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Master thesis position:
Characterization of capillary fluidics modules for multi-analyte bead-based immunoassays at the point-of-care

Modern medical diagnoses commonly rely on clinical laboratories for the detection of biomarkers in patient samples, thus requiring critical infrastructure and trained professionals. Point-of-care devices shorten the path from sample acquisition to diagnosis by providing automated analysis to produce accurate results. Current research interests in the field include improving speed, sensitivity and validity with the ability to measure multiple biomarkers at once. Bead-based assays are a common option in the field of multiplexed sensitive diagnostic assays. The use of beads as solid support for the assay increases the surface-to-volume ratio of the active surface, and favors the mass transport and collection of analytes. Moreover, beads are inexpensive, can be fabricated in batches with low variability and functionalization of their surfaces with several chemical species is well established.

The project aims at designing capillary microfluidics for multi-marker bead-based assays. This solution, being passive, is particularly convenient for point-of-care devices since it eliminates the need of bulky instrumentation for active pumping. The capillarity action is achieved in microfluidics by designing arrays of micrometric pillars, as the ones in Figure 1, which act as the pumping mechanism driving the beads inside the device. The microfluidics geometry can be tailored to achieve the desired flow rate and total volume. In order to achieve this, the student will work on different chip layouts, and fabricate them by SU-8 photolitography in the cleanroom facility of EPFL (Center of MicroNanotechnology).

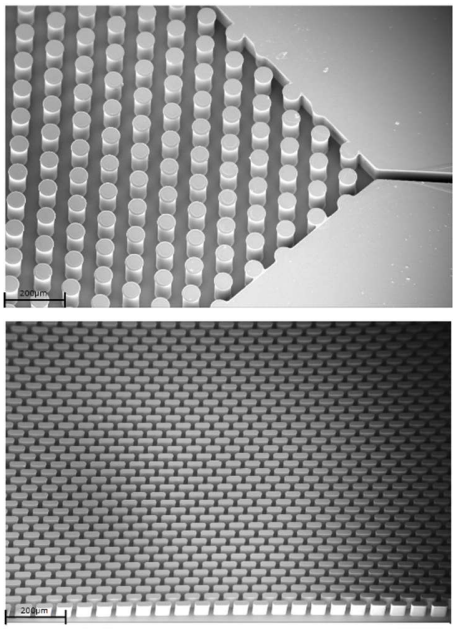

Figure 1: SEM pictures of SU-8 micrometric pillars array for capillary microfluidics.

The project will give the students the opportunity to gain some expertise in :

- Capillary microfluidics
- Microfabrication
- Layout design
- Immunoassay

Type of work: 10% literature study, 50% design and microfabrication, 20% microfluidic device testing, 20% data treatment and results reporting

Duration: 4 – 6 months

Prerequisites: Ideally someone with a background in microtechnology or bioengineering, but physics or mechanics are also welcome. A strong motivation is required regardless your background.

Do not hesitate to contact us by email in case of interest: gloria.porro@epfl.ch