NMR Probe for the Detection of Microstructures
Tech ID: 23132 / UC Case 2012-550-0

SUMMARY

UCLA researchers in the Department of Chemistry and Biochemistry have developed an NMR probe with superior sensitivity for in vivo spectroscopy and detection of ultra small samples.

BACKGROUND

Nuclear Magnetic Resonance (NMR) spectroscopy is a widely-utilized method for analyzing small molecule compositions. It is among the most sensitive techniques available and has great potential for studying metabolic profiles in living organisms. Since variations in the metabolite concentrations are indicative of many disease states, NMR can be a powerful diagnostic tool. In practice, however, this requires sensitivity still beyond the capabilities of current instruments. As a result, using NMR for diagnostic purposes has been limited to academic research. A key component responsible for the sensitivity is the NMR probe, which holds the sample as it is inserted into the magnetic field. Advancing the probe design is critical to enabling practical medical applications of NMR.

INNOVATION

UCLA researchers developed a NMR probe with sensitivity superior to current designs. It contains a novel noise reduction mechanism, making it the most sensitive probe of its kind. These properties allow the detection of metabolites at the single cell level. Additionally, the probe has a planar configuration, making it ideally suited for microfluidic chips used for diagnosis and prognosis. It is also made with an ultra small detection region, 0.08 mm length by 0.05 mm width by 0.05 mm high, for samples of small volume and low concentration (such as biological samples).

APPLICATIONS

• Measure samples of small volume and low concentration
• Measure compositions in thin films and condensed matters
• Detect small molecule compositions in single cells for diagnostic purposes.
• High-throughput testing of drug efficacy and other assays
• General research use

ADVANTAGES

• Greater sensitivity than currently available NMR probes
• Contain an ultra small detection region for samples of ultra small volume, 0.08 mm length by 0.05 mm width by 0.05 mm high.

STATE OF DEVELOPMENT

The researchers have developed a working prototype, able to detect 2.5 pmol (picomoles) thermally polarized hydrogen nuclei (at 400 MHz) inside a ~50 μm-diameter volume region.

PATENT STATUS

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ADDITIONAL TECHNOLOGIES BY THESE INVENTORS

• Reducing Computational Complexity of Training Algorithms for Artificial Neural Networks
• Method To Probe Bulk And Surface States In Thermoelectrics And Topological Materials
• Image Filtering Algorithm for Enhanced Noise Removal and Feature Preservation
• Biologically Applicable Water-Soluble Heterogeneous Catalysts For Parahydrogen-Induced Polarization

KEYWORDS

NMR, probe, cancer, diagnosis and prognosis, microfluidics, metabolic profiling, noise reduction, antenna, sensitivity, limit of detection, signal to noise ratio, nuclear magnetic resonance, imaging

CATEGORIZED AS

• Biotechnology
• Medical
• Devices
• Diagnostics
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