

5th World Congress on

SMART AND EMERGING MATERIALS

April 19-20, 2018 Dubai, UAE

Co-polymer brush based label-free electrochemical immunosensor for prostate specific antigen

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A sensitive electrochemical immunosensor synthesized using a surface initiated atom transfer radical polymerization process for the detection of prostate specific antigen (PSA) is proposed. Electrochemical immunosensors based on polymer brush [oligo (ethylene glycol) methacrylate-co-glycidyl methacrylate] (OEGMA-co-GMA) were grown on plane Au and nanostructured (NS) Au electrodes were characterized and compared for their sensitivity to detect PSA. Due to a large capacity for antibody loading and high resistance to nonspecific antibody adsorption of POEGMA-co-GMA brush, the Au-NS immunosensor exhibited detection in a wide dynamic range of five orders of magnitude with an improved lower limit of detection of 2 pg ml^{-1} , which was better than the synthesized immunosensor with the polymer brush grown on plane Au electrode. The Au-NS electrode improved detection sensitivity of $4.9 \mu\text{A ng}^{-1} \text{ ml}$ for PSA detection, which was almost 2 times better than the plane Au electrode. Finally, the use of silica nanoparticles (Si-NPs) conjugated with polyclonal antibody enhanced the response of the immunosensor. The proposed electrochemical immunosensor would be an exciting addition in medical diagnostics for the early detection of cancer biomarkers e.g., PSA due to improved limit of detection (LOD); eventually helpful in circumventing cancer metastasis.

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