

# SOLIDSENSE: A GAS ANALYZER ON A CHIP

Patent Pending

Technology Readiness Level: 8

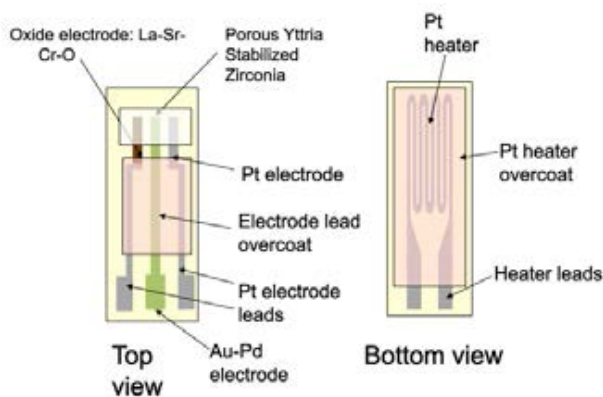
Actual technology completed and qualified through test and demonstration

In partnership with the University of New Mexico, Sandia Labs has developed the only sensor platform that measures all EPA regulated gas emissions (nitrogen oxides, carbon monoxide, and hydrocarbons) in addition to ammonia with high accuracy and sensitivity. The SolidSense chip-scale gas analyzer provides real-time diagnostics and is suitable for monitoring emissions from diesel and gasoline engines, turbines, steam power plants, and other combustion technologies. This novel device replaces a complex and expensive rack of chemical analysis equipment currently used today.

Designed to operate in hostile high temperature combustion environments, SolidSense operates without the need for cooling or filtration. The ceramic-based mixed-potential sensor comprises three electrodes connected to an artificial neural network. The differences between the catalytic activities of the electrodes for the electrochemical oxidation/reduction of the target gases provides the signals for concentration determination. The artificial neural network provides signal processing to determine compound concentration from sensor electrode output voltages. The

device enables real-time diagnostics with response times less than 1/100 of a second. SolidSense provides valuable exhaust chemistry feedback that can assist in improving combustion efficiency for engines, turbines, and power plants.

The sensor's ceramic platform enables easy manufacturing through thick film, high temperature co-fired ceramic technology. It also has potential applications in explosive detection and can be integrated into a hand-held device to provide a molecular fingerprint of explosive compounds.



## TECHNOLOGICAL BENEFITS

- Provides quantitative data to monitor and control the emissions of hydrocarbon, carbon monoxide, nitrogen oxides and ammonia
- No cross interference from CO<sub>2</sub> or H<sub>2</sub>O
- Real-time diagnostics—no sampling lag time
- Direct operation in exhaust gas streams
- Does not need frequent recalibration
- Large throughput manufacturing using high temperature co-fired ceramics technology

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