EUROPHOTONICS-POESII MASTER COURSE

PROPOSAL FOR A MASTER THESIS

Dates: April 1st, 2016 – September 30th, 2016

Laboratory: ICFO – The Institute of Photonic Sciences
City, Country: Castelldefels, Spain

Title of the master thesis: Enhancement of fluid transport in microchannels using electro-kinetics and plasmonic structures

Name of the tutor of the master thesis: Raúl Rica and Romain Quidant
Email address: raul.rica@icfo.es and romain.quidant@icfo.es
Phone number:
Mail address:
ICFO- The Institute of Photonic Sciences
The Barcelona Institute of Science and Technology
08860 Castelldefels (Barcelona), Spain

Summary of the subject (maximum 1 page):
Confinement effects in micro and nanochannels make it difficult to induce and control flow and convection on lab-on-a-chip devices, where the volume of the samples to be analysed are of the order of nanoliters. Electroosmosis, and particularly induced charge electroosmosis, is a phenomenon that allows one to induce and control fluid flow in microchannels. This is achieved thanks to the interaction of an electric field with the space charge at the interface between a polar liquid and a charged wall or electrode.
Another possible strategy to induce flow and convection could be the presence of temperature gradients due to heating close to plasmonic structures excited with a laser.
In this experimental project, the student will explore the combination of induced charge electroosmosis with plasmonic nanostructures to induce controlled transport and convection in the microchannels. The student will be involved in the design and implementation of the electrodes and on the realization of experiments to optimize the technique. The long-term goal of this project is the development of a lab-on-chip platform for ultra-sensitive detection platforms for early diagnostics of diseases like cancer. The project involves a multidisciplinary approach, combining concepts from thermodynamics, electro-hydrodynamics, non-linear optics and biochemistry.
Keywords: Plasmonic sensors, induced charge electroosmosis, lab-on-chip technology.
Additional information:
* Required skills: experience with optical and electronic instrumentation
* Miscellaneous: