TECHNOLOGY

Introducing Artificial Cilia NEMS – The World's Smallest Flow Rate Sensors

OVERVIEW

Microfluidic flow rate sensors and actuators have been transformational in the fields of life and biomedical sciences. Current flow sensing strategies like optical or image velocimetry, thermal anemometry, and micro-electromechanical (MEMS) cilia or hair inspired sensors with diameters on the order of 10-100 micrometers only provide limited flow information. Due to their large size, these methods are not beneficial to the future of ultra-compact and ultra-portable BioMEMS devices.

Researchers at the University of Maryland and the University of Minnesota have developed an improved cilia inspired nano-electromechanical system (NEMS) distributed flow sensor using magnetic nanowires that are several orders of magnitude smaller than current artificial cilia type sensors. New low-cost fabrication techniques and materials allow for these artificial cilia to be easily spread across an entire surface area within a micro-channel to determine flow rates precisely at the boundary layers where reactions are actually occurring. Rate information is indirectly sensed by measuring the nearby change in magnetic fields caused by motion of the nanowires. This technology allows accurate in-situ sensing of diffusion rates and dwell (reaction) time for the first time, and will allow for real time feedback and control of flow rates.

Advantages
Extremely small nanowires (10-100's nm diameter) are the same sizes as those found in nature
New and low-cost nanowire fabrication techniques
Long lasting and highly durable nanowire construction
Fully customizable sensitivity using 3D geometry tailoring
Ultra-compact, ultra-portable, disposable thumb drive sized bio-sensor integration is anticipated

Applications
Personal, implantable, and/or wearable medical devices
Portable and inexpensive medical diagnostic tools
Pharmaceutical testing
Hazardous chemical/biological warning systems (military, industrial, environmental)
Underwater robotics (mimicking fish scales/ skin)

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Additional Information

INSTITUTION

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

Contact OTC for licensing information

CATEGORIES

- Microfluidics
- Nanotechnology + Nanoparticles + Nanomaterials
- Sensors/Monitors

EXTERNAL RESOURCES

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