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Solution deposition of Cu doped Co_3O_4 for electrooxidation of glucose

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One of the major causes of death and disability in the world is due to diabetes mellitus. The frequent testing of physiological blood glucose levels to avoid grave emergencies is vital for the confirmation of effective diabetic treatment. The current glucose sensors that are being used by diabetic patients are glucose oxidase sensors. However, due to problems associated with fabrication of enzymatic glucose sensors, non-enzymatic glucose sensors have been of focus recently. In this study, a simple solution-based deposition process has been utilized to fabricate a Cu doped Co_3O_4 electrode for non-enzymatic glucose detection. The substitution of Cu into the Co_3O_4 host lattice resulted in an enhanced electrochemical performance compared to the pristine Co_3O_4 as was measured from the Hall Effect measurement. The sensor exhibited two distinctive linear ranges covering upto 7.6 mM at an applied potential of +0.65 V vs. Ag/AgCl in 0.1 M NaOH solution. The sensor depicted good repeatability (RSD of <10%), stability and reproducibility (RSD of <10%). The sensitivity of the sensor was determined to be 1333 μA/cm2 mM (lower concentration range) and 141 μA/cm^2 mM (upper concentration range), with a lower detection limit of 0.15 μM (S/N=3). The as prepared electrode showed a response time of <10 seconds and was very selective towards glucose in the presence of various interference species (Figure-1). The ease of fabrication, good electrochemical activity and good inter and intra electrode reproducibility makes this electrode a promising candidate for non-enzymatic glucose detection.

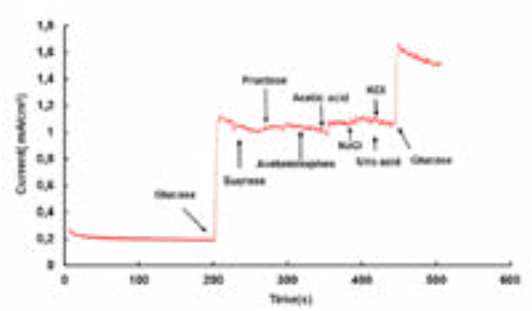

Figure-1: Amperometric response of the sensor in the presence of glucose and other interfering species.

Recent Publications:

1. T Gota, M Chowdhury and T Ojumu (2017) Non-enzymatic fructose sensor based on Co_3O_4 thin film. *Electroanalysis*; 29: 2855-2862.
2. Chowdhury M R, Shoko S, Cummings F, Fester V and Ojumu T (2017) Charge transfer between biogenic jarosite derived Fe^{3+} and TiO_2 enhances visible light photocatalytic activity of TiO_2. *Journal of Environmental Sciences;* 54: 256-267.

Biography

Mahabubur Chowdhury has received a Doctoral degree in Chemical Engineering and is currently a Senior Lecturer in the Department of Chemical Engineering at Cape Peninsula University of Technology. His research is on advanced functional materials for bio sensing and water treatment. His interest is on the relationship of electronic structure and ionic transport properties in semiconductor electrodes. He has published many journal articles, conference proceedings, book chapter and patent.

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