Abstract Submitted
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Oxide-on-graphene field effect biosensors BEI WANG, Physcis Department, Penn State University, KRISTI LIDDELL, Chemistry Department, Penn State University, JUNJIE WANG, BRANDON KOGER, Physcis Department, Penn State University, CHRISTINE KEATING, Chemistry Department, Penn State University, J. ZHU, Physcis Department, Penn State University — Nanoelectronics-based detection schemes offer fast and label-free alternatives to bioanalysis. Here we report on the design, fabrication, and operation of ion-sensitive field-effect biosensors using large-area graphene sheets synthesized by chemical vapor deposition. The graphene transducer channel has a high carrier mobility of approximately 5000cm^2/Vs. Our oxide-on-graphene design uses thin HfO_2 and SiO_2 films to passivate the graphene channel and electrodes from electrolyte and uses the top SiO_2 surface for sensing and linker chemistry. The pH sensitivity of the bare SiO_2 is measured to be 46mV/pH, in good agreement with literature results. We demonstrate the silanization of the SiO_2 surface with aminopropyl-trimethoxysilane (APTMS). The pH sensitivity of the APTMS-functionalized SiO_2 is measured to be 43mV/pH. By applying the solution gate voltage in pulse, we eliminate hysteresis in the transfer curve of the graphene channel, which is a common challenge in achieving high-solution detection using nanostructure-based field effect sensors. The amine-functionalized SiO_2 surface can be further functionalized with bio-probes to perform the detection of specific binding events such as DNA hybridization.

Bei Wang
Physcis Department, Penn State University

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