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Rational design of Au@Pt/Au nanoparticles for glucose sensor

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Among porous metallic nanoparticles, Au and Pt nanoparticles (NPs) are widely used as electrode materials for glucose sensors. However, they have some limitations due to passivation by oxidation product or anions resulting in a poor response to glucose oxidation. Compared with single metal particles, the sensing electrodes based on bimetal particles have advantages. Hence, some studies reveal that the synergistic effects of bimetal composition or the metal composites improve sensing performance. In this study, Au decorated Au@Pt core-shell structured (Au@Pt/Au) NPs were synthesized using the sonochemical and electrochemically methods for a non-enzymatic glucose sensor. The important aspect of the Au@Pt/Au synthesis was the formation of gold nanoparticles in the nano-channels of the Pt shell. The size of Au@Pt/Au nanoparticles was 35 to 50 nm, and they had a large electrochemical active surface area. The Au deposition into the Pt shell region achieved glucose oxidation even in neutral pH. The sensor performance indicated two dynamic ranges according glucose oxidation ranging from 0.5 to 10.0 μM and from 0.01 to 10.0 mM in PBS saline solution. The detection limit was 445.7 (±10.3) nM. Our material showed similar results to commercially available glucose meters. Therefore, Au@Pt/Au nanoparticles have good potential for use in non-enzymatic glucose sensors.

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