TECHNOLOGY

Diffusion-Based Biosensing Approach in Miniaturized Lab-on-a-Chip Devices

OVERVIEW

Background

Electrochemical impedance spectroscopy (EIS) biosensors are very sensitive to small electrochemical changes at the solid-electrolyte interface. EIS-based DNA biosensors detect any hybridization events that occur at the interface of an electrode, because such events change the total net charge at the interface of the electrode. This results in stronger electrostatic repulsion forces with the negatively charged electro-active species in the electrolyte, which further results in impeding ionic current flow towards the electrode. Substantial research is performed regarding using the charge transfer resistance as a transducer of the interaction event, by measuring an electrical signal.

Researchers at the University of Maryland have developed an EIS biosensor which uses the direct effect of the diffusion characteristics in the device (e.g. reaction chamber wall geometry and chemical properties) to transduce and analyze biosensing events. In particular, researchers used a restricted diffusion based electrical model to analyze DNA hybridization events, harnessing the dominant influence of the reaction nano-chamber's dimension for molecular diffusion. Results demonstrated both diffusion-based and charge transfer-based components influenced by the DNA hybridization events. This provides a versatile approach which improves the overall performance of miniaturized biosensing devices in terms of sensitivity, specificity, functionality, and response time.

Advantages
Improved sensitivity and specificity
Broader functionality
Faster response time
Versatile Transducer Types

Applications
Diagnostics/Biosensing
Pharmaceutical manufacturing
Electrochemical impedance spectroscopy
Biological Threat Detection
DNA Testing

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Additional Information

INSTITUTION

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PATENT STATUS

Patent(s) pending

LICENSE STATUS

Available for exclusive or non-exclusive license

CATEGORIES

- Bioengineering
- Sensors/Monitors

EXTERNAL RESOURCES

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