

VOLTAMMETRIC GLUCOSE SENSOR USING POLY(2,5 DIMETHOXY ANILINE) AS A POLYMER SUPPORT

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Abstract: A glucometer is a medical device for measuring levels of glucose concentration in the blood, depending on the level, administration of a drug might be required for the patient. Test strips are used in glucometers to interact with a patient's drop of blood. This work mainly focuses on the synthesis and fabrication of sensor material used in the test strips of the glucometer.

A non-enzymatic voltammetric sensor has been constructed for the detection of glucose by using nanofibrillar morphology of MPBA-Au-PDMA matrix. This was achieved by simple three step process involving electrochemical processes namely voltammetric techniques. PDMA (Poly dimethoxy aniline) is exclusively fabricated as non-enzymatic glucose sensor platform because the presence of two methoxy groups in the PANI (Poly Aniline) backbone shows better support for immobilization of Au nanocatalyst followed by SAM (Self Assembled Monolayer) attachment of 4-Mercapto phenyl boronic acid (MPBA) groups. The sensor platform was characterized by Cyclic voltammetry and Scanning Electron Microscopy (SEM). The resulting biosensor platform shows good sensitivity with linearity for the detection of Glucose between 0.25 mM to 50 mM at a pH of 7.2 in Phosphate Buffer solution (PBS) similar to physiological conditions of blood.

Several samples were synthesized by changing the experimental parameters such as method of deposition of polymer film, concentration of Auric chloride [HAuCl_4] solution, concentration of MPBA [$(\text{HO})_2\text{-B-C}_6\text{H}_4\text{-SH}$] solution and their immersion periods. These sensor materials were tested to find their use as one-time non reusable test strips for glucose meters. To be in an engineering point of view, cost for all samples were calculated. Finally optimization was carried out and the best material was identified. Hence a new sensor material has been fabricated.

Figure:

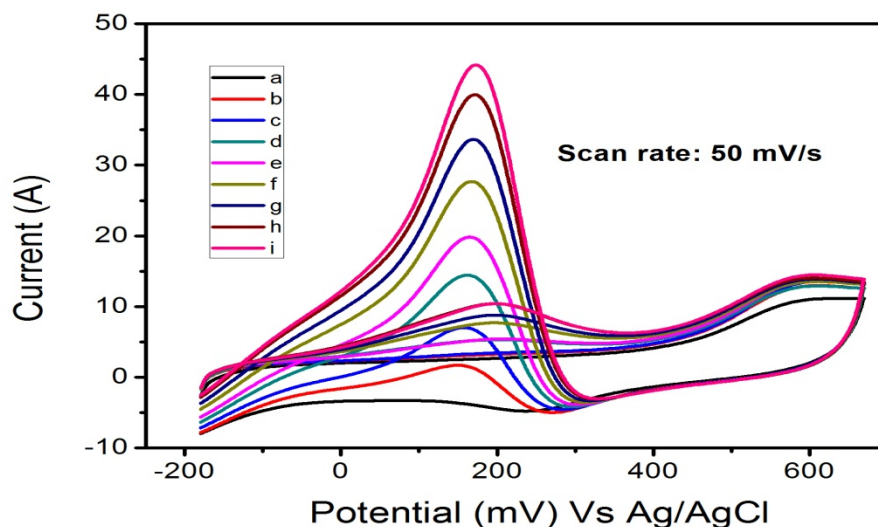


Fig.1. Cyclic voltammogram of MPBA-Au-PDMA film on GCE recorded in 0.1 M PBS (pH-7.2) for different additions of glucose (a) 0mM (b) 1mM (c) 2mM (d) 3mM (e) 4mM (f) 5mM (g) 6mM (h) 7mM (i) 8mM for one of the samples.