Semester Project/Master Project

High throughput bio-analytics via nucleic acid testing on CMOS chips

Non-optical detection of nucleic acid (NA) amplification by measuring change in pH has opened up avenues for new kinds of devices for clinical diagnostics. Using Ion Sensitive Field Effect Transistors (ISFETs) to measure the change in pH during NA amplification, offers simplification and miniaturization advantage over the conventional methods. To truly harness the potential of ISFETs for biosensing implies to be able to simultaneously carry out hundreds or thousands of biosensing reactions in electrolytically isolated incubation chambers, each of which is monitored in real-time by an ISFET sensor. Such approach requires parcelization strategies in microfluidics that can integrate a miniaturized reference electrode. Here at CLSE we have developed a novel design for reference electrode that allows biasing of sub-nanoliter volumes and can scale in numbers with CMOS scaling.

The project aims at developing a CMOS based high throughput DNA analysis system. The interdisciplinary nature of the project requires work on microfluidics, PCB design & programming, cleanroom fabrication and molecular biology.

If you have skills in any of the above and/or would like to learn and develop practical knowledge in them, we have various master thesis and lab immersion level projects for you.

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

- Microfluidics and cleanroom fabrication
- PCB designing and programming
- Molecular biology for clinical diagnostics

Duration: 4 – 6 months (Starting mid February 2022)

Prerequisites: Ideally someone with a background in electronics, biochemistry or biology, micro-engineering, physics or chemistry are welcome. A strong motivation to learn is required regardless your background.

To discuss the kind of project (master/semester) work you may be interested in, please contact Saurabh Tomar by email at saurabh.tomar@epfl.ch