Droplet-Based Microfluidics and its Applications for Biotechnology

Summary

The project focuses on developing and applying novel user-friendly droplet-based microfluidic pipelines for high-throughput biological assays. This includes employing a vast array of techniques such as hands-on construction and manipulation of microfluidic platforms, generation of small (pico- and nanoliter sized) water-in-oil droplets, biology and chemistry experimental procedures, microscopy imaging, and image analysis via software tools. The candidate will join an interdisciplinary and thriving environment comprised of international researchers and students, that work together and collaborate across departments and with other universities.

Research field:	Chemistry and biotechnology
Supervisors:	Prof. Dr. Ott Scheler Simona Bartkova
Availability:	This position is available.
Offered by:	School of Science Department of Chemistry and Biotechnology
Application deadline:	Applications are accepted between January 01, 2024 00:00 and January 22, 2024 23:59 (Europe/Zurich)

Description

The research

The goal of this PhD project is to develop and apply novel user-friendly droplet-based microfluidic pipelines for enabling high-throughput biological assays. Specifically, the project aims to implement droplet-based pipelines that not only assist in answering vital biological questions but are also accessible for non-specialists. This PhD Position is offered by the Microfluidics lab at Department of Chemistry and biotechnology at TalTech (https://taltech.ee/en/department-chemistry-biotechnology/division-of-gene-technology-and-biomedicine#p2219698).

The prospective PhD project is developed around these topics pursued currently in the Microfluidics lab:

- Development of user-friendly droplet microfluidic technologies for biotechnology
- Investigation of antimicrobial susceptibility and resistance mechanisms at single cell level in droplets
- Influence of different anthropogenic pollutants (Micro-and nanoplastic, metals, chemicals, etc) to cells and their drug sensitivity
- Prospective students can also propose and develop their own research directions in the field of droplet microfluidics

Droplet-based microfluidic applications are rapidly expanding in biological research. Encapsulation of study material into microdroplets enables massive high-throughput and resolution parallelization, chemical separation, and confined sample analysis. This is unprecedented via classical methods that use flasks, petri dishes, and microtiter plates. However, despite new droplet microfluidic tools evolving and providing new experimental pathways, many obstacles and limitations remain, and the tools are underused in general biology and chemistry labs. There is a need for bridging the gap between state-of-the-art droplet-based microfluidics tools and their easy application for the general scientific community.

Responsibilities and (foreseen) tasks

- development of different droplet-based microfluidic tools and analytical pipelines.
- Investigate current experimental approaches in biology and how droplet-based microfluidics could be implemented to improve these methods.
- Investigate different possibilities in droplet analysis (e.g. imaging tools, analytical software, etc).
- Contribute to dissemination of results relevant to the project (e.g. presentations and posters at international conferences, and workshops and popular writings for the general public).
- Contribute to supervision of bachelor and master students and assisting in lectures

Applicants should fulfil the following requirements:

- a master's degree in a natural science (e.g in molecular biology, gene technology, microbiology, biochemistry or similar)
- previous experience with basic laboratory procedures and techniques
- a clear interest in the topic of the position
- strong writing and analytical skills
- ability to work both as an independent researcher and as part of a dynamic and international team

(The following experience is beneficial, but not expected)

- Microfluidics (especially droplet-based microfluidics)
- Light microscopy, confocal fluorescence microscopy
- Working knowledge of image analysis
- Working knowledge of statistics
- Working in an interdisciplinary working environment

We offer:

- 4-year PhD position in a leading technological research and the most international University in Estonia
- Opportunities for conference visits, research stays and interdisciplinary networking with international collaborators
- We offer a starting salary package with 22 000 EUR/year gross, with potential for increase depending on performance
- Position comes with full social and medical benefits in Estonia

About the department

The Department of Chemistry and Biotechnology (DCB) is developing solutions to the great challenges of the 21st century – climate change, environmental protection, carbon neutrality, renewable energy and biodiversity conservation. DCB has offered high level interdisciplinary research training in the field for over 100 years. The department has long history in providing hands-on education in the fields of chemistry, biotechnology, gene technology and food sciences

(Additional information)

For further information, please contact Prof. Ott Scheler ott.scheler@taltech.ee and Dr. Simona Bartkova simona.bartkova@taltech.ee

To get more information or to apply online, visit https://taltech.glowbase.com/positions/722 or scan the the code on the left with your smartphone.