



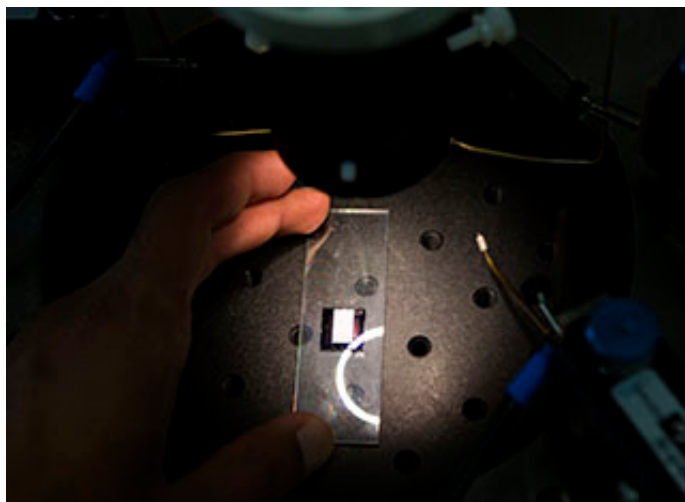
## News

ADVERTISEMENT

# Wearable Tech for Disease Monitoring

🕒 Fri, 08/08/2014 - 10:50am

✉ Get today's news and top headlines for cleanroom professionals - Sign up now!



*Girish Kulkarni, Electrical Engineering PhD Student, runs an experiment testing the vapor sensors that he has helped develop as part of a collaboration between Xudong Fan, BME Professor, and Zhaohui Zhong, EECS Professor, in the LBME Building. The sensors allow for the measuring of different vapors, whereas other sensors can only read for one type of vapor. Photo: Joseph Xu, Michigan Engineering Communications & Marketing*

A wearable vapor sensor being developed at the University of Michigan could one day offer continuous disease monitoring for patients with diabetes, high blood pressure, anemia, or lung disease.

Wearable technologies, which include Google Glass and the Apple iWatch, are part of a booming market that's expected to swell to \$14 billion in the next four years.

The new sensor, which can detect airborne chemicals either exhaled or released through the skin, would likely be the first wearable to pick up a broad array of chemical, rather than physical, attributes. U-M researchers are working with the National Science Foundation's Innovation Corps program to move the device from the lab to the marketplace.

"Each of these diseases has its own biomarkers that the device would be able to sense," says Sherman Fan, a professor of biomedical engineering. "For diabetes, acetone is a marker, for example."

Other chemicals it could detect include nitric oxide and oxygen, abnormal levels of which can point to conditions such as high blood pressure, anemia, or lung disease.

Fan is developing the sensor with Zhaohui Zhong, an associate professor of electrical and computer engineering, and Girish Kulkarni, a doctoral candidate in electrical engineering. The researchers say their device is faster, smaller and more reliable than its counterparts, which today are much too big to be wearable. The new sensor can also detect a broader array of chemicals.

Beyond disease monitoring, the sensor has other applications. It would be able to register the presence of hazardous chemical leaks in a lab, or elsewhere, or provide data about air quality.

"With our platform technology, we can measure a variety of chemicals at the same time, or modify the device to target specific chemicals. There are limitless possibilities," Zhong says.

To create their technology, the researchers took a unique approach to detecting molecules.

"Nanoelectronic sensors typically depend on detecting charge transfer between the sensor and a molecule in air or in solution," Kulkarni says.

However, these previous techniques typically led to strong bonds between the molecules being detected and the sensor itself. That binding leads to slow detection rates.

"Instead of detecting molecular charge, we use a technique called heterodyne mixing, in which we look at the interaction between the dipoles associated with these molecules and the nanosensor at high frequencies," Girish says.

This technique, made possible through the use of graphene, results in extremely fast response times of tenths of a second, as opposed to the tens or hundreds of seconds typical in existing technology. It also dramatically increases the device's sensitivity. The sensor can detect molecules in sample sizes at a ratio of several parts per billion.

