MEMS Chemical Sensor for In-situ Heavy Metal Detection
Technology #17891

Applications

- Heavy metal pollution level monitoring in surface water
- Compact MEMS chemical sensor for end-user water quality monitoring
- Three-dimensional AUV heavy metal contaminant mapping of watersheds

Problem Addressed

Monitoring heavy metal contamination in crucial water sources is vital because heavy metals are non-biodegradable and extremely toxic. Conventional water quality monitoring procedures are time-consuming, expensive and centralized. Thus, contamination results may be inaccurate as chemical reactions can occur in transit to testing sites. In addition, boundary layer effects may distort contamination readings due to ineffective sensor designs. The invention presents a novel sensor design for in-situ heavy metal detection, while resolving boundary layer problems to achieve extremely sensitive detection rates.

Technology

Inspired by the shark olfactory sensing system, the microfluidic channels are designed to have an enlarged effective sensing area. The sensor is miniaturized to offer improved operational benefits and designed to be biodegradable and easily manufactured. In addition, the sensor uses a more effective electrode construction and mode of ion transfer, increasing sensitivity to metal ions and resolving boundary layer detection problems. Due to its simple, compact and cost effective design, this disposable sensor is perfect for mass production.

Advantages

- Compact, light-weight design makes sensor versatile with great commercial viability
- Simple and low-cost fabrication using common MEMS batch fabrication techniques
- Novel design optimizes mass transfer rates and resolves boundary layer problem

Categories For This Invention:

Materials
Micro & Nanotech
MEMS/NEMS (Materials)
Photonics
Sensors (Photonics)
Biosensors
Life Sciences
Biotechnology
Health
Other (Biotechnology)  
Environment  
Sensing

**Intellectual Property:**

Chemical sensor for heavy metal detection  
PCT  
2017-007427  
Chemical sensor for metal detection  
US Patent Pending  
2018-0196025

**Inventors:**

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**Publications:**

*Miniaturized Chemical Sensor with Bio-inspired Micropillar Working Electrode Array for Lead Detection*  
Sensors and Actuators B: Chemical  
2016

*Shark-inspired MEMS Chemical Sensor with Epithelium-like Micropillar Electrode Array for Lead Detection*  
18th International Conference on Solid-State Sensors, Actuators and Microsystems (TRANSDUCERS)  
2015

*Copper Detection with Bio-inspired MEMS-based Electrochemical Sensor*  
19th International Conference on Miniaturized Systems for Chemistry and Life Sciences (MicroTAS),  
2015

**External Links:**

Oceans at MIT  
http://oceans.mit.edu/people/all-oceans-people/by-subject/engineering/name/michael-triantafyllou

**Image Gallery:**