NANO INTERDIGITATED ELECTRODES ARRAY (nIDA) AS BIOSENSORS FOR LAB-ON-A-CHIP

Zhiwei Zou, Michael J. Rust, and Chong H. Ahn

Center for BioMEMS and Nanobiosystems
Department of Electrical & Computer Engineering and Computer Science, University of Cincinnati

Abstract
In this poster, several nano interdigitated electrodes array (nIDA) based biosensors are presented. IDA electrode has been widely used for miniaturized electrochemical analysis systems, and a highly sensitive IDA electrode with high density array and a small surface area is desirable to be integrated with lab-on-a-chip. A mixed-matched nano/micro fabrication method is well developed in our group to make high density metal nIDA on various substrate materials including Si, glass, and polymer. By using the high density nIDA, several types of biosensor with different sensing mechanisms and target analyte are realized. This work represents recent research efforts of nIDA based biosensors in the Center for BioMEMS and Nanobiosystems at the University of Cincinnati.

Introduction
- nIDA Based Electrochemical Biosensor [1]
  - Development of a ultrahigh sensitive electrochemical IDA nanosensor in the detection of reversible redox species.
  - nIDA based biosensor provide an almost two-order-level improvement in the detection ability, compared with the microelectrodes in the same ring-band sensing area size.
- nIDA Based Impedimetric Biosensor on Polymer [2]
  - Development of a label-free nIDA bio-affinity sensor on polymer substrate using impedimetric spectroscopy.
  - nIDA is fabricated on polymer substrate, and it provides an easy way to be integrated into polymer lab-on-a-chip.
- nIDA Based Hydrogel pH Sensor [3]
  - Development of a rapid pH sensor using photo cross-linkable pH sensitive hydrogel layer patterned on a nIDA.
  - The sensing time is significantly reduced to within 1 minute.

nIDA Based Electrochemical Biosensor

Figure 1. Fabricated ring-type nanobiosensor.

Figure 2. The capacitor discharge rates under the different sample concentrations.

nIDA Based Impedimetric Biosensor on Polymer

Figure 3. Schematic view and photographs of the polymer impedimetric sensor with nIDA and micro channels.

Figure 4. Impedimetric spectroscopy under different concentrations KCl electrolyte for characterization.

Figure 5. Simulation of electrostatic energy distribution around nIDA (200 nm wide, 500 nm spacing) in wafer.

Figure 6. Impedimetric response before and after protein binding (0.25 mg/ml mouse anti-rabbit IgG).

nIDA Based Hydrogel pH Sensor

Figure 7. Schematic illustration and device picture of the hydrogel-based nIDA sensor for pH measurement.

Figure 8. SEM image of nIDA electrodes.

Figure 9. Measurement results of the nanobiosensor for pH detection with the response time within 1 min.

Related Publications

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