Broadband single cell cytometry – Xuanhong Cheng

xuc207@lehigh.edu wordpress.lehigh.edu/xuc207/xuanhong-cheng/

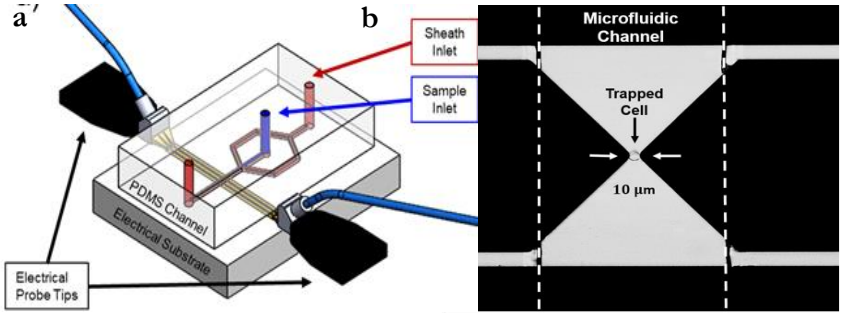
LEHIGH UNIVERSITY | Institute for Functional Materials and Devices (I-FMD)

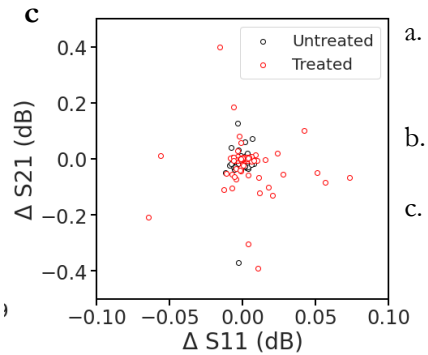
The problem we are addressing is that optical approaches to characterize cells often require cell staining, while conventional electrical sensors measures only limited physical characteristics of cells such as cell size.

Broadband single cell cytometry uses kHz to GHz signals to interrogate different cell compartments → ***yielding dielectric properties of the whole cell and organelles*** to indicate cell physiology and pathology ***without staining***.

To learn more:

- How we designed the sensor: 10.1109/MWSYM.2016.7540262 and 10.23919/EuMC.2019.8910779
- The sensor has been demonstrated to detect various cell properties, such as oxidative stress and electroporation in single cells: 10.1016/j.aca.2021.338678 and 10.1109/TBME.2018.2885781





a. Schematic of the broadband sensor coupled with a microfluidic channel to analyze single cells.
b. Photograph showing a single cell trapped and measured in the chip.
c. Difference of cells under oxidative stress and the control based on electrically measured S-parameter.

Summary/Call to action: We have shown the characterization of various cell properties using model cells and the electrical sensor → We are seeking clinical collaborators to evaluate the device for disease diagnosis.