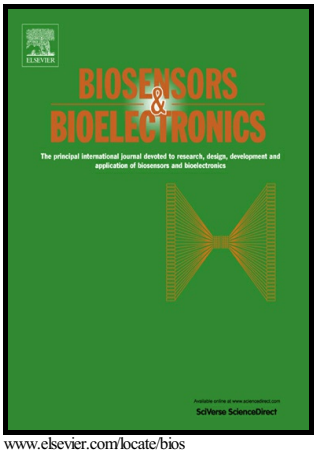

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Abstract

An optically transparent patterned indium tin oxide (ITO) three-electrode sensor integrated with a microfluidic channel was designed for label-free immunosensing of prostate-specific membrane antigen (PSMA), a prostate cancer (PCa) biomarker, expressed on prostate tissue and circulating tumor cells but also found in serum. The sensor relies on cysteamine capped gold nanoparticles (N-AuNPs) covalently linked with anti-PSMA antibody (Ab) for target specificity. A polydimethylsiloxane (PDMS) microfluidic channel is used to efficiently and reproducibly introduce sample containing soluble proteins/cells to the sensor. The PSMA is detected and quantified by measuring the change in differential pulse voltammetry signal of a redox probe ($[Fe(CN)_6]^{3-}$/$[Fe(CN)_6]^{4-}$) that is altered upon binding of PSMA with PSMA-Ab immobilized on N-AuNPs/ITO. Detection of PSMA expressing cells and soluble PSMA was tested. The limit of detection (LOD) of the sensor for PSMA-based