Bioengineering Department  (Ecole Centrale de Lyon, Ecully)
Research internship

Subject: Contribution to the development of microfluidic devices based on 3D electrode arrangements for improved mass transport and particle separation using AC electric fields.

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Keywords: Microfluidics, electroosmosis, dielectrophoresis, ITO

Subject:

The proposed internship consists in studying the integration of ITO (Indium tin oxide) electrodes on glass in different microfluidic systems dedicated to the study of electrokinetic effects. ITO offers the advantage of being both a conductive and transparent material, which facilitates the observation of the manipulated micro-objects. In the context of ongoing projects in the team related to SPR biosensing and cell sorting under continuous flow, we are interested in the exploitation of 3D electrokinetic effects that can be obtained with "top-bottom" electrode configurations. The systems developed during the internship will be dedicated to the study of electroosmosis (cross-sectional observation of vortices obtained during the application of a low frequency AC electric field) and dielectrophoresis (separation of particles with different electric properties). The 3D effects obtained will be compared to the 2D effects generated with coplanar interdigitated electrodes. The main technological challenge is electrode integration on top of the microfluidic channel (electrical contact, sealing, etc.).

The ideal candidate will have a strong interest for experimental work, and basic knowledge in microfabrication and microfluidics. He or she will participate in device microfabrication (photolithography, wet etching, soft-lithography...), characterization (4-point measurements, profilometry...) and testing in presence of microobjects (microparticles, cells), which will imply observations by fluorescence microscopy. Within the framework of a starting collaboration with the NeuroMyoGene Institute, he/she will also perform dielectrophoresis experiments on neuronal cells.

References: