Wafer-scale graphene FETs on a CMOS platform for biosensing

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Graphene FETs (GFETs) and extended gate FETs (EGFETs) are promising platforms for label-free electrical biosensing. It has also been demonstrated in recent publications that these devices can work in complex sample media. [1-2]

To bring the technology closer to industrial maturity, we present wafer-scale high yield fabrication of graphene FETs on CMOS platform for biosensing. The CMOS platform enables simultaneous readout of thousands of GFET and EGFET devices, enabling quantitative bioassays. Our CMOS platform offers an extensive toolkit for electrical biosensing, including resistive and capacitive readouts for GFETs, and N-MOS, P-MOS, voltage follower and electrochemical impedance spectroscopy options for EGFETs. These allow all of the most typical electrical biosensing detection schemes, enabling the benchmarking of different readout mechanisms on a single platform.

References

[1] Gutiérrez-Sanz, Ó., Andoy, N. M., Filipiak, M. S., Haustein, N., & Tarasov, A. (2017). ACS sensors, 2(9), 1278-1286.
[2] Andoy, N. M., Filipiak, M. S., Vetter, D., Gutiérrez-Sanz, Ó., & Tarasov, A. (2018). Advanced Materials Technologies, 3(12), 1800186.

Figures

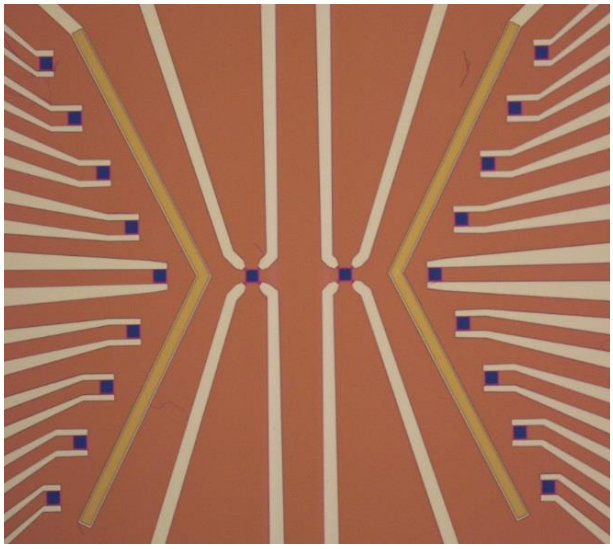

Figure 1: A wafer-scale fabricated graphene FET biosensor array. A single device chip includes 18 GFETs, 2 van der Pauw test structures and 2 liquid gate electrodes.

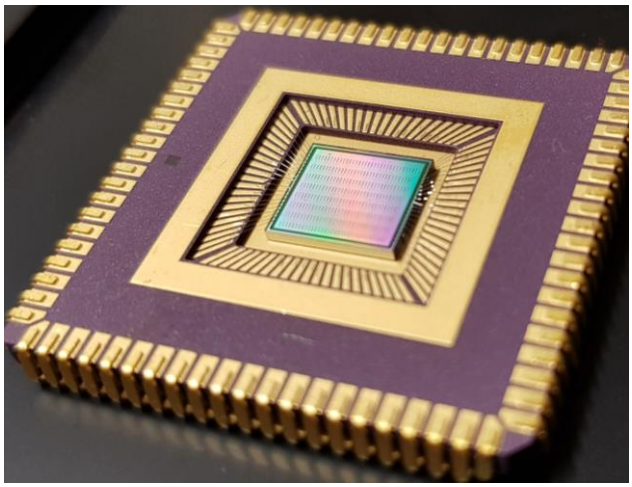

Figure 2: CMOS platform including GFETs and EGFETs. GFETs have resistive and capacitive readouts, and EGFETs have N-MOS, P-MOS, voltage follower and EIS readouts included in the same platform.