Low-Cost Point of Care Graphene-Based Cell Flow Cytometry

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Graphene with its unique 2D structural, mechanical and electronical properties has attracted much attention in recent years and is rapidly emerging for impedance based biosensors [1].

In this work, we present an on-chip integrated graphene impedance based bio-sensor Microfluidic Impedance Cytometry (MIC). In our process, CVD grown and Ink jet printed graphene will be deposited in parallel (Fig 1) and co-planar (Fig 2) electrode configurations in a micro fluidic channel, where an RF signal is applied spanning the microfluidic flow. As a cell passes through the system the impedance is measured via differential current [2,3].

The MIC, provides an advantage over optical readout because of the potential for developing devices that are more compact and simple to fabricate. Here graphene is used to replace metal electrodes to improve MIC operation due to its flexibility, low electrical noise, and low electrochemical reactivity [4]. We will show the progress toward implementation of several graphene based MIC configurations.

References

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[2] Rollo, Enrica, et al. Biosensors and Bioelectronics, **94** (2017), 193-199.
[3] T. Sun and H. Morgan, Microfluidic. Nanofluid, **8** (2010), 423-41.
[4] Yuan, Wenjing, et al. Scientific Reports, **3** (2013).

Figures

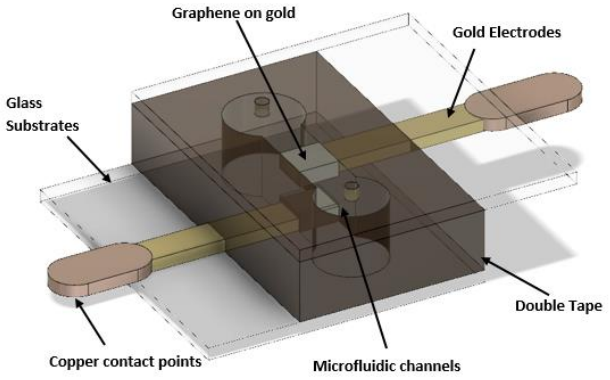

Figure 1: 3D Model of parallel electrode design, microchannel created via a novel flip-chip fabrication process.

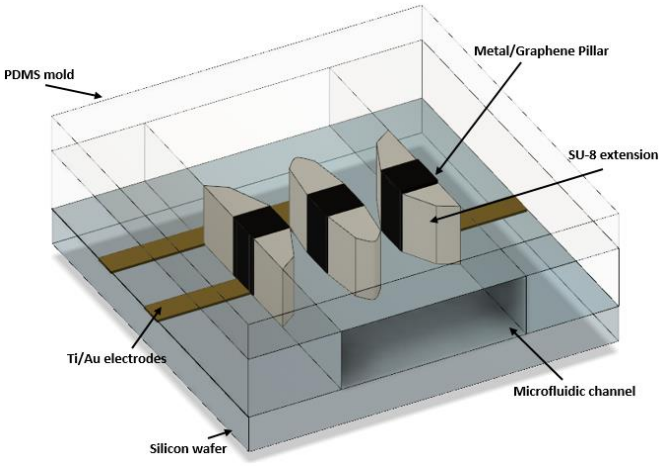

Figure 2: 3D model of co-planar electrode design.