Review Paper on Design of Mems Sensor for Generating the Vibration in DNA Sequencing

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Abstract - *Electrochemical biosensors are simple devices based on the measurements of electric current, ionic or conductance changes carried out by bio electrodes. It is the type of biosensors based on the sensor devices and the type of biological material used. DNA sequencing is the process of determining the precise order of nucleotides within a DNA molecule. It include any method or technology that is used to determine the order of the four bases-adenine, guanine, cytosine, and thymine-in a strand of DNA. CMOS plate is used for making the resonator. A resonator used for changing the capacitance charge. When add blood drop as a sample of DNA that drop will be excite and vibrate. Due to that vibration of resonator a change in frequency take place due to variable frequency an EMF is induced and high frequency vibration generated by resonator sequence the DNA.*

***Key Words*: Electrochemical Biosensor, Electrode, DNA Sequence**

1. INTRODUCTION

Sensors are sophisticated devices that are frequently used to detect and respond to electrical or optical signals. A Sensor converts the physical parameter into a signal which can be measured electrically. Sensor principles are based on physical or chemical effects. Biomedical sensors are used to gain the information on body and pathology, which is a branch of biomedical engineering. Biomedical sensors are also used to monitor the safety of medicines, food, environmental conditions and other substances. The most frequently used different types of sensors are classified based on the quantities such as Electric current or Potential or Magnetic or Radio sensors, Humidity sensor, Fluid velocity or Flow sensors, Pressure sensors, Thermal or Heat or Temperature sensors, Proximity sensors, Optical sensors, Position sensors, Chemical sensor, Environment sensor, Magnetic switch sensor , etc. Electrochemical biosensors are simple devices based on the measurements of electric current, ionic or conductance changes carried out by bio electrodes. It is the type of biosensors based on the sensor devices and the type of biological material used. DNA sequencing is the process of determining the precise order of nucleotides within a DNA molecule. It include any method or technology that is used to determine the order of the four bases-adenine, guanine, cytosine, and thymine-in a strand of DNA.

2. Literature review

1)Pradyumna S.Singh, "From Sensor to system:CMOS-Integrated Electrochemical Biosensor",volume3 2015

Electronic detection techniques are being increasingly sought as components of highly scalable technologies for high-throughput biosensing application. Advancement in nano scale electrochemistry makes this an opportune moment to consider the prospects of its integration with CMOS process. It focuses on the new properties & challenges that emerge from the downscaling of electrode dimension on redox-cycling based approaches to nanoscale electrochemical devices.

2) S. Sarkar, K. Mathwig, S. Kang, A. F. Nieuwenhuis, and S. G. Lemay, "Redox cycling without reference electrodes,'' Analyst, vol. 139, no. 22,pp. 6052_6057, 2014.

The reference electrode is a key component in electrochemical measurements, yet it remains a challengeto implement a reliable reference electrode in miniaturized electrochemical sensors. Here we explore experimentally and theoretically an alternative approach based on redox cycling which eliminates the reference electrode altogether. We show that shifts in the solution potential caused by the lack of reference can be understood quantitatively, and determine the requirements for accurate measurements in miniaturized systems in the absence of a reference electrode.

3)C. Ma, N. M. Contento, and P. W. Bohn, ``Redox cycling on recessed ring-disk nanoelectrode arrays in the absence of supporting electrolyte,'' J. Amer. Chem. Soc., vol. 136, no. 20, pp. 7225_7228, 2014.

In canonical electrochemical experiments, a high-concentration background electrolyte is used, carrying the vast majority of current between macroscopic electrodes, thus minimizing the contribution of electromigration transport of the redox-active species being studied. In contrast, here large current enhancements are achieved in the absence of supporting electrolyte during cyclic voltammetry at a recessed ring-disk nanoelectrode array (RRDE) by taking advantage of the redox cycling effect in combination with ion enrichment and an unshielded ion migration contribution to mass transport.

4)E. Kätelhön, K. J. Krause, K. Mathwig, S. G. Lemay, and B. Wolfrum, "Noise phenomena caused by reversible adsorption in nanoscale electrochemical devices," ACS Nano, vol. 8, no. 5, pp. 4924–4930, 2014

We theoretically investigate reversible adsorptionin electrochemical devices on a molecular level. To this end, a computational framework is introduced, which is based on 3D random walks including probabilities for adsorption and desorption events at surfaces. We demonstrate that this approach can be used to investigate adsorption phenomena in electrochemical sensors by analyzing experimental noise spectra of a nanofluidic redox cycling device. The evaluation of simulate and experimental results reveals an upper limit for the average adsorption time of ferrocene dimethanol of ~200 μs. We apply our model to predict current noise spectra of further electrochemical experiments based on interdigitated arrays and scanning electrochemical microscopy.

5) Y. Huang, Y. Liu, B. L. Hassler, R. M. Worden, and A. J. Mason, "A protein-based electrochemical biosensor array platform for integrated microsystems," IEEE Trans. Biomed. Circuits Syst., vol. 7, no. 1, pp. 43–51, Feb. 2013

This paper elucidates challenges in integrating different classes of proteins into a microsystem and presents an electrochemical array strategy for heterogeneous protein-based biosensor. The overlapping requirements and limitations imposed by bio interface formation, electrochemical characterization, and microsystem fabrication are identified. A planar electrode array is presented that synergistically resolves these requirements using thin film Au and Ag/AgCl electrodes on a dielectric substrate. Using molecular self-assembly, electrodes were modified by nano-structures of two diverse proteins, alkali ion-channel protein and alcohol dehydrogenase enzyme. Electrochemical impedance spectroscopy and cyclic voltammetry measurements were performed to characterize sensor response to alkali ion and alcohol, respectively.

3. Expected Outcomes

In the propose work the DNA structure gate channelized in a single structure vary efficiently as high frequency vibrations are generated by the resonator. Because of high frequency of resonator large value of EMF is induced corresponding to the value of DNA structure.

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