University of Victoria | Graduate Studies

Notice of the Final Oral Examination for the Degree of Master of Applied Science

of

YASHASWINI RAJASHEKARA

BE (Visvesvaraya Technological University, 2011)

"Robust Microfluidic Integration for Shallow Channel Aperture Optical Tweezer"

Department of Electrical and Computer Engineering

Tuesday, July 5, 2016
2:00 P.M.
Engineering Office Wing
Room 430

Supervisory Committee:
Dr. Reuven Gordon, Department of Electrical and Computer Engineering, University of Victoria (Supervisor)
Dr. Martin Jun, Department of Electrical and Computer Engineering, UVic (Member)

External Examiner:
Dr. Mohsen Akbari, Department of Mechanical Engineering, University of Victoria

Chair of Oral Examination:
Dr. Falk Herwig, Department of Physics and Astronomy, UVic

Dr. David Capson, Dean, Faculty of Graduate Studies

Abstract

The main objective of this thesis is to present a simple and robust hands-on technology for the fabrication of a microfluidic chip in a laboratory. The purpose of this new technology is to replace the existing PDMS based microfluidic chip used for optical trapping of diverse single nano particles. It also lists the different fabrication methods attempted and the successful integration of this chip to the optical trap system which is used to study binding at the single molecular level.

Microfluidics is a quickly growing field which deals with manipulating the fluids in channels whose dimensions are few tens of micrometers. Its potential has a major impact on fields like chemical analysis and synthesis techniques, biological analysis and separation techniques, and optics and information technology. One of the main application of these microfluidic chips is in optofluidics, which is the emerging field of integrated photonics with fluidics. This provides freedom to both fields and permitting the realization of optical and fluidic property. It requires small volumes of fluids and connections and eventually perform better than conventional method of robotic fluid handling.

Here, the microfluidic chip is targeted for optical trapping with double nano-hole aperture to trap a single protein. The double nanoholes integrated with this microfluidic chip show that stable trapping can be achieved below flow rates of few μL/min. This has provided many possibilities of co-trapping of proteins and study their interactions.