Sensor Technology Supported by EPA's Small Business Innovation Research (SBIR) Program

Federal Remediation Technologies Roundtable

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Federal SBIR Program

- Set-aside program for small businesses to engage in federal R&D
- Promote commercialization
- Budget = 2.5 % of Federal R&D Budget
- Over $2 Billion in 2004
- Eligible companies: for profit, located in U.S., less than 200 employees

11 Participating Agencies

- Department of Defense (DOD)
- Department of Health & Human Services (HHS)
- National Aeronautics & Space Admin (NASA)
- Department of Energy (DOE)
- National Science Foundation (NSF)
- Department of Homeland Security (DHS)
- Department of Agriculture (USDA)
- Department of Commerce (DOC)
- **Environmental Protection Agency (EPA)**
- Department of Transportation (DOT)
- Department of Education (ED)

Mission



- EPA:
  - Protect human health and the environment – air, water and land
- EPA SBIR:
  - Develop and commercialize innovative environmental technologies needed by EPA regions, program offices and states

EPA SBIR Program Overview

- FY06 Budget - $6.5 million
- Annual Research Solicitation
- Projects awarded in 2 Phases
  - Phase 1
    - Proof of Concept
    - $70,000 for 6 months
  - Phase 2
    - Development and Commercialization
    - Base $225,000 for 2 years
- Focus on Commercialization

Solicitation Topics Related to Remediation Technology

- EPA's Office of Solid Waste and Emergency Response (OSWER)
  - Waste Minimization
  - Hazardous Waste Management
  - Hazardous Waste Monitoring
  - Solid Waste Recycling
  - Waste Gasification

Solicitation Topics Related to Remediation Technology (cont.)

- EPA Region 10 (Pacific NW)
  - Air Pollution Monitoring and Control (PM from agricultural sources, diesel)
  - Low Level Area-Wide Soil Contamination
- EPA Region 3 (Mid-Atlantic)
  - Management of Mining Wastes
  - In-situ clean up of sediments
- EPA Regular Solicitation
  - Safe Buildings
  - Drinking Water and Wastewater Security
  - Lead Paint Detection and Remediation

Field Screening Detector for Metals in Soil

- Company: Physical Sciences, Inc. (PSI)
- Status: Phase II completed 2002
- Technology: Spark-induced breakdown spectroscopy (SIBS)
- Use: Field instrument for the measurement of metals in soil
- Application: Site characterization
- Advantages:
  - Field-rugged, rapid, simple, inexpensive

Multimetals Monitoring System

- Company: Physical Sciences, Inc. (PSI)
- Status: Ongoing Phase II Project - Follow on from previous work. (Previously proved technology for metals that emit in visible range (Pb, Cr and Cd), on this project develop SIBS for deep ultraviolet range)
- Technology: Spark-Induced breakdown spectroscopy
- Use: real-time, multimetals emissions monitor to identify and quantify all HAP metals
- Application: support Title V permitting of large air pollution sources

A 3-in-1 Continuous, Automated, Ambient-Fenceline-Fugitive Emissions Instrument

- Company: VOC Technologies, Inc.
- Status: Ongoing Phase II project, Patent pending
- Technology: Pneumatic Focusing Gas Chromatography (compress air sample to high pressure before injecting it into a GC)
- Use: Analysis of VOCs and HAPs
- Advantages:
  - GC is housed in a PC – Provides automated, continuous record of emissions
  - Potential to lower the cost of VOC/HAP analysis by a factor of 100

Robust, Tunable Diode Lasers for Environmental Monitoring

- Company: Vescent Photonics, Inc.
- Status: Phase II completed 2005
- Technology: Tunable diode laser spectroscopy
- Use: contaminant monitoring in the ppt range
- Applications: in situ factory, mobile emissions and fenceline detection
- Advantages:
  - solid-state laser that is robust and compact (book of matches)
  - widely tunable - wavelengths from 400 nm to 2um

Electrochemical Sensor for Cr(VI) in Water

- Company: Eltron Research, Inc.
- Status: Phase II completed 2004
- Technology: self-assembled monolayer (SAM) modified microelectrode arrays
- Use: electrochemical detection of Cr(VI)
- Applications: remote monitoring of groundwater and surface water
- Advantages:
  - self-contained laboratory that samples, analyzes and stores results

Polymer-Based Sensor for Contaminants in the Field

- Company: American Research Corporation of Virginia
- Status: Phase II completed in 2003
- Technology: fluorescent competitive flow assay based on the release of labeled analyte from a molecularly imprinted polymer (MIP) in the presence of free analyte
- Use: field-based quantitative detection of a multiple contaminants
- Applications: environmental, biomedical and industrial
- Advantages: low-cost, miniaturizable

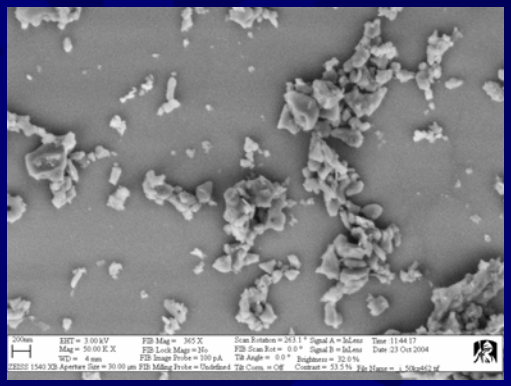
Downhole Gas Chromatograph

- Company: Dakota Technologies, Inc.
- Status: Phase II completed in 2002
- Technology: Gas chromatograph constructed within the interior of a cone penetrometer probe equipped with a membrane interface probe (MIP)
- Use: Measurement of subsurface chemical contaminants in either the vadose or saturated soil zones
- Applications: Tracking dissolved-phase plumes in near real-time, siting monitoring wells, tracking remediation procedures

Sensor for RCRA Metals in Groundwater

- Company: BiODE, Inc.
- Status: Phase II completed in 2001
- Technology: Hybrid sensor combining piezoelectric mass detection and electrochemical processes
- Use: Direct detection of Cr (VI)
- Applications: on-site chromate detection at air field and nuclear weapons production facilities, industrial hygiene, drinking water safety

Nanocrystalline Zero Valent Iron (Z-Loy™)



- Company: OnMaterials, Inc.
- Status: Phase II completed in 2005, Patent pending on manufacturing process
- Use: In-situ remediation of contaminated soils and aquifers
- Application:
  - 1400 lb. deployed by pneumatic fracturing at 1,1,1 TCA site in NJ
  - ORP reduced from +50 to nearly -400 mV
  - TCA concentrations reduced by up to 95%
  - 8000 lb injection at same site in June, 2005
- Advantages: customizable surface area (15 m^2/g), low cost (<$20/lb)

2006 EPA SBIR Schedule

- Any thoughts on solicitation topics - Provide now
- Phase I Solicitation Open March 23 – May 24, 2006
- Phase I Contracts Awarded - February 2007
- Phase II Solicitation Open - July 2007
- Phase II Contracts Awarded - April 2008

For more information

- Website
  - www.epa.gov/ncer/sbir
    - Previous research solicitations
    - Abstracts and final reports from awardees
    - EPA success stories
    - Links to other agencies
- Program Contacts
  - Program Director, Jim Gallup
  - Deputy Director, April Richards