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Immunosensor for label-free PSA cancer detection on GQDs-AuNRs modified screen-printed electrodes

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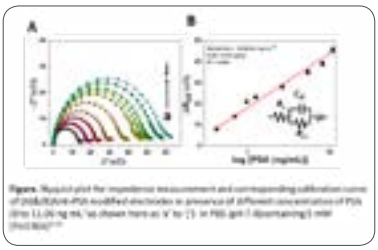
Literature reveals that, in males, prostate cancer is ranked second as leading cause of death out of more than 200 different cancer types. Prostate specific antigen (PSA) is a 33-kDa serine protease, which is largely bound to endogenous protease inhibitors in human blood serum and its concentration in serum is used as indicator for prostate cancer. In healthy males the PSA concentration level ranges from 0 to 4 ng ml^{-1} in the serum. There are several PSA detection methods available like enzyme-linked immunosorbent assay (ELISA), radioimmunoassay, chemiluminescent immunoassay and SPR based immunosensors but are complicated, costly and time consuming. There is urgent need for the development of low cost, user-friendly and quick sensors for PSA. Recently, we have developed a simple and cost-effective biosensor for detection of PSA based on novel graphene quantum dots decorated with gold nanorods (GQDs-AuNRs) and modified with PSA antibody coated over screen-printed electrodes. The detection of PSA is demonstrated using three electrochemical techniques cyclic voltammetry (CV), differential pulse voltammetry (DPV) and electrochemical impedance spectroscopy (EIS). A typical response for the PSA is shown in the figure based on EIS technique. The modification of screen printed electrodes with novel hybrid of graphene quantum dots-gold nanorods and simultaneous detection using three different techniques makes the sensor sensitive, reproducible and reliable. PSA immunosensor shows 0.14 ng ml^{-1} limit of detection, which is capable of prediction of any disorder or chances of PSA cancer.



Recent Publications

1. Kashish, Sandeep Gupta, S K Dubey and Rajiv Prakash (2015) Genosensor based on nanostructured platinum modified glassy carbon electrode for *Listeria* detection. Analytical Methods 7:2616-2622.
2. Madhu Tiwari, Ashish Kumar, Uma Shankar and Rajiv Prakash (2016) The nanocrystalline coordination polymer of AMT–Ag for an effective detection of ciprofloxacin hydrochloride in pharmaceutical formulation and biological fluid. Biosensors and Bioelectronics 85:529–535.
3. Madhu Tiwari, Ashish Kumar and Rajiv Prakash (2016) Nano-porous network of DMTD-Ag coordination polymer for the ultra-trace detection of anticholinergic drug. Polymer 82:66-74.
4. Sandeep Gupta and Rajiv Prakash (2014) Photochemical assisted formation of silver nanoparticles by dithizone and its application in amperometric sensing of cefotaxime. J. Mater. Chem. C 2:6859-6866.
5. Rajiv Prakash et al. (2017) Highly sensitive *in vitro* biosensor for enterotoxigenic *Escherichia coli* detection based on ssDNA anchored on PtNPs-chitosan nanocomposite. Electroanalysis DOI: 10.1002/elan.201600169

Biography

Rajiv Prakash is a Professor and Coordinator of the School of Materials Science and Technology, Indian Institute of Technology, Banaras Hindu University, India. He has served as Scientist at CSIR lab Lucknow, India for more than 7 years before joining Indian Institute of Technology. He has been recipients of Young Scientist (Council of Science and Technology), Young Engineer Awards (INAE) of India and Materials Society Medal Award of India. His current research interests include synthesis of morphology controlled organic conducting polymers, nanocomposites, fabrication and characterization of organic electronic devices and sensors/biosensors. He is having more than 150 publications in international journals of repute and 17 patents in his credit. He is in Editorial Board of several National and International Journals. He is Member of various national committees including DST-TIFAC for India Vision 2035 and MHRD IMPRINT program.

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