PROJECT facts

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

Advanced Research

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REAL-TIME, IN-SITU MONITORING OF COMBUSTION GAS MIXTURES BY MICROPOROUS SOLID ARRAY SENSOR

CONTACT

U.S. Department of Energy
National Energy Technology
Susan M. Maley
Project Manager
304-285-1321
304-285-4403 fax
susan.maley@netl.doe.gov

Lynntech, Inc.
Dr. Ruya Ozer
Research Scientist
7610 Eastmark Drive
College Station, TX 77840
979-693-0017
ruya.ozer@lynntech.com

PROJECT COST

DOE SBIR Phase I: $100,000

CUSTOMER SERVICE

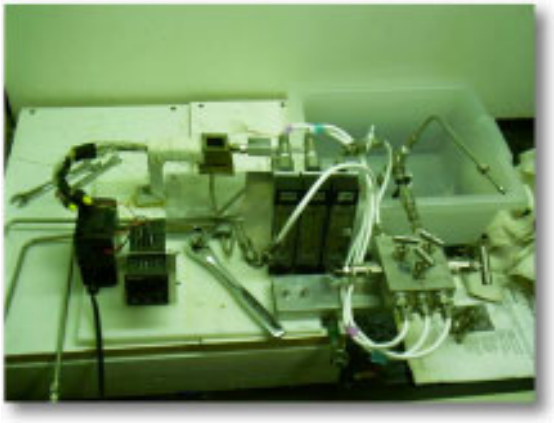
800-553-7681

WEBSITE

www.netl.doe.gov
www.science.doe.gov/sbir

Lynntech, Inc. is developing a novel microporous solid array sensor to detect gaseous combustion pollutants in a complex gas mixture at elevated temperatures. The technology is based on zeolite material and has the capability of sensing in process streams with temperatures in the range of 350-1000 ^{o}C. Array-based sensors are an emerging technology in which the identification of a species is not only achieved by the specific response of one sensor but also by the response of multiple sensors, producing a characteristic "fingerprint" of the species. This technology is capable of fast, stable, reproducible, selective and sensitive concentration measurements of mixed gas systems and offers capabilities that can potentially overcome the limitations associated with existing array-based sensors. The goal of this Phase I SBIR project is to show the feasibility of the proposed sensor device in qualitative and quantitative identification of targeted compounds (CO, SO_2, NO_X). Other gases of interest include hydrocarbons and carbon dioxide. Phase II work will pursue the optimization of the system parameters, design, and fabrication of the sensor system and the commercialization of the technology with the industrial partners.

To date, a bench-top prototype of the sensor system has been designed and constructed. Microporous solid materials were deposited onto gold electrodes with a technique developed at Lynntech, Inc. The prototype was tested for each of four different microporous material-coated sensor elements. CO, SO_2, and NO_X were

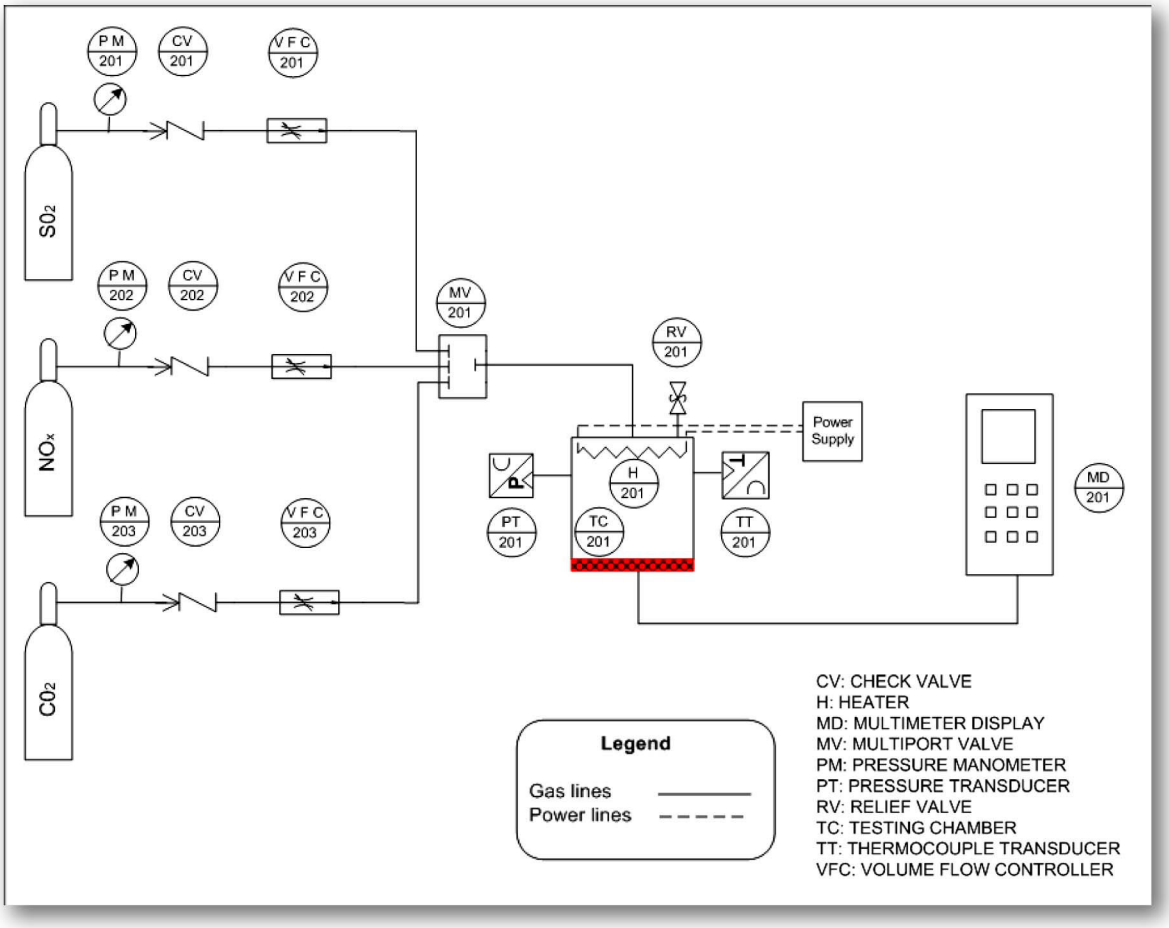


Bench-scale sensor test stand

REAL-TIME, IN-SITU MONITORING OF COMBUSTION GAS MIXTURES BY MICROPOROUS SOLID ARRAY SENSOR

successfully detected with those sensor elements at 350°C. Future work will include testing the gas matrix at higher temperatures and investigating the effect of parameters (coating thickness, analyte concentration, humidity, etc.) on the sensitivity and selectivity of the sensing mechanism.

Potential applications of the proposed technology are enormous. Air quality and environmental monitoring, process control, and food processing will immediately benefit from this technology. It will also find many applications in the medical industry to identify certain skin diseases and infections and remote monitoring of patients. It can be utilized in military and homeland security applications.



Schematic of bench-top test stand