

## Graphene Formaldehyde Sensor

Previous formaldehyde detection methods are expensive and time consuming and required bulky instrumentation and trained operators. In addition, they rely on either physical adsorption of formaldehyde gas molecules onto sensing materials or optical methods that require sophisticated light sources and light detectors. An easier method, preferable electrochemical based, for detecting gaseous formaldehyde is desirable.

### Description of the Invention

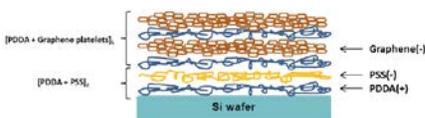
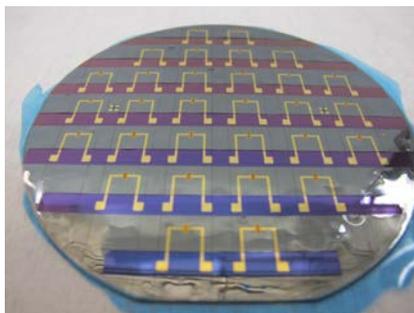
A micro-fabricated, layered graphene sensor uses electrochemical methods to detect formaldehyde gas. A layer-by-layer method using poly(diallyldiamine chloride) (PDDA) immobilizes formaldehyde dehydrogenase to a single layer sheet of graphene, where an enzymatic reaction links formaldehyde to the graphene sheet, changing the graphene's electrical resistance in proportion to formaldehyde concentration. The sensor uses electrochemical detection to detect formaldehyde concentration in the air by sensing hydrogen ions produced by the specific enzymatic reaction.

### Features and Benefits

- Graphene-based
- Electrochemistry-based gaseous formaldehyde detection
- Detects gas-phase formaldehyde concentrations of <10ppb
- Layer-by-layer method immobilizes formaldehyde dehydrogenase to single layer graphene sheet
- Poly(diallyldiamine chloride) (PDDA)
- Enzymatic reaction links formaldehyde to graphene sheet, changing electrical resistance
- Fast (under 60 seconds)
- Potential for a small, portable device
- Compact, portable
- Easy to use (i.e., by a novice)
- May be less inexpensive than other methods

### Potential Applications

- Formaldehyde sensor; portable sensor
- Electrochemical sensor
- Volatile Organic Compound (VOC) detection
- Manufacturing plants
- Personal/environmental safety markets
- Indoor wood preparation, individual housing detection
- Home/housing or community-wide environmental detection
- Medical preservation
- Chemical, oil, gas and/or transportation industries
- Laboratories



### Technology Status

Prototype dev: High-fidelity prototype and proof of concept.

### IP Status

US Patent Pending

### Primary Inventor(s)

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### Case Reference

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