Auburn University

Innovation Advancement & Commercialization

Contact

Brian Wright
Auburn University
Innovation Advancement
& Commercialization
334-844-4977
brian.wright@auburn.edu
https://iac.auburn.edu/
Reference: Heavy Metals

Inventors

Dr. Dongye "Don" Zhao
Professor

Zhong Xiong
Doctoral Candidate

Dr. Mark O. Barnett
Professor

Dr. Willie F. Harper, Jr.
Assistant Professor

Feng He
Doctoral Graduate

Ruiqiang Liu
Doctoral Candidate

Yinhui Xu
Doctoral Candidate

Department of Civil Engineering

Status

- This process has been experimentally verified for mercury

Click here **for a listing of Auburn patents available for immediate licensing**

Click here **for a listing of Auburn's available physical science technologies**

Follow Auburn IAC

AUBURN UNIVERSITY

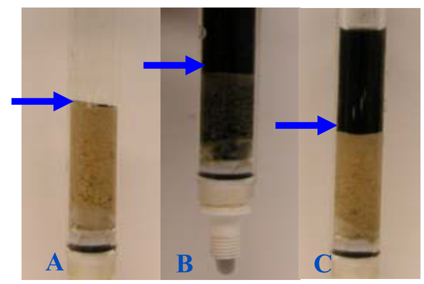
In-situ Remediation of Inorganic Contaminants & Heavy Metals from Soil

Overview

Auburn University is seeking licensees for a remediation technology for the *in situ* treatment of contaminated soil or soil wastes. Starch-stabilized iron nanoparticles of varying compositions can be used to remediate such inorganic contaminants as arsenate, nitrate, chromate and perchlorate and such heavy metals as arsenic, cadmium, chromium, lead and mercury. Auburn's innovative process provides a fast and cost effective solution for the immediate need of soil and waste remediation.

Advantages

- Uses an inexpensive, easily available, and environmentally friendly stabilizer
- Allows for easy control of soil mobility
- Treats sub-surface regions where other methods fail (e.g., excavation, bioremediation)
- Reduces processing time and materials needed, thereby reducing costs
- Prevents aggregation of nanoparticles, providing superior *in situ* performance
- Allows for application to entire contaminated zone or for building a sorptive barrier



Visual comparison of nanoparticle (NP) mobility in sandy soil.
(A) Untreated sandy soil
(B) Penetration of starch stabilized FeS NPs after 15 min.
(C) Immobile unstabilized NPs (30 min)
Arrows show top of soil matrix

Description

When mercury enters water and sediments, it can undergo numerous transformation processes, of which mercury methylation is a top environmental concern. Dangerously high concentrations of methylated mercury have been found in fish and waterfowl. Existing methods to minimize the mercury methylation process either tend to let the mercury leak back into the soil and groundwater (as with excavation and landfill techniques), or are not suited for subsurface treatment as they are time consuming and difficult to control.

Auburn inventors have developed an innovative method using stabilized iron sulfide nanoparticles that can effectively prevent the formation of methylated mercury. Without stabilization, these particles tend to agglomerate, leading to vastly reduced reactivity and particles becoming trapped in the sub-surface soil, making them impractical for *in situ* use.

This technology modifies iron sulfide particles at production by adding a very low-cost stabilizer to prevent the nanoscale particles from agglomerating, thereby maintaining their high surface area and reactivity. The stabilizer can also be used to control the particle size and dispersibility of the nanoparticles in the subsurface. Tests performed by the inventors with mercury show that almost 100% of the immobilized mercury is non-leachable. These and similar stabilized nanoparticles can be used for remediation of a variety of inorganic and metallic contaminants.

Licensing Opportunities

- U.S. Patent 7,581,902 (Heavy Metals) and U.S. Patent 7,635,236 (inorganics)
- Either or both patents are available for immediate non-exclusive licensing through Auburn's customizable "Ready to Sign" licensing program.
- Similar patents are available in the Remediation Technology field.