THE FLORIDA STATE UNIVERSITY

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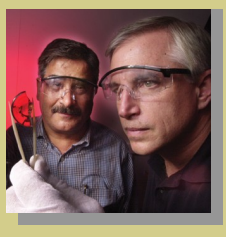
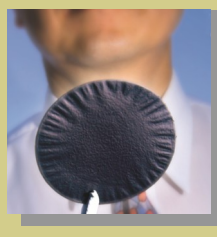
Technology Opportunity







Reusable Colorimetric Fluoride Sensors

Fluoridation of drinking water has been effective in preventing tooth decay and improving overall dental health; however, overexposure to fluoride poses numerous serious health risks including brittle bone disease and increases in bone cancers. Thus, accurate detection of fluoride levels in water and food sources as well as in body fluids is essential.

To date, few fluoride sensors provide both colorimetric and fluorimetric detection. Dr. Sourav Saha has invented a new visual sensor that accurately detects the presence and concentrations of fluoride in aqueous environments.

The sensor is based on the discovery of a new method of colorimetric fluoride detection that uses electron defficient naphthalenediimide (NDI) receptors. Modification of these receptors has improved their sensitivity to a nanomolar level, making them 1000 times more sensitive than the EPA and World Health Organization standards. The resulting sensor undergoes a two-step color change to indicate the amount of fluoride ions present in the medium. The NDI receptors remain colorless in the presence of chloride, bromide, iodide, nitrite, nitrate, azide, acetate, phosphates, hexafluorophosphate, tetrafluoroborate, and triflate anions. The sensor device could be portable, such as a dip-stick or spot-test kit, and may be reusable.

Applications

- Medicine and health applications, both commercial and consumer-oriented, to test for the presence of fluoride in tap water, foods, blood and urine.
- Food industry applications, such as testing toothpaste, bottled water, and food products.
- Commercial product to enable water purifier manufacturers to test the effectiveness of their products more easily and at a reduced cost.
- Municipal water-testing applications, particularly field testing.
- Humanitarian application for use in developing countries with few or non-existent fluoride testing tools or standards.

Unique Advantages

- Offers both colorimetric and fluorimetric detection.
- Could detect fluoride presence and quantity in a variety of environments including water, food, gas/air, and body fluids.
- The sensors are easy to synthesize, environmentally benign, and can detect a range of fluoride concentration levels, with high sensitivity at extremely low nanomolar concentrations.
- Dip-stick and spot-test forms are easy to use, effective, and comparatively inexpensive to produce.
- Tests are reversible, reusable (with power source), and recyclable (disposable), thus reducing waste and costs.

Technology Opportunity

Status

- Patent filed: US 61/349,280.
- Lab prototype Proof of concept demonstrated.

Current Work Underway

- Complete the preparation and characterization of water-soluble NDI-based sensor compounds and metal-organic frameworks (MOFs).
- Construct a prototype fluoride sensing kit by coating solid surfaces (paper and plastic strips) with NDI-based chemosensors and examine their ability to detect fluoride solutions.

The Inventor

Dr. Sourav Saha started his independent research career as an Assistant Professor in the Department of Chemistry and Biochemistry at Florida State University in August 2009. The underlying theme of his research program is to expand fundamental understanding of various aspects of supramolecular chemistry and employ this knowledge to confront important challenges in nano- and biotechnologies. In particular, Dr. Saha's research group (three postdocs, one graduate student, and three undergraduate students) is working on anion recognition, sensing, and artificial transmembrane passage, as well as on self-assembled multichromophoric light-harvesting materials.

Areas of Research

Dr. Saha's Lab uses synthetic chemistry to prepare structurally and functionally encoded molecular building blocks, exploit molecular recognition and self-assembly to assemble these building blocks into functional materials, and employ numerous physical and analytical probes to explore materials' properties and functions. His interdisciplinary research program seeks to unveil fundamental knowledge in various aspects of supramolecular chemistry and apply this knowledge to solve problems in the following areas:

1. **Sensors — Anion Recognition and Sensing by π-Acidic Naphthalenediimide Receptors**
2. **Ion-Channels — Ditopic Ion-Pair Receptors and Channels for Transmembrane Passage of Salts**
3. **Solar Cells — Self-Assembled Multichromophoric Light-Harvesting Materials**

For Licensing Opportunities Contact

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