

Labeling techniques for droplet microfluidic applications in biosciences

Summary

The project focuses on developing and applying novel labeling techniques for different droplet-based high-throughput 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 June 01, 2024 00:00 and June 30, 2024 23:59 (Europe/Zurich)

Description

The goal of this PhD project is to develop and apply novel labeling techniques in droplet-based microfluidics for enabling high-throughput biological assays. Specifically, the project aims to implement droplet-based pipelines that assist in answering vital biological and environmental questions, while also being 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
- Analysis of different anthropogenic pollutants (Micro-and nanoplastic, metals, chemicals, etc) and their biological impact at single cell level
- Labels for DNA nanotechnology in droplets
- Prospective students can also propose and develop their own research directions in the field of different labelling techniques that can be used in 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/labeling 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 hands-on experience with basic laboratory procedures and techniques in molecular biology, microbiology, genetic engineering, biochemistry or similar
- 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 previous experience is beneficial, but not expected)

- Microfluidics (especially droplet-based microfluidics)
- Light microscopy, fluorescence microscopy
- DNA nanotechnology
- Nucleic acid amplification technologies
- Image analysis tools and applications
- Self-assembly of organic dyes and probe design
- Statistics, bioinformatics or computational biology
- Working in an interdisciplinary working environment

We offer:

- 4-year PhD position in a leading technological research University in Estonia
- Opportunities for conference visits, research stays and interdisciplinary networking with international collaborators
- We offer a starting gross salary package of at least 1828 EUR/month, 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



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