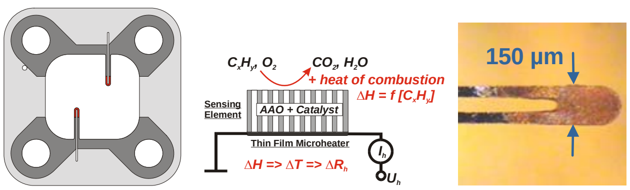
COMBUSTIBLE GAS MICROSENSOR
Technology Profile

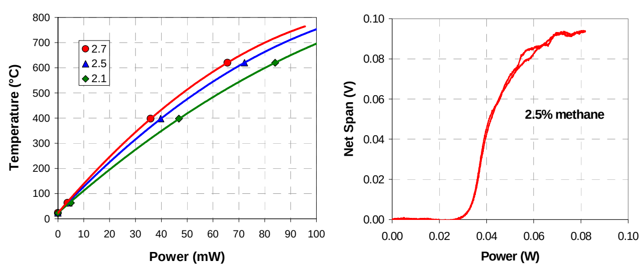
OVERVIEW

The industrial health and safety market has a strong demand for ultra-portable and inexpensive gas monitors – used as personal employee safety tools where exposure to combustible and/or toxic gases is possible. Such instruments require low cost gas microsensors that can provide ***low power, high sensitivity, and long-term reliability***. Combustible gas sensors available on the market today fall short either in power (catalytic beads) or reliability and performance (Si-based microsensors).

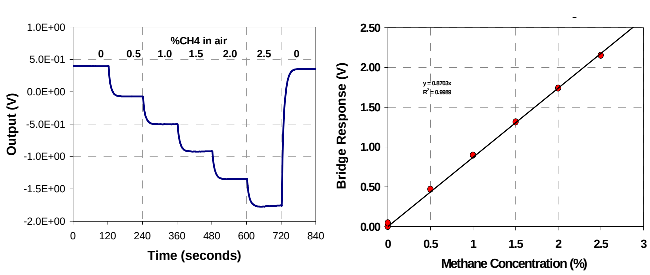


Representative sensor design, outline of the cross-section and the top view of the sensing element.

Based on its patented microsensor platform technology, Synkera is developing new and improved catalytic combustible gas microsensors. These sensors integrate precision-engineered nanostructured sensing elements with high surface area into a robust monolithic ceramic platform. With seed funding provided through NIOSH, Synkera has developed prototype sensors and demonstrated significant performance advantages in comparison with the existing products.



Temperature vs. power for three different designs (left) and a power plateau for representative sensor (right).



Output of the bridge circuit for varied CH_4 levels (left) and a linear calibration plot (right).

FEATURES AND PERFORMANCE

- Miniature size, low power consumption
- High sensitivity and rapid response time enabled by high surface area and open nanoporous architecture.
- Consistent performance due to precise and reproducible control of the nanoporous morphology.
- Superior chemical, thermal and mechanical stability, and high reliability of ceramic microsensor substrate.
- Advanced operating modes (temperature pulse and modulation) to reduce power, improve selectivity and increase lifetime.
- Performance drift and aging in some cases reversible using high temperature pulses.
- Low cost afforded by easily scalable, parallel and highly consistent ceramic micromachining.

Parameter	*Value / Performance*
Sensitivity	Up to 40 mV per 1% methane
Operating Temperature	Continuous operation up to 600°C short excursions up to 850°C
Power Consumption	As low as 47 mW at 500°C
Temperature Rise Time	100 to 300 ms, for 90% of setpoint
Response Time	50% LEL of CH_4 : t_{90} <2 sec, t_{63} <0.3 sec
Operating Modes	Constant temperature, temperature pulse and modulation, high temperature regeneration
Resistance Stability (500°C)	0.28 Ohm/month (constant temperature) 0.07 Ohm /month (T-pulses, 10% duty cycle)
Temperature Cycling	>100,000 cycles from ambient to 500°C
Mechanical Stability	No damage in 5 foot drop test
Packaging	Flexible options

PARTNERSHIP DEVELOPMENT

Partners are being sought to support commercialization of combustible gas microsensors based on this platform. If you would like to discuss this further, or need additional information, please contact:

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