These nanoelectronic graphene vapor sensors can be completely embedded in a microgas chromatography system, which is the gold standard for vapor analysis, the researchers say. The entire microgas chromatography system can be integrated on a single chip with low power operation, and embedded in a badge-sized device that can be worn on the body to provide noninvasive and continuous monitoring of specific health conditions.

"We believe this device can be extremely beneficial to society," Fan says.

The technology is described in the paper, "Graphene nanoelectronic heterodyne sensor for rapid and sensitive vapour detection," which is published in *Nature Communications*.

Release Date: August 6, 2014

Source: University of Michigan

TOPICS

GRAPHENE

MEDICAL DEVICES

NANOTECHNOLOGY

SHARE THIS STORY



Like

3



Tweet

4



Share

95



Pin it



Share

4



COMMENTS

0 Comments

Controlled Environments

1 Login

Sort by Best

Share Favorite



Start the discussion...

Be the first to comment.

ALSO ON CONTROLLED ENVIRONMENTS

WHAT'S THIS?

Death Row Inmates Sue Over Drugs' Secrecy

1 comment • 6 months ago

george — And what about the "pain and suffering" that their victims had? There needs to be a serious adjustment to our ...

Cleanroom Systems Developer Acquires Wynright Corp.

1 comment • a year ago

Doris Chu — We source Cleanroom conveyor systems from AS Conveyor Systems in the uk. They are agents for ...

Building the Case for Modular Cleanrooms

1 comment • 6 months ago

Jess — Great post regarding modular clean rooms. I am looking for something like this. Keep it update. Modular Clean Rooms

Death-row Inmate Seeks Stay Over Expired Lethal Injection Drug

3 comments • 7 months ago

OllieProphet — No, shame on the convicted murderer. Death row inmates typically are there because of the heinous and cruel ...

Subscribe

Add Disqus to your site



Search Controlled Environments

Trending

## Featured Companies

 **Azbil BioVigilant, Inc.**

 **E+E Elektronik Corp.**

 **Innotech Products, Inc.**



 **Met One Instruments, Inc.**

## Tips



### Fixture Styles for Cleanroom Lighting

August 10, 2014 7:33 pm



### When employees disappoint: how effective leaders respond

July 28, 2014 5:23 pm | by Alesia Latson



### The 5 Frank Principles of Business: Blunt Leadership Lessons Learned Over a Lifetime

July 18, 2014 9:27 am | by Richard J. Bryan



### The Responsibilities of a Certified CPT Professional

July 16, 2014 4:20 pm | by Richard Bilodeau, PE

[View More Tips »](#)

## New Products

### Product Catalog

August 15, 2014 10:45 am

### Packaging Robots

August 15, 2014 10:28 am

### Photodiode

August 15, 2014 10:04 am

### UHPLC System

August 14, 2014 12:30 pm

[View More Product Releases »](#)



## CONTROLLED RESOURCES ENVIRONMENTS

- Articles
- About Us
- Blogs
- Advertising Info
- Digital Editions
- Author
- Events
- Guidelines
- Calendar
- Contact Us
- News
- Subscriptions
- Sitemap
- Privacy Policy
- Videos
- Supplier
- Directory FAQ
- Terms & Conditions

## TOPICS

- Cleanroom
- Design
- Equipment
- Consumables
- Life Sciences
- Microelectronics

## CONNECT WITH US

-  Facebook
-  LinkedIn
-  Twitter
-  YouTube
-  RSS

## NEWSLETTERS

*All fields are required.*

**CE Update**

Industry news, tips, featured articles, trends, and solutions for professionals working in cleanrooms and other critical environments

**Product Showcase**

Products and technologies for cleanroom professionals

**Academic News**

Delivering current news on research and development, design, equipment and technology for academic lab professionals across the globe.

**SUBSCRIBE**

**OUR PARTNER SITES**



Advantage Business Media © Copyright 2014 Advantage Business Media