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TOPIC:
Nanobiosensors using aligned carbon Nanofibers

ABSTRACT:

The advent of nanotechnology and fabrication has opened up a plethora of ways to design and develop point of care diagnostics. These biosensors/ devices use several transduction mechanisms, the predominant ones being electrochemical, optical, magnetic, conductometric and impedimetric transduction mechanisms. Though the principle of transduction mechanism is known, the novelty lies in the ability to engineer the biosensor to achieve very high sensitivity and selectivity. Nanotechnology enabled the researches to design and develop these biosensors who dimensions are in the range of nanometers, thereby exploiting the inherent advantages of nano regime viz, high surface to volume ratio, availability of active sites, chemical functionalization so on and so forth. One of the key parameters to be considered is the economic viability of making nanobiosensors without compromising on the sensitivity. In this regard, we present a low cost, ultrasensitive, robust, generic nanobiosensor platform using nanofibers. Nanofibers can be made using a simple electrospinning technique. A variety of polymers can be electrospun to obtain nanofibers. SU-8 is a negative epoxy photoresist which is biocompatible and its surface can be easily functionalized. Nanofibers derived out of SU-8 can pontentially be used as high sensitive biosensors. However, the resistivity of SU-8 is really high which causes the nanofibers derived out of it to be highly resistive. To circumvent this problem, these fibers are doped with Multiwall Carbon Nanotubes. By optimizing the electrospinning parameters, these fibers can precisely be placed between to conductive posts. Upon the appropriate surface functionalization, the molecule of interest can be detected based on the change in the conductivity before and after the binding of the target molecule. This is a generic, conductometric platform which can be used for detecting a variety of molecules depending on the surface functionalization. As a proof of concept, we demonstrate the detection of Myoglobin, an important biomarker for cardiac anamolies. The detection limit that we obtained was 6 fg/ml and the detection can be performed all the way from fg/ml to µg/ml.

PROFILE:

Dr. Siva Rama Krishna Vanjari completed his B.Tech. from S.V.Univeristy, Tirupati in Electronics and Electronics Engineering, Masters in Electrical Engineering from University of NotreDame, USA and Ph.D.

at Indian Institute of Science, Bangalore. His primary interest is in the development of low cost disposable biosensors. He worked on the development of low cost electrochemical disposable biosensor for measuring percentage glycated hemoglobin. He is currently working as an Assistant Professor, Department of Electrical Engineering, Indian Institute of Technology, and Hyderabad. His areas of expertise include VLSI technology, basic fabrication principles, electrochemistry and its application towards development of biosensors. He has couple of international patents, publications and conferences to his credit.