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INNOVATIVE SOLUTIONS FOR GAS DETECTION

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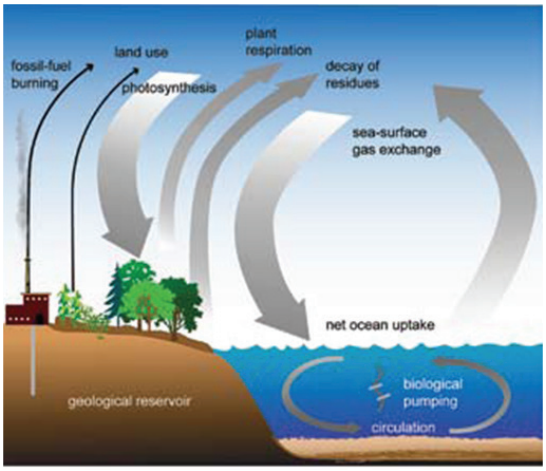
High Performance Low Power Electrochemical CO2 Gas Sensor
DOE Phase I: DE-SC0007530

Need: The overall success of future carbon cycle management will depend in part on reliable, ubiquitous carbon dioxide (CO2) monitoring to support carbon cycle measurements. Current CO2 measurements rely on IR spectrometry, which is the gold standard for CO2 measurement, but whose expense limits the scope of deployability of measuring devices. New methods that achieve competitive sensitivity and detection capability, while lowering the cost dramatically to enable widespread deployment, are needed.



Carbon cycle studies will benefit from new low cost, low power, high performance CO_2 sensors.

Approach/Results: This program addressed development of an advanced, amperometric CO2 sensing technology that combines novel electrochemical electrolytes and a new printed gas sensor to provide a unique, low cost, low power, high performance tool to support carbon cycle management. Such an alternative technology to more costly, conventional instrumental approaches does not exist at this time.

The new printed amperometric gas sensor will provide a new tool for qualitative, quantitative and spatial measurement and mapping of CO2 in the air. The amperometric device is designed to allow CO2 concentration changes to be measured reliably in the presence of typical ambient background CO2 levels.

In the Phase I program we demonstrated that the printed electrochemical sensor concept could be used to reliably measure CO2 in air with single ppm resolution. This is an unprecedented result. Previously, it has been difficult or impossible to measure CO2 directly in air because of the high oxygen concentration of air (210,000 ppm) compared to CO2 (370-400 ppm). Identification of new electrode catalysts and new electrolytes enabled this accomplishment.

Benefits/Innovation: New, improved CO2 monitoring methods with reduced cost, ultralow power requirements and improved sensitivity will provide measurement alternatives in a variety of fields. Technology that supports carbon cycle measurements will also benefit the nascent CO2 sequestration industry with long term efficacy evidence and liability protection. The new, low cost, low power, high performance sensor will benefit a variety of customers that rely on CO2 measurements, including the food and beverage, medical diagnostics, ventilation control systems and indoor air quality monitoring.