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ÉCOLE POLYTECHNIQUE FÉDÉRALE DE LAUSANNE

Master project
Microfabrication and experimental investigation of dielectrophoretic traps

The goal of this master project is to design, fabricate and measure dielectrophoretic traps for cell trapping applications.
Dielectrophoresis is a phenomenon in which neutral particles are polarized in gradient electric fields. If the polarizability of the particle is larger than the one of the surrounding medium, the particle will move to higher electric field regions, which is called positive dielectrophoresis (pDEP), if the polarizability of the particle is smaller than the one of the surrounding medium, the particle will move to lower field regions, which is called negative dielectrophoresis (nDEP).

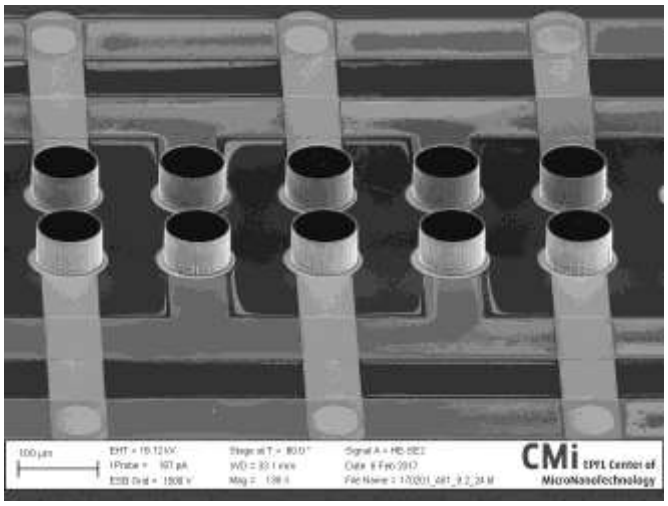

Figure 1: Array of three dimensional electrodes for cell trapping and analysis applications.

With the help of three dimensional microelectrodes fabricated across a microfluidic channel as shown in figure 1 allows to create dielectrophoretic barriers which polarizable particles such as cells cannot pass. The cells consequently will be trapped within the electrodes. The trapped cells dielectrophoretic properties can be investigated using electrorotation, for which a rotating electric field is applied and the resulting speed of rotation of the cells is measured. According to this for example cancer cells and human T lymphocytes can be differentiated.

The task of the student for this master project is to design an array of three dimensional microelectrodes, to fabricate them in the CMi (Center for Microtechnology) facility at EPFL and experimentally trap and analyse different cell lines. In a last step the student will write a report about the results of the experiments.

Advisor: Prof. Dr. Carlotta Guiducci
Supervisor: Kevin Keim (kevin.keim@epfl.ch)

Type of work: 20% literature study, 30% microfabrication, 30% measurements, 20% data analysis

Duration: 6-12 month

Required background: micro-engineering, electrical-engineering, physics, biomedical-engineering or similar

If you are interested in this semester project, please send an email including CV and transcript of records to kevin.keim@epfl.ch .

[1] Lab Chip, 2009, **9**, 1534-1540