Giant Magnetoresistance Biomolecule Sensing System

Technology #20110105

High-throughput Giant Magnetoresistance Biomolecule-Sensing System

The highly sensitive magnetic-based biomolecule detection system can identify the presence of antigens, DNA fragments, biomarkers or other biomolecules using magnetic nanoparticles, an applied magnetic field and a giant magnetoresistance (GMR) sensor that detects the presence of nanoparticle tagged biomolecules based on changes in the measured magnetic field. This sensor may provide four orders of magnitude greater sensitivity than the gold standard ELISA (enzyme-linked immunosorbent assay) used for clinical diagnostics and based on optical measurement.

Note: The Giant Magnetoresistance Biomolecule-Sensing System technology has been exclusively licensed to Zepto Life Technology. If you have questions, please contact the University of Minnesota's Office for Technology Commercialization.

GMR Sensor for Drug Development and Biomedical Testing

The ability to screen large numbers of samples simultaneously is enabled by use of an out-of-plane (perpendicular) GMR sensor. This sensor structure is similar to that of sensors used for perpendicular recording in the hard disk drive market, which is replacing in-plane (longitudinal) recording due to greater density and therefore data capacity. In comparison to in-plane GMR sensor architecture, this system would provide greater magnetic field homogeneity for high sensitivity and specificity with reduced power and magnetic field strength requirements. A bench top system based on this technology would provide fast, ultra-sensitive results and the ability to screen large numbers of samples simultaneously. The GMR biomolecule

Learn about more groundbreaking discoveries at www.research.umn.edu/techcomm
sensing system may be able to test 1000 samples in 5 minutes. The primary applications of the GMR biomolecule sensing system are in drug development and biomedical testing and screening.

FEATURES AND BENEFITS OF THE HIGH-THROUGHPUT GMR BIOMOLECULE SENSOR:

- Ability to screen a large number of samples simultaneously
- Fast time to results
- Enables use of a smaller electromagnet and footprint than comparable systems for high-throughput screening
- Applications in diagnostic centers and labs, drug development and biomedical testing
- May not require washing or long incubation times
- Required sample volume per well is expected to be less than 10 nL as opposed to uL for ELISA
- Requires much smaller magnetic field than other GMR-based sensors for high-throughput screening, reducing cost and power requirements
- Expected to provide linear, accurate measurement of biomolecules

Phase of Development
Prototype is being developed.

Other technologies related to magnets by Jian-Ping Wang:

- Magnetic Tunnel Junction (MTJ) Logic Devices without Sense Amplifiers
- Nanoparticle Synthesis System with High Deposition Rate

Inventors

Jian-Ping Wang, PhD

Computer and Electrical Engineering, College of Science and Engineering