

Low-Power, Chip-Scale, Carbon Dioxide Gas Sensors for Spacesuit Monitoring

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N5 Sensors, Inc. through a Small Business Technology Transfer (STTR) contract award has been developing ultra-small, low-power carbon dioxide (CO₂) gas sensors, suited for monitoring CO₂ levels inside NASA spacesuits. Due to the unique environmental conditions within the spacesuits, such as high humidity, large temperature swings, and operating pressure swings, measurement of key gases relevant to astronaut's safety and health such as (CO₂), is quite challenging. Conventional non-dispersive infrared absorption based CO₂ sensors present challenges inside the spacesuits due to size, weight, and power constraints, along with the ability to sense CO₂ in a high humidity environment. Unique chip-scale, nanoengineered chemiresistive gas-sensing architecture has been developed for this application, which can be operated in a typical space-suite environmental conditions. Unique design combining the selective adsorption properties of the nanophotocatalytic clusters of metal-oxides and metals, provides selective detection of CO₂ in high relative humidity conditions. All electronic design provides a compact and low-power solution, which can be implemented for multipoint detection of CO₂ inside the spacesuits. This paper will describe the sensor architecture, development of new photocatalytic material for better sensor response, and advanced structure for better sensitivity and shorter response times.

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