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Transparent Intracellular Sensing Platform with Nanowires for Simultaneous Live Imaging

Si nanowire platform for simultaneous live imaging and intracellular recording with minimal cell damage.

Researchers at Purdue University, University of Illinois, and Hanyang University have developed a transparent intracellular sensing platform. This technology employs vertically ordered silicon (Si) nanowires to allow simultaneous live cell imaging in cell culture environments. Si wafers are typically used to manufacture Si nanowires, but the opacity of the wafers hinders the performance of standard live imaging techniques such as inverted and confocal microscopy. The rigidity of the Si wafers can also cause mechanical discrepancies during intracellular recording, leading to cell stress and damage.

This technology helps researchers and scientists conduct simultaneous live cell imaging and intracellular recording that is less invasive, more reliable, and more versatile compared to existing solutions. This technology provides high optical transparency and low electrochemical impedance with minimal damage to cells, improving the quality and flexibility of intracellular signals. The sensing platform facilitates comprehensive electrical and optical monitoring of cellular activity over time, making this technology ideal for drug screenings and cardiovascular disease therapies. The system heralds unprecedented opportunity to enhance knowledge of cellular function and activity.

Technology Validation:

The researchers recorded electrical potentials in biological cells and 3D-engineered tissues before and after administration of therapeutic drugs. Cardiovascular differentiation was observed through increased gene expressions compared to undifferentiated embryonic bodies.

Advantages:

Technology ID
2023-LEE-70300

Category
Materials Science & Nanotechnology/Biomedical & Bioinspired Materials
Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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- High optical transparency

- Minimizes cell damage

- Mechanically compliant

Applications:

- Neuroscience

- Cardiology

- Muscle physiology

- Drug screening

TRL: 4

Intellectual Property:

Provisional-Gov. Funding, 2023-12-01, United States

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Keywords: Biomedical Engineering, intracellular recording, live cell imaging, Mechanical Engineering, transparent sensing platform, vertically ordered Si nanowires