Core@shell Ni@NiO nanowire array electrode for catalytic activity towards glucose

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Fabrication of reliable and cost-effective catalysts for the precise monitoring of electro-active species is of significant interest in the development of sensing devices for point of care, environmental control or industrial systems. Nanostructure based material provide very high electrochemically active surface area, thereby leading to high detection sensitivity. Until now, noble metal nanomaterials, such as Pt, Au, Ag and their alloys [1, 2], have been extensively investigated as anodic materials for designing non-enzymatic sensor surface. Although these noble metal-based nanomaterials exhibit high catalytic activity towards various analytes, they were easily fouled by the electrochemically active interferents. Glucose detection is of great interest in diagnosis and management of diabetes mellitus, as well as monitoring and controlling of food processes. It is thus necessary to develop rapid, sensitive, simple and inexpensive glucose sensors. Besides noble metallic nanomaterials, other metal and metal oxides, such as CuO, RuO₂, and MnO₂, have also been used as anodic materials for direct oxidation of glucose [3-5]. Among them, Ni-based nanomaterials have received special attention owing to their low cost and high catalytic activity towards glucose oxidation. You et al. reported the glucose biosensors based on Ni nanoparticles (NPs) decorated carbon nanofibers [6]. He et al. reported the glucose sensors based on Ni NPs modified TiO₂ tube arrays [7]. Recently we have fabricated core@shell nanowire arrays of nickel oxide and nickel, which found to have excellent charge storage capacity when examined as a pseudocapacitor anode electrode [8]. It is because of the core@shell nanowires combined both the high charge storage capacity metal oxide (NiO) in the shell and the conductive metal (Ni) in the core.

In this work, we will report a novel non enzymatic glucose sensor based on Ni@NiO nanowire array composite platform and investigate the effects of NiO thickness on the electrocatalytic properties for glucose detection. We will also study the effect of electrochemically active interferents on glucose detection using Ni@NiO nanowire array electrode. We will study the effects of Ni@NiO thickness on the electrocatalytic properties for glucose detection. We will also study the effect of electrochemically active interferents on glucose detection using Ni@NiO nanowire array electrode. We will study the effects of Ni@NiO thickness on the electrocatalytic properties for glucose detection. We will also study the effect of electrochemically active interferents on glucose detection using Ni@NiO nanowire array electrode.

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References