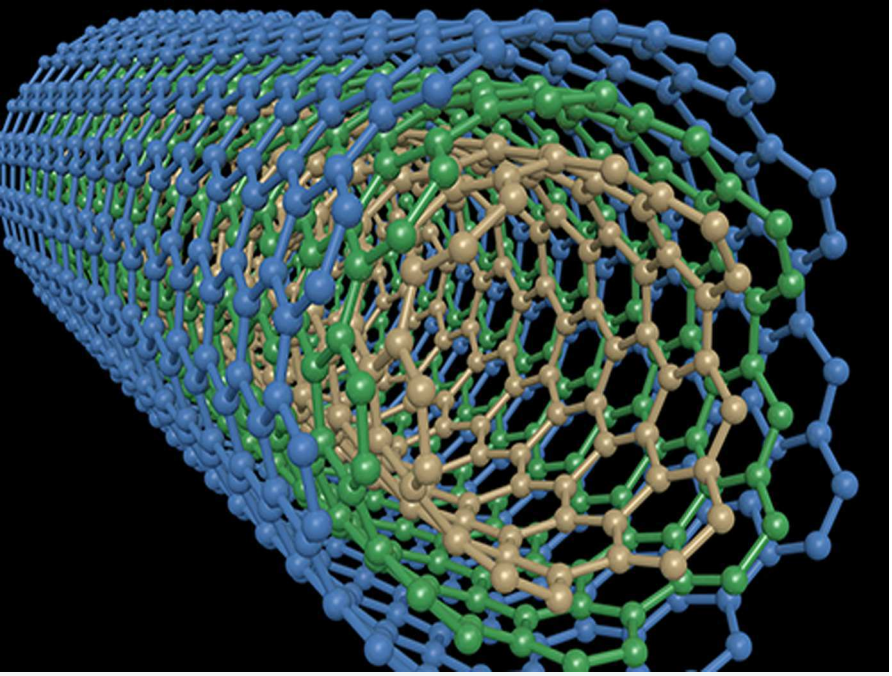

National Aeronautics and
Space Administration

Manufacturing

Applications Of Carbon Nanotube Hold-Off Voltages for Determining Gas Composition

Identifying chemical composition of a single-component or multiple-component gas

NASA has developed a lightweight, small sensor that detects one or more inert gas components and measures gas concentration with accuracy comparable to conventional sensors. Few sensors are available to detect inert gases. This new technology uses variable voltages, applied to an exposed end of a carbon nanotube immersed in a gas mixture for a variable time interval, to estimate gas composition. It distinguishes between a gas component discharge that occurs substantially instantaneously and a discharge in the same gas component that occurs after a substantial time delay.

BENEFITS

- Use constant non-pulse hold-off voltages
- Can be combined with other gas discharge methods
- Measures extremely low levels of gases
- Accurate
- Low cost
- Light weight
- Consumes small amounts of power
- Can be automated

technology solution

THE TECHNOLOGY

This technology is a method and system for identifying chemical composition of a single-component or multiple-component gas, using a discharge holdoff mechanism. A voltage difference, V, between two spaced-apart electrodes is brought to a selected value and held, the hoIdoff time interval, Delta t(V;ho), required before gas discharge is measured, and the associated electrical current or cumulative electrical charge is measured. As the voltage difference V increases, the time interval length Delta t(V;ho) decreases monotonically. Particular voltage values, V (infinity) and V (o), correspond to initial appearance of discharge (Delta t approximately equals infinity) and prompt discharge (Delta t approximately equals O). The values V (infinity) and V (o) and the rate of decrease of Delta t(V;ho) and/or the rate of increase of current or cumulative charge with increasing V are characteristic of one or more gas components present. The sensor is able to detect and identify the presence of one, two or more gas components, some or all of which may be relatively inert (e.g., Ne, Ar, Xe, Kr, CO, etc.). It also provides an estimate of the concentration of at least one gas component. Use of one or more carbon nanotube contacts may allow a more precise determination of discharge voltage holdoff than would be available where a larger diameter electrical contact is used.

Phone Sensor

APPLICATIONS

The technology has several potential applications:

- Space exploration
- Public safety
- Healthcare
- Oil and Gas industry
- Fire detection
- Leak detection
- Terrestrial environment
- Automobile industry
- Air monitoring in buildings, tunnels, and mines

PUBLICATIONS

Patent No: 7,529,633

More Information

National Aeronautics and Space Administration

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