



Sensors

Wireless Chemical Sensor

Wireless, powerless, passive, thin-film SansEC sensor that detects the presence of chemicals

NASA's Langley Research Center researchers have developed a wireless, open-circuit SansEC [Sans Electrical Connections] sensor that can detect the presence of chemicals without being in contact with the chemical it is detecting. This unique thin-film sensor is used in conjunction with a chemical reactant that detects the presence of the chemical. Because of the way the sensor operates, the reactant can be separated from the sensor itself and placed in caustic or harsh environments, and can still work to detect the specific chemical it was designed to discern. The ingenuity of the thin-film design with the elimination of all wires, connections, and electronic components enables the sensors to be produced cost-effectively. This is an application of the NASA award-winning SansEC sensor, which is damage resilient and environmentally friendly to manufacture and use. The sensors use a NASA award-winning magnetic field response recorder to provide power to the sensors and to acquire physical property measurements from them.

BENEFITS

- The sensor's electrical trace can detect chemical presence while being physically isolated from the chemical, allowing it to operate in harsh conditions
- Receives power wirelessly
- Sends signals wirelessly to the data acquisition device
- Reduces system weight due to less wiring
- Eliminates all electrical connections within the circuit and to the circuit, improving reliability
- Can be mass produced, and is well suited for manufacture to a specific size

technology solution

THE TECHNOLOGY

The SansEC sensor is an open circuit without electrical connections, which functions as an electrical simple harmonic oscillator when exposed to a harmonic magnetic field. Its response is dependent upon the measured physical property. It consists of a uniquely designed thin-film electrically conductive geometric pattern that stores energy in both electric and magnetic fields. When wirelessly interrogated using the NASA developed Magnetic Field Response Recorder (U.S. Patent Number 7,159,774), the sensor becomes electrically active, and a chemical reactant works in tandem with the thin-film trace. If the chemical is present, it causes a change to the reactant, resulting in an alteration to the sensors magnetic field response attributes. This change is noted electronically by the Magnetic Field Response Recorder.



SansEC circuit



SansEC circuit underneath a chemically selective reactant

APPLICATIONS

The technology has several potential applications:

- Oil and gas industry - flammable and combustible gas detection
- Food production - monitoring for refrigeration leaks
- Chemical manufacturing - hazardous leak detection

PUBLICATIONS

Patent No: 8,673,649; 9,329,149

National Aeronautics and Space Administration

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NASA's Technology Transfer Program pursues the widest possible applications of agency technology to benefit US citizens. Through partnerships and licensing agreements with industry, the program ensures that NASA's investments in pioneering research find secondary uses that benefit the economy, create jobs, and improve quality of life.

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