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Voltammetric analysis of glucose using poly 4-vinylpyridine modified carbon fiber electrode

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An enzyme-modified microelectrode has been constructed and evaluated. The 4-vinlypyridine was polymerized anodically at its optimum onto a carbon fiber (8 μm diameter) when its concentration was 0.003 M, pH 3.0, scan rate 50 mV s^{-1} and at a constant potential of +0.40 V *vs.* SCE. Initial investigation indicated that the type of supporting electrolyte and solvent used affected this polymerization. Glucose oxidase was then dip-coated onto the polymer modified electrode for glucose determination. The dip-coating enzyme immobilization technique has produced the best current response. The glucose analysis was only done *in vitro* for a whole blood sample. The effects of common interferents in glucose determination are also reported. The operational life of the electrode spanned over two weeks of constant use under normal laboratory condition. The *in-vivo* glucose analysis has yet to be done but preliminary work on this looked very promising. This topic will be discussed in future articles.

Keywords: Glucose; Microelecrode; Polymer

1. Introduction

Voltammetric studies using ultra microelectrodes have been the subject of growing interest in recent decades [1–3]. This is due to their unique properties that facilitate them to be used either *in vitro* or *in vivo* [4]. Overall, the rates of diffusion of reactive species to and from microelectrode surfaces are enhanced relative to the rates of unwanted (non-diffusion-controlled) side reactions and double layer charging. Hence, faster reactions than normal can be observed due to efficient supply of reactant. Additionally, ohmic distortion of responses is negligible, on account of the low currents involved [5]. Moreover, such devices are practical in a very small volume of analytes.

The use of microelectrodes in the determination of glucose has been reported [6–13]. A glucose microelectrode electrochemically deposited with tetrathiafulvalene–tetracyanoquinodimethane crystals as mediator was found suitable for glucose detection in an environment where oxygen concentrations did not frequently change [6]. Other mediator such as poly[(vinylpyridine)Os(bipyridine)$_2$Cl] in hydrogel

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