A Novel Low-cost Microsensor for Point-of-care Multi-gas Monitoring

Ian Papautsky,[1] Michael Ratterman,[1] David Klotzkin[2]
[1]Electrical and Computer Engineering, University of Cincinnati
[2]Electrical and Computer Engineering, University of Binghamton

The long-term goal of this project is to develop a miniature, portable, low-cost sensor for detection of multiple (toxic and nontoxic) gases specifically encountered by the firefighting, mining, and scuba diving industries. This proposal is our first step in achieving this long term goal and we thus begin with detection of nontoxic, yet critically important O2 and CO2 gases. Absorption-based infrared CO2 detectors and Clark-type O2 electrochemical sensors are the common methods for determining concentration of these gases in breathable air. These conventional methods pose numerous challenges such as degradation over time and high cost. Our strategy to developing the multi-gas sensor is to integrate the low-cost CMOS array detector with luminophores which fluorescent emission is quenched selectively by the target gases. We will use novel cross-polarization optical signal isolation concept to filter excitation light and dramatically increase sensitivity. We will use the different color channels of the CMOS array to selectively detect wavelength-specific (i.e. color- specific) emission of each gas-specific luminophore. Our team of engineers has already developed a preliminary proof of concept O2 sensor and has achieved promising results. We propose to build on these results and accomplish the following aims: 1) Demonstrate a portable O2 sensor, 2) Demonstrate a portable, optical CO2 sensor, and 3) Demonstrate simultaneous detection of CO2 and O2 gases.

The outcome of this project will be the first low-cost optical CMOS sensor capable of detecting multiple gases simultaneously. Ultimately, this technology can be scaled down to a small, wearable device or possibly integrated into existing clothing worn by firefighters or miners.

University of Cincinnati
11th Annual
Pilot Research Project Symposium
October 14-15, 2010

Main Menu

Hosted by: The University of Cincinnati Education and Research Center Supported by: The National Institute for Occupational Safety and Health. (NIOSH) Grant #: T42/OH008432-05

Produced by Kurt Roberts Department of Environmental Health