

Binderless Solution Processed Zn Doped Co₃O₄ Film on FTO for Rapid and Selective Non-enzymatic Glucose Detection

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Abstract

A simple solution based deposition process has been used to fabricate Zn doped Co(sub3)O(sub4) electrode as an electrocatalyst for non-enzymatic oxidation of glucose. XRD, HRTEM, SEM, EELS, AFM, EIS was used to characterise the electrode. The addition of Zn as dopant on Co(sub3)O(sub4) resulted in enhanced electrochemical performance of Zn:Co(sub3)O(sub4) material compared to pristine Co(sub3)O(sub4) due to increased charge transferability. The as prepared electrode showed fast response (<7s) time, good sensitivity (193 $\mu\text{A mM}^{-1} \text{cm}^{-2}$) in the linear range of 5 μM –0.62 mM, good selectivity towards glucose at a relatively lower applied potential of +0.52 V in 0.1 M NaOH solution. A detection limit of 2 μM was measured for the Zn:Co(sub3)O(sub4) electrode. The applied fabrication method resulted in good inter and intra electrode reproducibility as was shown by the lower relative standard deviation values (R.S.D). The electrode retained 70% of initial current response after 30 days. Although the as prepared Zn:Co(sub3)O(sub4) electrodes did not result in highest reported sensitivity, and lowest limit of detection; the ease of fabrication and scalability of production, good inter and intra electrode reproducibility makes it a potential candidate for commercial application as glucose sensor.