PENNSTATE

Technology Available for Licensing
Intellectual Property Office - The Pennsylvania State University
113 Technology Center, University Park, PA 16802
814.865.6277 phone; 814.865.3591 fax

Non-Confidential Description - PSU No. 2545
"Multi-Target Molecule Bio-Sensor Arrays Based on Nano-Mechanical Metal and Semiconductor Rods Integrated with ON-Chip Sensing Circuitry"

Keywords:
Biosensor, nanotechnology, on-chip, sensing circuitry

Links:
Inventor website - 1
Inventor Website - 2

Inventors:
Theresa Mayer , Christine Keating

Background

The worldwide market for biosensors has been estimated to have a potential of $7.3 billion with a growth rate of 10.4%. Uses for this technology range from drug discovery to biowarfare defense to clinical diagnostics. To advance this industry, the science community is actively developing highly sensitive and selective biosensor arrays. One area of advancement for sensors is the mere size of components. Micron- and nano-scale dimensions become necessary for handheld instruments and *in vivo*, non-invasive diagnostics. Current systems under the public eye rely on *ex vivo* operation due to line-of sight optical detection. Therefore, opportunity and demand exist to commercialize alternative technologies for the next level of biosensor applications.

Invention Description

The underlying principle involves the integration of nanometer diameter, micron long metal or semiconductor rods onto a substrate to form suspended nanomechenical cantilevers. The cantilever rods are rigidly attached to the substrate on one or both ends, and resonate at a characteristic frequency depending on the diameter, length, and stiffness of the rod. The metal or semiconductor rods are integrated onto the substrate using electrofluidic or fluidic assembly techniques. A receptor coating is placed on the metal or semiconductor rods prior to or following rod alignment using self-assembly chemistries. Sensing is accomplished when the target agent binds to the receptor substance, causing a change in the mass of the cantilever rod, and a corresponding change in the resonant frequency. This change in resonant frequency can be detected using an electrical readout. The sensing circuitry is integrated with CMOS of TFT technologies to form compact multi-analyte sensor arrays on single crystal silicon, glass, or polymeric substrates. Circuits can also be included on the substrate to transmit the array data via wireless methods to a remote workstation for analysis. Devices may be integrated on chips with other analysis devices.

Advantages/Applications

- Non-optical detection of receptor-target interaction
- Integration of multi-analyte biosensor elements on a single chip
- Excellent sensitivity and selectivity towards each target analyte
- Rapid response
- Remote data collection for target analysis
- Low-cost, integration

Contact: **Matthew D. Smith**
Sr. Technology Licensing Officer
The Pennsylvania State University

Phone: (814) 863-1122
Fax: (814) 865-3591
E-mail: mds126@psu.edu