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Amperometric protein biosensing on nanostructured polyaniline (n-PAni) substrate

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Conducting polymers have been widely used in the development and fabrication of biosensors for several applications. This is attributed to their peculiar physical, optical and electrical properties. Polyaniline (PAni), because of its extraordinary stability, simplicity of synthesis and excellent electrochemical properties is one of the most investigated conducting polymers for such applications. PAni based sensors function for amperometric measurements as well as for piezoelectric immunosensing. PAni based amperometric biosensors can be developed on noble metal electrodes such as Au and Pt etc. Currently nanostructures are being used for signal amplification to achieve better sensitivity in sensors. In this paper we have explored the nanostructure form of PAni (n-PAni) to facilitate the immobilisation of a large number of biomolecules as n-PAni has provided improved surface-to-volume ratio. This is found to enhance the sensitivity and response time. n-PAni has been electrochemically deposited on a silicon (Si) substrate to form thin nanostructured films. The film was modified with avidin, followed by immobilization of biotinylated anti-human IgG. Deposited PAni thin films on the Si substrate have been characterized by electron and atomic force microscopy. Successful immobilization of the biomolecules has been confirmed by Raman spectrometric studies. The current–voltage characteristics of the prepared sensor are exploited for the determination of human IgG antigen in the concentration range of 5–550 μg mL−1. The proposed biosensor's detection limit and sensitivity are 5 μg mL−1 and 0.15 μS ppm−1 human IgG, respectively.

Biography

Parveen Kumar is working in the division of nanoscience and nanotechnology in central scientific instruments organisation of council of scientific and industrial research, India. Presently he is working on the immunosensing of breast cancer. His research interests are in the fields of biochemistry, nanotechnology and molecular biology. He has several research publications to his credit.

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