Office of technology transfer

LEHIGH UNIVERSITY

Rapid Sensing of Toxic Metals with a New Hybrid Inorganic Material (HIM) Through pH Changes

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Licensing Opportunities

- Exclusive
- Non-exclusive
- Research Sponsorship
- Product Development Partnerships (PDP)

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Overview

Lehigh University is actively looking for partners to commercialize a new method for rapidly identifying the presence of toxic heavy-metal contaminants in groundwater. Decades of mining for heavy metals such as lead, zinc and cadmium have produced abandoned mines across the U.S., each of which has the potential to pollute nearby groundwater sources. (Many metals are essential nutrients in tiny quantities, but produce toxic effects at higher concentrations.) Detecting such contamination typically requires pretreatment of the samples to be tested, and frequently involves either expensive and complex laboratory devices or cheaper instruments with short half-lives and limited precision. By contrast, the Lehigh method involves a simple solid-state sensor based upon a new hybrid inorganic material that can detect heavy metals in water -- without pretreatment -- quickly and accurately.

Suggested Uses

The new sensor can be used to identify the presence and concentration of waterborne heavy-metal toxins in a variety of circumstances, including:

- Municipal water-treatment screening;
- Suspected groundwater contamination;
- Safety screening of water used in agriculture, livestock raising and fish farming

Advantages

The new toxin sensors offer a variety of advantages over current techniques, including:

- Fast, accurate measurement readouts via simple pH tests;
- High sensitivity to low toxin concentrations;
- No need for expensive instruments or additional specialty chemicals;
- Inexpensive and operationally straightforward operation.

Technology Description

The invention is a novel hybrid inorganic material consisting of hydrated iron oxides and calcium magnesium silicate that can be ground and placed into the base of a test bed. As water is passed through the bed, the silicate hydrolyzes it, producing hydroxyl ions that render it slightly alkaline, while the iron oxides pull dissolved heavy-metal atoms out of solution. When the adsorbed level of heavy metal reaches a "breakthrough" concentration, the toxins draw hydroxyls out of the water, leading to a measureable rise in sample acidity (i.e., a drop in pH value). The pH level of water at the end of test-bed columns containing different ratios of oxide to silicate can thus indicate the presence, concentration and type of heavy metals in the original sample.

Innovation Categories

Agriculture, chemicals, devices, materials, environment, process/procedure

Status and Intellectual Property

The invention has been validated as a detector of heavy metals such as zinc and lead. The hybrid material is currently being further refined. A U.S. provisional patent application has been filed.

Lehigh ExpertNet

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