Graphene Chemical Sensor

Using 2-dimensional materials for ultrasensitive, chip-based nanosensors

The miniaturized Graphene Chemical Sensor can detect trace amounts of gases and neutral atoms, even highly diluted samples that mass spectrometers cannot.

Description

Researchers at NASA Goddard Space Flight Center have developed a highly sensitive, low-power graphene-based detector designed to sense trace gases and neutral atoms without having to ionize them. The detector was developed in an effort to detect trace gases for planetary science missions, as well as to investigate the impact of atmospheric drag experienced by orbiting spacecraft due to the presence of atomic oxygen in the upper atmosphere, which is highly corrosive and can cause orbiting spacecraft to lose altitude prematurely and plunge to Earth.

The Graphene Chemical Sensor chip measures roughly 1cm x 1cm and has an array of 10 sensor elements. The chip also has on-chip temperature sensors and heaters to heat up the sensors, which resets them. Graphene is a two-dimensional crystalline material with the carbon atoms packed in a honeycomb lattice. It is not only the thinnest and lightest material, but also the strongest material ever measured; it has the highest surface to volume ratio with all the atoms exposed to the surface; it is optically transparent, yet impermeable to even hydrogen; it is radiation hard and stable at extreme temperatures; making it ideal for many different applications. The sensors have been optimized to measure traces of oxygen atom, hydrogen, ammonia, and water vapor.

Benefits

- ***Ultrasensitive:*** The Graphene Chemical Sensor can detect traces of neutral atoms, as well as highly diluted gases that mass spectrometers cannot.
- ***Substantial advancement of prior art:*** The novel device eliminates the need to ionize samples to run through the mass spectrometer.
- ***Remote applications:*** A wireless card can be added to the nanosensor to enable automated and remote data collection.
- ***Radiation hardened:*** Radiation hardened due to minute cross section.
- ***Low-mass, low-power, and portable:*** The sensor is portable, requires low-power, and can be used in situ.

Applications

NASA's Graphene Chemical Sensor invention can offer:

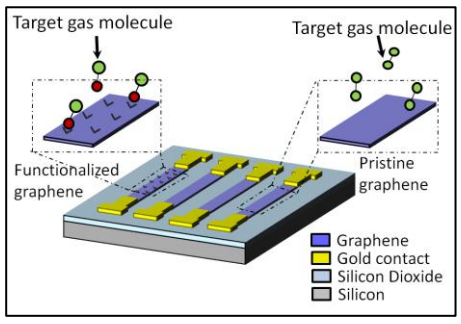
- Trace gas sensing
- Contamination control
- Neutral atom imaging

Patent Status

Patent Pending

Contact

To learn more about this licensing opportunity, contact Eric McGill at eric.s.mcgill@nasa.gov



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