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Scalable Production of Sensor Arrays Based on High-Mobility Hybrid Graphene Field Effect Transistors ZHAOLI GAO, University of Pennsylvania, HOJIN KANG, YUNG WOO PARK, Seoul National University, ZHENGTANG LUO, Hong Kong University of Science and Technology, LI REN, South China University of Technology, CHARLIE JOHNSON, University of Pennsylvania, SEOUL NATIONAL UNIVERSITY TEAM, HONG KONG UNIVERSITY OF SCIENCE AND TECHNOLOGY TEAM, UNIVERSITY OF PENNSYLVANIA TEAM — We have developed a scalable fabrication process for the production of DNA biosensors based on gold nanoparticle-decorated graphene field effect transistors (AuNP-Gr-FETs), where monodisperse AuNPs are created through physical vapor deposition followed by thermal annealing. The FETs are created in a four-probe configuration, using an optimized bilayer photolithography process that yields chemically clean devices, as confirmed by XPS and AFM, with high carrier mobility (3590 $cm^2/V\bullet s$) and low unintended doping (Dirac voltages of 9.4V). The AuNP-Gr-FETs were readily functionalized with thiolated probe DNA to yield DNA biosensors with a detection limit of 1 nM and high specificity against noncomplementary DNA. Our work provides a pathway toward the scalable fabrication of high-performance AuNP-Gr-FET devices for label-free nucleic acid testing in a realistic clinical setting.

Zhaoli Gao
University of Pennsylvania

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