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Sensing toxic formaldehyde using graphene oxide and graphene as sensing materials

Murthy Chavali¹, Srinivasan K¹ and Ren-Jang Wu² ¹VFSTR University, India ²Providence University, Taiwan

Nanomaterials have been widely used in analytical chemistry as chemical sensor and biosensor materials. Graphene, a kind of nanomaterial, has attracted attention increasingly since it was isolated in 2004 showing promising applications in scientific and technological fields owing to its novel properties such as electrical, thermal, and mechanical properties. Graphene and its derivatives including graphene oxide (GO) have attracted ever-increasing attention in recent years as a novel class of 2D carbon-based nanomaterials with the promise of a range of applications. GO has large surface area, excellent conductivity, good chemical stability and easy fabrication; in combination makes GO the paramount materials in the fields of sensors. Formaldehyde is a highly toxic systemic poison that is absorbed well by inhalation. The vapor is a severe respiratory tract and skin irritant and may cause dizziness or suffocation. For skin protection: Chemical-protective clothing is recommended because formaldehyde can cause skin irritation and burns. A graphene oxide (GO) based formaldehyde sensor to detect at room temperature was developed. Graphene oxide was synthesised by modified Hummers method. FT-IR spectra of the graphene oxide revealed these –OH and –COOH functional groups were formed on the graphene surface. XRD patterns also showed the formation of graphene oxide material. The p-type semiconductor sensing material of GO was performed and at room working temperature. It was tested as 10 to 50 ppm HCHO concentrations for GO, and the sensor response was raised from 2.11 to 6.98. Using Material Studio 4.3 software, the adsorption phenomena were explained to the HCHO sensing property.

Biography

Murthy Chavali is an expert in nanotechnology. He is a recipient of a number of awards and fellowships like OEAD-NSD, NSF, NSC and JSPS, VBL. He received his M.Sc. (Tech.) in Chemistry (1994) from Jawaharlal Nehru Technological University, India and PhD Tech., (2000) from Technische Universität Wien, Austria in Analytical Chemistry and also served as a postdoctoral scientist in different countries. To date, he received 28international travel grants/fellowships for visiting abroad. He had visited around 48 countries as of now, representing India, Taiwan, Japan, Austria etc. He had over 24 years of research experience and 19 years of teaching experience; also established 8 research laboratories; recently he established a nano characterization laboratory as one of the best labs, worth 400 lakhs along with BTech, MTech and PhD programs in Analytical Chemistry and Nanotechnology. He published his research works in journals of high repute with high impact factor related to all types of sensors, nanomaterials, nano-polymer composites, nano-thin films; he published over 185 articles/communiqués in various international and national seminars/symposia/ conferences, workshops.

chavalim@gmail.com

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