A COMPACT AND EFFECTIVE DEVICE FOR DETECTING CELLULAR STRESS INDUCED BY TOXIC CHEMICALS

This novel E.coli biocapacitor chip device determines cellular stress induced by toxic chemicals at a chemical-biocapacitor interface. This interface contains living bacterial cells that interact with toxic chemicals and change their electrical properties depending upon the toxic nature of the chemical. The biocapacitor then captures this signal that enables distinguishing toxic from non-toxic chemicals to the living cells.

In this technology, biocapacitor device was fabricated by utilizing carboxylated carbon nanotubes (CNTs) at the interface of bacteria and capacitor. The presence of CNTs enabled capturing sensitive responses of bacterial cells on chip devise against the external chemical stimuli. Bacterial cells are ideal choice as recognition elements on electronic capacitors, since they can respond to the external stimuli. Cells in conjunction with these capacitors, capture the change in electrical signal directly from the living cells.

There are a variety of known methods to detect and measure the toxicity. The most commonly used methods are laboratory based tedious biochemical methods, or use of heavy equipment, such as spectrophotometers or luminometers that are laborious and time consuming. But the technology presented herein offers a solution to detect chemicals on living cells directly to determine their biological effects within minutes. This makes the biocapacitor sensing device technology more superior since no laboratory equipment or trained personal is required.

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Potential Applications

This technology is applicable in the following industries:

- Medical and clinical diagnosis
- Pharmaceuticals
- Environmental monitoring
- Food monitoring
- Defense

Customer Benefits

- Easy-to-use device for measuring and detecting the toxicity of unknown chemicals or drugs, to predict the impact of such chemicals on humans
- Ability to screen a wide variety of chemicals, toxic gases, pharmaceuticals, drugs, defense agents, environmental and food samples for the determination of potential cytotoxicity
- Knowing direct biological effects of unknown chemicals
- High sensitivity and selectivity
- Cost effectiveness
- No need for trained professionals

Technology Features & Specifications

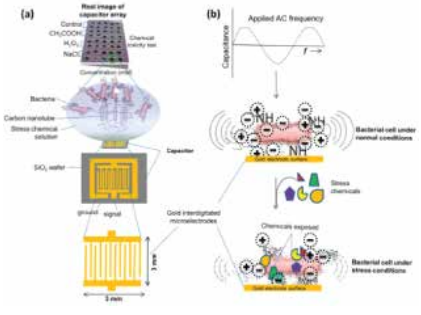
This technology offers a compact, accurate and efficient solution to detect toxic/harmful chemicals on living cells directly to determine their biological response to toxic chemicals within minutes. This feature makes the biocapacitor sensing device technology superior to other devices in the market since no laboratory equipment or trained personal is required. The technology offered herein provides a more compact, less expensive solution with the advantageous features such as:

- Viable bacterial cells as recognition elements interfaced with electronic capacitor device (Biocapacitor)
- Carbon nanotubes for the enhancement of the signal's sensitivity
- Direct exposure of toxic chemicals, drugs or environmental samples on biocapacitor
- No liquid or nutrient medium required
- Flexible range of frequencies
- No additional chemicals in order to detect the signal and

Market Trends and Opportunities

The global life science & chemical instrumentation market is estimated to grow at a CAGR of 7.9% to reach $45.4 billion by 2018.

Most efforts and R&D investment for chemical sensing and testing technologies are in laboratory-based methods. Devices for such use have started to permeate the markets in recent years and hold great potential for the near future.



Schematic representation of (a) Biocapacitor device with viable E. coli cells tethered with carboxy-CNTs on capacitor electrodes in an array; and (b) diagram showing the response of E. coli and surface charge distribution under the applied AC frequency in normal and chemical stress conditions.

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