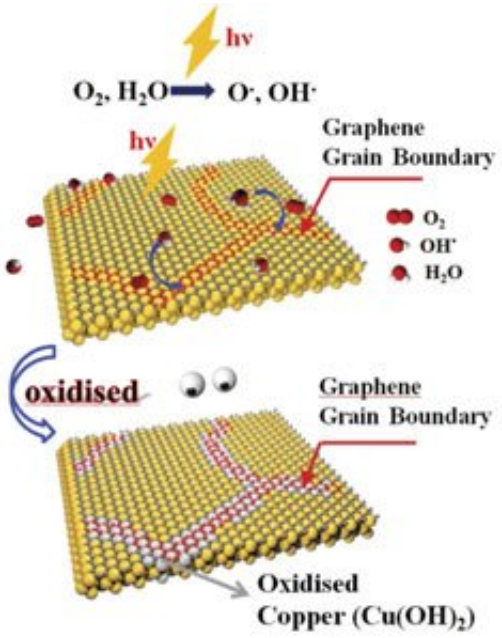
A nanosensor to identify vapors based on a graphene-silicon heterojunction Schottky diode

July 11 2014



Among other carbon-based nanomaterials, graphene represents a great promise for gas sensing applications. In 2009 the detection of individual gas molecules of NO[sub]2[/sub] adsorbed onto graphene surface was reported for the first time. This initial observation has been successfully explored during the recent years. The *Nanobioelectronics & Biosensors* Group at Institut Català de Nanociència i Nanotecnologia (ICN2), led by

ICREA Research Professor Arben Merkoçi, published in *Small* a work showing how to use a Graphene/Silicon Heterojunction Schottky Diode as a sensitive, selective and simple tool for vapors sensing. The work was developed in collaboration with researchers from the Amirkabir University of Technology (Tehran, Iran).

The Graphene/Silicon heterojunction Schottky diode is fabricated using a silicon wafer onto which Cr and Au were deposited to form the junction between graphene and silicon (see the attached figure). The adsorbed vapor molecules change the local carrier concentration in graphene, which yields to the changes in impedance response. The vapors of the various chemical compounds studied change the impedance response of Graphene/Silicon heterojunction Schottky diode. The relative impedance change versus frequency dependence shows a selective response in gas sensing which makes this characteristic frequency a distinctive parameter of a given vapor.

The device is well reproducible for different concentrations of phenol vapor using three different devices. This graphene based device and the developed detection methodology could be extended to several other gases and applications with interest for environmental monitoring as well as other industries.

More information: *Small*. 2014 Jun 30. DOI: 10.1002/smll.201400691.

Provided by Catalan Institute of Nanoscience and Nanotechnology