Optically enhanced gas sensing performance of graphene field effect transistors

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Graphene field effect transistors (GFETs) have an enormous potential for the development of next-generation gas sensors, but more efforts are required to improve their sensitivity and selectivity. In this talk we discuss UV illumination as a promising method to enhance the performance of GFETs for the detection and recognition of analytes such as ethanol, water vapor and dimethyl methylphosphonate (DMMP), a molecule with structural similarities to nerve agents such as sarin. We show that illuminating the devices in operando with a UV LED (365 nm) results in both improved sensitivity and selectivity. By monitoring the sensing response of the GFETs as a function of gate voltage, we directly demonstrate that a shift in the Dirac point due to the optical doping is associated with the increased sensitivity. Moreover, we discuss how the substrate and fabrication residues on the surface of the graphene sensors can play a role in modifying the sensing performance.

FIGURES

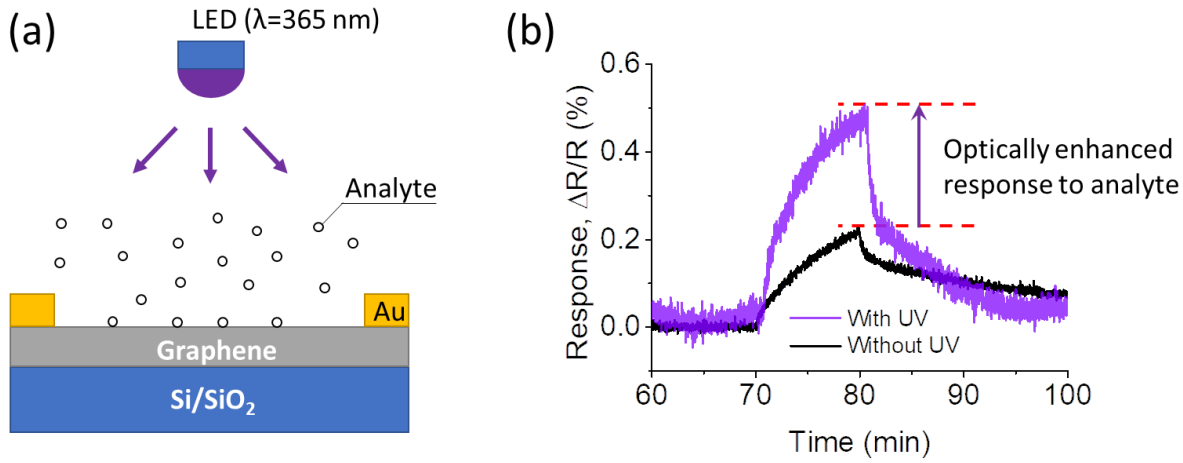

Figure 1: (a) Schematics of optically enhanced gas sensing of GFET and (b) its improved sensing response under UV.