, driven by consumers interest in healthier diets. Microencapsulation of nutrients is a major component of this success, with a wide range of capsule shells materials, from proteins to fossil-fuel derived polymers, with the latter having the largest share in the market. The success of fossil-fuel derived polymers in this application is due to their high stability and ease of production. As part of the drive away from fossil fuels and towards a circular economy, there is a clear need for novel capsule materials with performance comparable to fossil fuel-derived polymers but which are biodegradable.

In this joint project between Bath and Monash, we will develop biodegradable cellulose microcapsules for nutraceutical applications. Bath has recently developed a process to create cellulose microcapsules capable of carrying oil-based compounds. Monash has developed an efficient process for the extraction of omega 3 fatty acids from pomegranate seeds, which represent one of the largest growth areas in nutraceuticals.

Working in an integrated team across the two institutions, the PhD student will adapt Bath's cellulose capsule process to incorporate the Omega 3 fatty acids in a continuous process that could be scaled up industrially. The student will also investigate the stability of the capsules, developing different release mechanisms for distinct applications (e.g. for food or beverages). This will involve chemical modifications of the cellulose materials which, in turn, will necessitate assessing whether there modified materials retain their biodegradability.

Features of the programme

- PhD researchers will be registered at both institutions and will be awarded a joint PhD degree.
- PhD researchers will be jointly supervised by academics from both Monash and Bath Universities.
- All PhD researchers in the joint programme will also undertake a bespoke advanced training plan covering a range of topics focusing on sustainability.
- Applicants can apply to either Monash University or the University of Bath as their nominated home institution.
- PhD researchers will undertake a period of no less than 12 months at the partner institution.
- Up to four scholarships/studentships will be offered. Additional and suitably qualified applicants who can access a scholarship/studentship from other sources will be also considered. Evidence of funding must be provided.
- The scholarships/studentships include:
 - a *full tuition fee sponsorship* provided by Monash or Bath for the course duration (up to a maximum 42 months). **Funding for Bath-based projects, such as the one advertised here, is available to candidates who qualify for Home fee status only.** In determining Home student status, we follow the UK government's fee regulations and [guidance from the UK Council for International Student Affairs \(UKCISA\)](#). Further information may also be found within the university's [fee status guidance](#). EU/EEA citizens who live outside the UK are unlikely to be eligible for Home fees and funding. Funding for Monash-based projects is available to candidates of any nationality.
 - a *living allowance (stipend)* provided by Monash or Bath Universities.

Note: Overseas Student Health Cover (OSHC) must be paid by the student, unless covered by the university.

How to apply

You MUST express interest for three projects in order of preference. Please submit your application at the Home institution of your preferred project ('Home' institution details can be found in the project summary). However, please note that you are applying for a joint PhD programme and applications will be processed as such.

The deadline to submit applications is 11th April 2021

Monash University

Expressions of interest (Eoi) can be lodged through <https://www.monash.edu/science/bath-monash-program>. The Eoi should provide the following information:

CV including details of citizenship, your Official Academic Transcripts, key to grades/grading scale of your transcripts, evidence of English language proficiency (IELTS or TOEFL, for full requirements see: <https://www.monash.edu/graduate-research/faqs-and-resources/content/chapter-two/2-2>), and two referees and contact details (optional). You must provide a link to these documents in Section 8 using Google Drive (Instructions in Section 8).

University of Bath

Please submit your application through the following link: <https://www.csct.ac.uk/bath-monash-global-phd-programme/>

Please make sure to mention in the "finance" section of your application that you are applying for funding through the joint Bath/Monash PhD programme for your specified projects.

In the "research interests" section of your application, please name the three projects you are interested in and rank them in order of preference. Please also include the names of the Bath lead supervisors.