

Nanomaterials and Nanotechnology

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Application of nanomaterials in the development of optical and electrical biosensors for health and environmental monitoring

Javed H Niazi

Sabanci University, Istanbul

Nanomaterials have gained importance for their exceptional properties that may be optical, electrical, chemical, mechanical or magnetic in nature. Their unique physio-chemical properties make them most suitable for a wide range of applications ranging from electronics to healthcare. This presentation will highlight the latest results on use of nanomaterials in the development of optical and electrical lab-on-a chip biosensing platforms from our laboratory. These biosensors employ unique physio-chemical features of nanomaterials that are aimed at ultrasensitive detection of cancer and cardiovascular disease biomarkers in human serum, pathogenic bacteria, toxic chemicals on a chip, as well as optical and electrical based nano-biosensing of cellular interactions with external stimuli. These biosensors are fabricated with

nanomaterials, such as bio-functionalized graphene or carbon nanotubes, luminescent quantum dots or other metallic nanoparticles on electrical or optical transducer platforms that transform biological signals into measurable electrical or optical signals, respectively. The experience gained from laboratory scale biosensing is extended to the point-of-care hand-held diagnostic prototype device fabrication, which has been successfully tested for detecting multiple cancer and cardiovascular disease biomarkers in real patient samples. Finally, the talk also provides an overview of the available biosensor platforms and integration of nanomaterials for the detection of various analytes and considerations for prospects of nanomaterials in the biosensor technology.

e: javed@sabanciuniv.edu



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