Portable Chemical Sensor that Detects Breast Cancer in Exhaled Breath Condensate

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Technology description

Device Functionalizes High Electron Mobility Transistor Surface to Detect Biological Markers of Breast Cancer.

This chemical sensor is based on high electron mobility transistors and analyzes samples from exhaled breath to detect biological markers for breast cancer. The American Cancer Society projects more than 235,000 new diagnoses and 40,000 American deaths from breast cancer this year. Early detection -- when tumors are small and have not spread -- saves thousands of lives every year. The market for biosensors and chemical sensors has the highest rate of growth in the sensor industry and is expected to be worth $21 billion by 2016. Exhaled breath condensate is one of the most important bodily fluids that can be safely collected. Analyzing exhaled breath condensate provides valuable information about the metabolic state of the body and can help detect certain types of cancer, respiratory disease and liver and kidney function. Researchers at the University of Florida have developed a device that can quickly and accurately detect breast cancer in a saliva or exhaled breath condensate sample. The development of inexpensive sensing technologies that can detect and wirelessly transmit testing results could lead to significantly lower mortality rates and health care costs. The sensor also can be functionalized with different surface layers to detect a range of other materials such as heavy metal contamination in liquid samples.

Technology

In this sensor, fluids adsorb onto AlGaN/GaN High Electron Mobility Transistors (HEMT), inducing charges from the polar molecules in the liquids bonded to the AlGaN/GaN surface. One end of the chemical of interest forms bonds with the Au and the other end bonds to cancer antibodies or forms chelates with ions of heavy metals, such as mercury, copper, and lead. The charges of the ions affect the gate potential of HEMTs, allowing the sensor to detect abnormal levels of chemicals in breath condensate or fluid, possibly identifying health problems.

Application area

Portable/handheld sensor for analysis of environment- and health-related samples such as breath, saliva, urine or blood

Advantages

Wirelessly transmits detection results with a fast response time, providing an alternative to slower available technologies
Is portable and inexpensive, lowering cost to the customer
Detects various types of cancer, as well as pulmonary and respiratory problems, benefitting public health and awareness

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