Hollow nanoporous gold nanoparticles for ultrasensitive immunosensing
detection of prostate cancer biomarker
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Abstract: A novel and sensitive electrochemical immunosensor for the detection of prostate-
specific antigen (PSA) has been developed using copper (Cu) probes loaded onto the hollow
porous gold (Au) nanoparticles as labels for signal amplification. The secondary PSA
antibody (Anti-PSA2) can adsorb on the surface of Cu probes- hollow porous Au
nanoparticles which have large surface area and could increase antibodies loading as well as
the probability of Anti-PSA2-antigen (PSA) interactions by leading to higher sensitivity.
Graphene-poly(3-aminobenzoic acid) (GP/P3ABA) nanocomposite modified on screen
printed carbon electrode (SPCE) containing abundant COOH groups was used as a support
electrochemical platform to immobilize the primary PSA antibody (Anti-PSA1). The resulting
sensing interface of GP/P3ABA modified on SPCE could offer a large electroconductive
surface area, leading to high loadings of the biological recognition elements. Under optimal
conditions, the immunosensor possessed good linearity in the detection of PSA from 1.0 ng
mL\(^{-1}\) to 80 ng mL\(^{-1}\) and exhibited the sensitivity of 0.6825 \(\mu\)A cm\(^{-2}\) µM\(^{-1}\) and lower limit of
detection (4.4 pg mL\(^{-1}\), S/N = 3, n = 5). In addition, with good sensitivity, stability, specificity
and simplicity, this kind of the immunosensor provided a great potential in clinical
applications.

Schematic Illustration of the Electrochemical Immunosensor

Keywords: Immunosensor; Graphene; Prostate-specific antigen