HIGH CONTRAST DUAL-MODE OPTICAL AND 13C MAGNETIC RESONANCE IMAGING IN DIAMOND PARTICLES

Tech ID: 31650 / UC Case 2020-049-0

BRIEF DESCRIPTION

Modern biomedical imaging often requires choosing between the deep tissue penetration of magnetic resonance imaging and the high spatial resolution of optical microscopy. Researchers at UC Berkeley have bridged this gap by developing a dual-mode imaging technique that utilizes hyperpolarized diamond particles. These diamond particles are engineered for enhanced hyperpolarizability, a state achieved by simultaneously applying light, a specific sequence of microwaves, and a magnetic field. This process significantly boosts the Carbon-13 signal, allowing for high-contrast magnetic resonance imaging with virtually no background interference from natural body tissues. By attaching targeting ligands to the diamond surfaces, the particles can be directed to specific biological targets. The system then correlates the magnetic resonance data with fluorescent optical images, providing a comprehensive, multi-scale view of the targeted area within a single diagnostic platform.

SUGGESTED USES

»

Molecular Cancer Imaging: Using targeted diamond particles to identify and map specific tumor markers with high sensitivity and deep tissue penetration.

»

Intraoperative Guidance: Providing surgeons with real-time optical fluorescence for surface-level navigation and magnetic resonance data for subsurface anatomical context.

»

Drug Delivery Tracking: Monitoring the distribution and accumulation of nanomedicines in real-time as they travel through the body to reach diseased tissues.

»

Cellular Research: Tracking the migration of specific cell types, such as stem cells or immune cells, across different scales of a living organism.

»

Advanced Biopsy Analysis: Enhancing the visualization of tissue samples in a laboratory setting by combining the chemical specificity of magnetic resonance with high-resolution microscopy.

ADVANTAGES

»

High Signal-to-Noise Ratio: The hyperpolarization of Carbon-13 in diamond creates a unique signal that does not exist naturally in the body, eliminating background "noise."

»

CONTACT

Laleh Shayesteh
lalehs@berkeley.edu
tel: 510-642-4537.



INVENTORS

» Reimer, Jeffrey A.

OTHER INFORMATION

CATEGORIZED AS

» **Optics and Photonics**

» All Optics and Photonics

» **Materials & Chemicals**

» Nanomaterials

» **Medical**

» Diagnostics

» **Sensors & Instrumentation**

» Medical

» Scientific/Research

RELATED CASES

2020-049-0

Simultaneous Multi-Scale Imaging: Combines the anatomical depth of magnetic resonance imaging with the microscopic precision of optical fluorescence.

»

Enhanced Biocompatibility: Diamond particles are chemically inert and non-toxic, making them safer for long-term biological applications than many metal-based contrast agents.

»

Specific Targeting: The ability to functionalize diamond surfaces with ligands ensures that the imaging agents accumulate only where they are needed.

»

Persistent Signal: The unique physical properties of diamond allow the hyperpolarized state to last longer than many conventional liquid-based agents, providing a wider window for clinical imaging.

RELATED MATERIALS

Berkeley
UNIVERSITY OF CALIFORNIA

University of California, Berkeley Office of Technology Licensing
2150 Shattuck Avenue, Suite 510, Berkeley,CA 94704
Tel: 510.643.7201 | Fax: 510.642.4566
https://ipira.berkeley.edu/ | otl-feedback@lists.berkeley.edu
© 2026, The Regents of the University of California
Terms of use | Privacy Notice