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DUAL-GATE FET CHEMICAL SENSOR

HARDWARE, CIRCUITS, & SENSORS

Flexible, chemical sensing dual gate field effect transistor with high sensitivity and superior selectivity.

TECHNOLOGY TYPE

Gas Sensors
Chemical Sensors
Transistors
Semiconductor

STAGE OF DEVELOPMENT

- Prototype demonstrated.

- Ongoing laboratory testing and qualification.

IP PROTECTION

U.S. Utility Patent Issued
Dual-Gate Chemical Field Effect Transistor Sensor
US10043990B2

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Reference Number: U-5819

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TECHNOLOGY SUMMARY

Detection of chemical species in gas or vapor phases is a rapidly growing field. Detection can be used as a warning system for chemical and biological threats, as well as to monitor air quality concerns. These sensors generally fall into two categories: sensing semiconductors and sensing gates. Sensing semiconductors have poor *selectivity*, while sensing gates have poor *sensitivity*. Additionally, state-of-the-art chemical sensors are expensive and material-dependent. They also require specific conditions for proper operation.

The *dual gate field effect transistor* (DG-FET) combines sensing semiconductor and sensing gate technologies to provide both high chemical sensitivity and high selectivity. The top gate is functionalized for sensitivity to ammonia and interacts with the analyte. The bottom gate drives the transistor into saturation to enhance sensitivity. The DG-FET chemical sensor can be easily tailored to detect a wide range of chemicals by changing the functional layer alone. Additionally, this sensor is highly conductive and can be used with off-the-shelf electronics, which reduces manufacturing and circuitry costs.

FEATURES AND BENEFITS

- Increases selectivity and sensitivity.
- Facilitates detection of a broader range of chemicals.
- Enables electronic signaling.
- Demonstrates potential for use in air pollution, medical diagnostics, food spoilage, and chemical weapons.

RECENT PUBLICATIONS

Bunes, B.R., Knowlton, T., Jacobs, D.L., Slattum, P., & Zang, L. (2014). Dual gate architecture for high sensitivity, high selectivity chemical-sensing field effect transistors. *IEEE SENSORS 2014 Proceedings*.
doi: 10.1109/icsens.2014.6984933

INVENTOR PROFILE

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