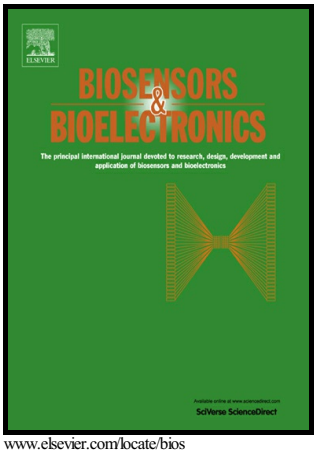

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Ultra-rapid fabrication of highly surface-roughened nanoporous gold film from AuSn alloy with improved performance for nonenzymatic glucose sensing

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Abstract

Using one-step anodization strategy, a nanoporous gold film (HNPG) with large surface area was rapidly fabricated on $Au_{80}Sn_{20}$ (wt. %) alloy in just 80 s. The formation of highly surface-roughened nanoporous structures results from a complex process of electrochemical dealloying of Sn component from AuSn alloy, anodic electrodissolution, disproportion and deposition of Au component, and spontaneous redox reaction between electrodissolved Sn^{2+} and $AuCl_4^-$species at the applied anodic potential. As-prepared HNPG/AuSn shows enhanced electrochemical performance for glucose oxidation in alkaline electrolyte. At a low potential of 0.1 V (vs. SCE), it offers a short response time of 4 s, a wide linear detection range of 2 μM to 8.11 mM, an ultralow detection limit of 0.36 μM (S/N = 3), an ultrahigh sensitivity of 4374.6 μA cm^{-2} mM^{-1}, and satisfactory selectivity and reproducibility. Specifically, after 6 weeks, no obvious loss of glucose amperometric signal was observed on HNPG/AuSn. The facile preparation and excellent sensing performance of HNPG/AuSn electrode make sure that it is a promising candidate for advanced enzyme-free glucose sensors.