PROJECT facts

U.S. DEPARTMENT OF ENERGY
OFFICE OF FOSSIL ENERGY
NATIONAL ENERGY TECHNOLOGY LABORATORY

Advanced Research

09/2004

DEVELOPING A COMBUSTION FLUE GAS MONITOR BASED ON SEMI-CONDUCTING METAL OXIDE SENSOR TECHNOLOGY

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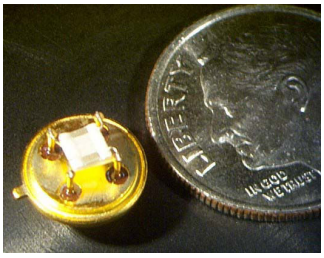
Description

Sensor Research and Development Corporation is developing a reliable, low-cost sensor system capable of in-situ, real-time detection, identification, and measurement of select flue gases generated in coal-fired power plants. The sensor system currently being studied has a sensor array comprised of several different semi-conducting metal oxide sensors (SMO) to selectively detect and measure NO, NO_2, SO_X, CO_2, CO, H_2S, and NH_3.

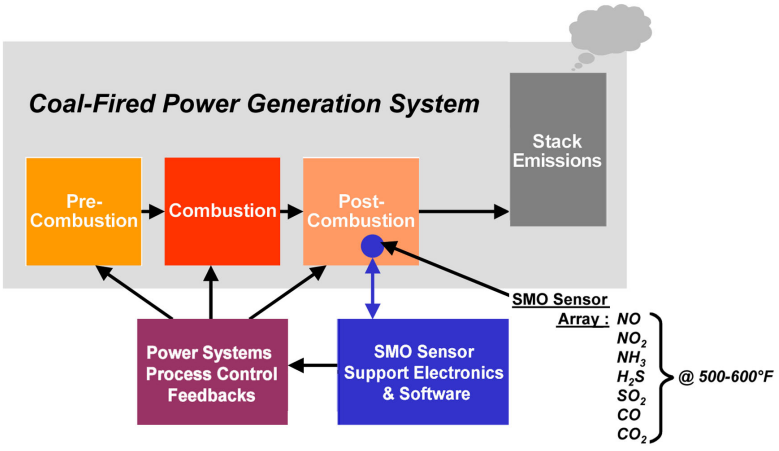


Solid Metal Oxide Micro Sensor

The SMO sensor is the heart of the combustion gas analyzer that is being developed to operate in the post-combustion stage of the coal-fired power generation process. As the system detects and analyzes the combustion gas stream it provides continuous feedback to the power generation system's process control to help optimize the combustion process for cleaner, cheaper, and faster power. The sensor system will also assist with meeting air quality standards and provide the end-user with necessary real-time data.

Currently, a laboratory-based combustion gas analyzer has been developed along with a post-combustion environment simulation and delivery system.

At the completion of this project, the SMO technology will offer a fast, low-cost, highly reproducible sensor array system. The sensor array will detect, identify, and measure target combustion gases in the low parts per million (ppm).



Envisioned Placement and Use of SMO Micro Sensors

PARTICIPANT

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TOTAL PROJECT COST

Total	$814,365
DOE	$489,829
SRD	$324,536

PROJECT DURATION

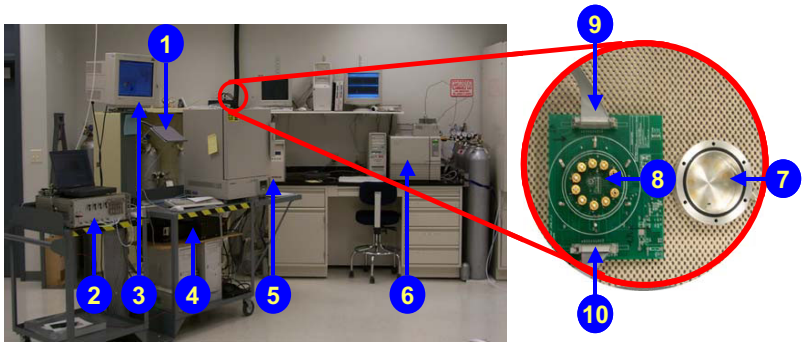
July, 1999 – October, 2004

WEBSITES

www.netl.doe.gov/coal

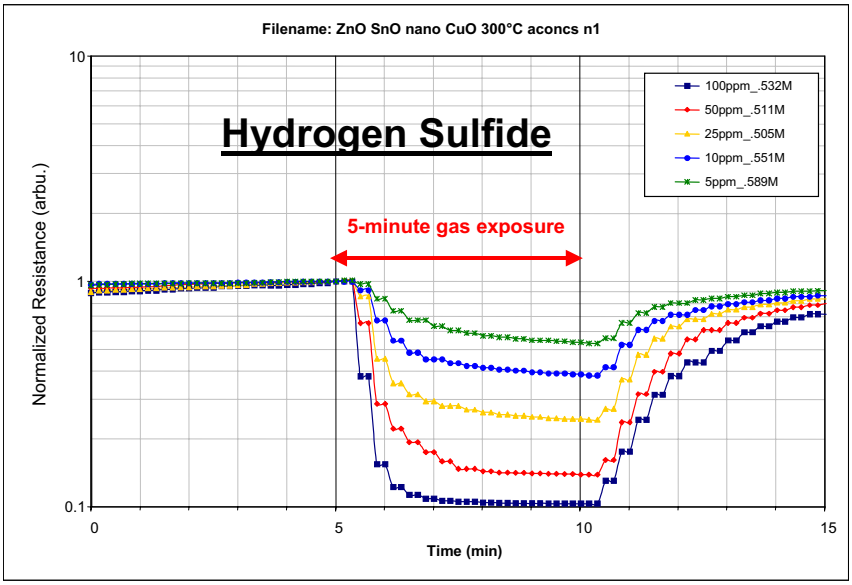
Benefits of SRD Sensor Array System

- Small space/size requirement & low-cost
- Continuous, real-time monitoring
- Stand-alone capabilities with low maintenance
- High sensitivity (<ppm)
- Rugged, in-situ operation directly in flue gas stream (300-600 °F)
- Flexible, user definable implementation into process controls as feedback
- Demonstrated potential for selective detection of flue gases



1. source of flue gases
2. automated gas simulation system
3. data acquisition & control
4. sensor support electronics
5. chemiluminescence analyzer (NO/NO_2)
6. GC/TCD system
7. gas-sampling chamber
8. 10 single SMO sensors
9. resistance measurement connections
10. heater control connections

Laboratory gas simulation system and micro sensor test equipment



Micro Sensor detection of Hydrogen Sulfide (5-100 ppm)