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Microbiosensors Based on DNA Modified Single-Walled Carbon Nanotube and Pt Black Nanocomposites

Novel nanocomposite biosensors utilizing DNA-modified carbon nanotubes significantly enhance the sensitivity and detection limits for measuring metabolic activity in physiological and biotechnological applications.

Electrochemical biosensors have offered new insights into cellular metabolism. The technology allows scientists to measure the metabolic activity (oxygen, glucose, lactate, etc.) of a single cell or a group of cells. Conventional biosensor materials suffer from low sensitivity and low spatial resolution, but single-walled carbon nanotubes (SWCNTs) combined with black nanoparticles have been shown to significantly enhance performance. However, it was noted that the carbon nanotubes suffer from aqueous insolubility, limiting the ability to interact with the metabolite of interest.

Purdue University researchers have developed a technology that uses nanocomposites in electrochemical biosensors. Single-stranded DNA (ssDNA) was used to modify SWCNTs to increase solubility in water, making it more useful in physiological applications. The ssDNA-SWCNT nanocomposite exhibits high sensitivity, wide linear range of detection, and low limit detection. This work is significant to biosensor development because this is the first demonstration of ssDNA-SWCNT nanocomposite as a platform for constructing both single-enzyme and multi-enzyme biosensors for physiological applications.

Advantages:

-Increased sensitivity and spatial resolution

-Lowered limit of detection

Potential Applications:

-Genetics

-Biotechnology

Technology ID

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Category

Materials Science & Nanotechnology/Nanomaterials & Nanostructures

Biotechnology & Life Sciences/Analytical & Diagnostic Instrumentation

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