



Thesis Project Form

Title (tentative): DNA-based biodetection in lab-on-a-chip systems

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Description

Motivation and application domain

The aim is to develop low-cost disposable chips with a simple optical/magnetic readout for detection of DNA targets. Targets include infectious diseases such as tuberculosis.

General objectives and main activities

The activities are based on the combination of polymer chips made by either injection moulding or by laser cutting and assembly using adhesives. Our current work aims to integrate amplification of a DNA target (typically by an isothermal amplification scheme) with detection of the product using a newly developed optomagnetic readout technique. This technique is based on optical detection of the changes in the dynamic response of magnetic nanoparticles in the presence of the target. Sample handling is done using microfluidic structures combined with sample transportation by magnetic particles. We work on all aspects of this development ranging from design and testing of microfluidic chips and lab-on-a-chip assay development to fundamental studies and development of molecular amplification and detection schemes and the optomagnetic readout. Projects will be tailored to fit into our ongoing activities and to the interest and background of the student.

Training Objectives (technical/analytical tools, experimental methodologies)

- lab-on-a-chip design, fabrication, characterization and integration
- molecular amplification and detection schemes (DNA)
- molecular amplification on a chip (transfer of lab assay to chip)
- real-time optomagnetic characterization of molecular amplification processes
- optimization and characterization of optomagnetic detection of DNA

Place(s) where the thesis work will be carried out: Department of Health Technology, Technical University of Denmark, Kongens Lyngby, Denmark

Additional information

Maximum number of students: 1