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Scalable Arrays of DNA-decorated Graphene Chemical Vapor Sensors NICHOLAS KYBERT, GANG HEE HAN, MITCHELL LERNER, A.T. CHARLIE JOHNSON, University of Pennsylvania — Chemical vapor sensors based on biomolecular functionalization of graphene field effect transistor arrays are demonstrated. Novel photolithographic methods were developed to fabricate high quality transistors from CVD-grown graphene. Atomic Force Microscopy was used to verify that the graphene surface remained uncontaminated and was thus suitable for controlled chemical functionalization. Single-stranded DNA was chosen as the functionalizing biomolecule due to its affinity to a wide range of target molecules as well as its π-π stacking interaction with graphene, which allowed functionalization with minimal impact on the transistor mobility. The resulting sensor arrays showed analyte and DNA sequence dependent responses down to parts-per-billion level concentrations. By using large arrays of differently functionalized devices, we distinguished chemically similar analytes and determined electronic signatures indicative of their presence.

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