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Label Free Nucleotide Sensing Based Upon Back Gated Graphene Field Effect Transistors ADITHYA SRIRAM, RAMYA VISHNUBHOTLA, Univ of Pennsylvania — Early detection of nucleic acid biomarkers for chronic diseases is essential for their diagnoses and therapeutic monitoring. All-electronic biosensor systems based on graphene field effect transistors (GFETs) have shown promise for this application. We have developed a scalable and reproducible method for fabricating arrays of GFET biosensors to detect DNA targets of different lengths as well as mRNA targets. Specificity for the nucleic acid target is achieved by functionalizing the GFET with complementary single-stranded probe DNA. For all targets, varying the concentration of the target nucleic acid caused reproducible shifts in the Dirac voltage of the GFET sensor, in quantitative agreement with the Langmuir-Hill theory of equilibrium binding. The sensor detection limit decreased as the length of the DNA target increased, with sensitivity on the aM level for targets of length 80 mer. Similarly, for the mRNA target, as the concentration of the target increased, the Dirac voltage shifted by greater intervals, tested in a range between the nM and micromolar level. These sensors are developing towards an inexpensive and quick method of biomarker detection. This work was supported by the National Science Foundation through grant number EFRI 2-DARE 1542879.

Adithya Sriram
Univ of Pennsylvania

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