A review on Nano Technology And Sensor Chips

Mohammad Rashid Ansari, Assistant Professor, Department of Electronics, Electrical and Communications, Galgotias University

ABSTRACT

In addition, novel electrochemical systems are required in molecular medicine and cell biology to detect biomarkers and therapeutic symptoms of illness. Microelectronic technology provides strong circuits and methods for developing new and tiny molecular sensing biochips. However, microelectronic biochips suggested in the literature generally do not demonstrate the proper biological specificity, sensitivity and dependability. Nanotechnology provides novel materials and ways for improving sensor surface qualities. This presentation will examine the latest advances in nano-biology in the field of the creation of novel electrochemical detecting systems in customised medicine and cell culture monitoring.

Keywords: Nano Technology, Chips, Molecular

INTRODUCTION

One of the major aims of customised treatment is to inject the proper quantity of medication dosages with regard to the metabolic circumstances of a patient. This is an important topic, since patients might express cytochrome P450 isoforms according to their genotype. Cytochrome P450 is a key human metabolism protein. Varying genotype groups of patients have been earlier shown to have different amounts of a mean plasma concentration after injection of the same quantity of drug[1]. Roche has developed a genetic test called AmpliChip[2] for this purpose. The Roche test may identify depletion of the two 2D6 and 2C19 protein-related genes which are various cytochrome P450 isoforms. The AmpliChip has been approved by the FDA and is currently on the market. Although it is a strong tool for determining four distinct groups of patients, the test detects their genetic susceptibility to metabolise medicines that are exclusively catalysed by both P450 isoforms whereas human metabolism comprises more than three thousand distinct P450 isoforms. In addition, human metabolism is associated not only with genetic predisposition but also with (changing) patients' everyday situations. One evidence of this complicated scenario is that only 20–50 percent of patients get treated with the most efficient compounds[3]. Therapeutic drug monitoring is currently only possible in specialised laboratories, requiring large equipment and clinical feedback after a few days only, so the monitoring of medicines metabolism in blood or serum by new point-of-care or portable technologies are essential in order to further the personalization of therapies.

Other very inventive disciplines of contemporary medicine include cell therapy and regenerative medicine. In certain circumstances, damaged tissues may be replaced with synthetic stem cell tissues[4]. In order to optimise the manufacturing procedures of these manufactured tissues, new automated factories are being

developed[5]. In order to optimise cell nutrition, new chemical compounds have been investigated[6]. New cell sorting technologies employing magnetic fields as driving forces are being developed[7]. Further physical criteria promoting differentiation to electrically specialised cells were explored in electrical fields [8]. However, during cell differentiation several biochemical pathways are still missing. A detailed knowledge of cell metabolism during differentiation is thus very important in order to elucidate many nuances in the biology of stem cells and to enhance tissue engineering management.

Microchip technology can deliver new circuits and systems to meet these emerging requirements. Glucose monitoring implantable biosensors [9], label-free biochips for DNA detection [10], saliva pharmaceutical care equipment [11], and cellular glucose measures [12] provide useful examples. However, sensitivity is more often not in the proper range, specificity is inadequate and the methods offered are not reliable enough for real-time applications. New efforts are thus needed to increase the performance of biochips. Nanotechnology may give novel materials and ways to improve the properties of biochips.

"Biology does not only write information; it does something about it. A biological system may be quite tiny. Many cells are extremely little, but they are quite active," stated Richard Phillip Feynman at Massachusetts Institute of Technology in 1959 in his renowned presentation on nanotech. Nanotechnology should learn from biology, according to him. So, the greatest “Nanotechnology” appears to be the “Nano-Bio-technology”, which also presents new potential to enhance nano-bio-chips, i.e., new bio-materials manufactured with control at the nano-scale.

A 2D system may be generated by retaining one of its dimensions on a nano-scale when it comes to making nano-structures. For instance, a surface may be seen theoretically as a cube with a height of zero. A 2D nano-structure may thus be considered as a material sheet with a nano-scale of one dimension, while the other two are micro- or millimetre scale. Good examples are molecular mono-and multi-layer approaches constructed utilising Langmuir-Blodgett[13] or self-assembling[14]. In the first example, it is initially generated at the air/water interface, and then transmitted to a solid substrate, by ordering mono-molecular layer. Multi-layer may be constructed by repeating this technique. A highly organised nano-scale structure may be created by using intercalating proteins and amphiphilic chemicals (for example, fatty acids or alkanethiols) [15]. When self-assembled, a molecular layer may be generated by placing substrates over night in molecular solutions, which allow the molecules to establish stable chemical ties on the surfaces of the substratum. An orderly structure of the nano-scale may also be created by intercalating both proteins and amphiphilic molecules [16]. In both circumstances, multi-layer functionality may include both protein and amphiphilic functionality, and may increase selectivity and performance in biochips for the detection of DNA or antigen. Published articles on label-free detection more commonly show techniques that lack specificity and reliability. A method that is mainly advocated for fully-electronic DNA detection includes the measurement of capacity or impedance changes on sensor surfaces when DNA is hybridised. Initially, this approach was suggested for antigen[17] and afterwards for detection of DNA[18]. For completely electronic readers in DNA-Chips, VLSI designs were proposed[10]. However, the specificity was not very good [10,19], electrode repeatability was about 40% [19], signal amplitude [10] detecting

fault was equivalent, data points were greatly dispersed [17,18], and time series had extremely significant time drifts [17,20]. All of these major limitations were due to insulated surfaces of the probe. Nano-sized grooves that pass through the film have been demonstrated to be connected to capacitance time-drift[21], and to offer conducting paths that influence the ideality of the ELI[22].

CONCLUSION

These incredibly tiny particles are excellent quantum points which may capture carrier conductors. In the '80s, Averim and Likharev established theory of the Coulomb Blockade[62] that electrodes may be trapped in the quantum dot when the electrostatic energy in the dot is bigger than their thermal excitation. If the electrostatic power is lower, electrons might fall out of the dot. A basic semicircular description may give you a concept of system physics. If one electron has sufficient energy to be imprisoned within, the additional incoming electron will be under its electrostatic repulsion. Therefore, we should predict a current deletion in a current / voltage curve at the voltages around each trapping occurrence.

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