Functionalised Single Wall Carbon Nanotubes/Polypyrrole Composites for the Preparation of Amperometric Glucose Biosensors

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SUPPORTING INFORMATION

Experimental

Materials. Glucose oxidase (GOx) (EC 1.1.3.4., from Fluka (Aspergillus Niger). Compounds **1** (**a** and **b**) were prepared as decribed in ref. 1. Compound **2** was prepared as described elsewhere.[1] $LiClO_4$ (pro analysi from Merck), ferrocenemethanol (from Strem Chemicals), glucose (Sigma) and phosphate buffer (pH = 7, from Merck) were used as received All other materials were reagent grade chemicals.

Enzyme electrode preparation. The poly-**2** electrodes containing either **1** or GOx or both, were prepared as follows: the amphiphilic pyrrole **2** was disperded ultrasonically in pure water to give a stable, optically transparent solution (3 mM). **1** was added to such a solution and disperded ultrasonically. GOx was dissolved in the resulting solution to provide 4 mg/ml enzyme concentration. The mixture was spread on the GC electrode and the solvent was evaporated to dryness under reduced pressure. The resulting modified electrode was transferred into a cell containing aqueous $LiClO_4$ solution. Then, the polymerization of the adsorbed monomer film was carried out by controlled-potential electrolysis at 0.75 V for 15-20 min. The amount of enzyme retained within the film after electropolymerization was determined by the difference between the amount nominally deposited and the amount of enzyme lost during the electropolymerization step. The latter was estimated by spectrophotometric measurements (at 453 nm) using a calibration curve.

Electrochemical instrumentation and measurements. The electrochemical experiments were carried out with an Autolab Model PGSTAT30. Potentials were measured with respect to a saturated calomel electrode (SCE). $E_{1/2}$ values correspond to $(E_{pc}+E_{pa})/2$ from CV. A disc glassy carbon (GC) electrode, 3 mm diameter, was used as working electrode, mounted on a Tacussel EDI rotating disc electrode. A platinum spiral was used as counter electrode and experiments were carried out in a three-compartment electrochemical cell.

For the CV curve reported in Figure 1a (blue curve): Tetrabutylammonium hexafluorophosphate (puriss from FLUKA) was used as supporting electrolyte as received. Tetrahydrofuran (THF, LiChrosolv, Merck) was treated according to a procedure described elsewhere.[3] The working electrode consisted either of a Pt disk microelectrode (diameter: 125 μm) sealed in glass. The counter electrode consisted of a platinum spiral, and the quasi-reference electrode was a silver spiral. The voltammogram was recorded with an AMEL model 552 potentiostat controlled by a AMEL model 568 function generator. Data acquisition was performed by a Nicolet Model 3091 digital oscilloscope interfaced to a PC. Temperature control was accomplished within 0.1 °C with a Lauda RL 6 CS thermostat.

References.

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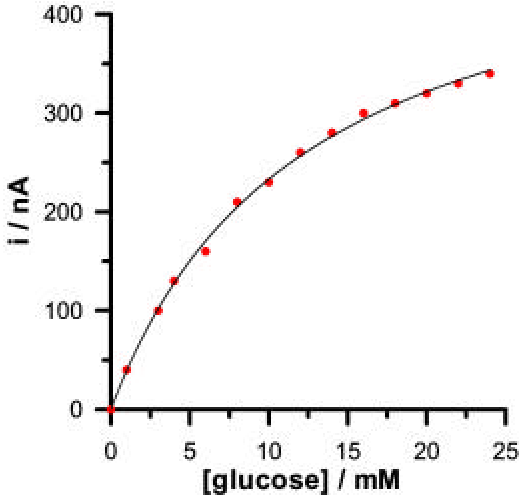

Fig. S1 Amperometric response of the **1b**/GOx/poly-**2** film $\Gamma_2 = 2.2\times10^{-9}$ mol/cm^2,and $\Gamma_{GOx} = 0.7\times10^{-9}$ mol/cm^2), supported onto a glassy carbon RDE (3 mm diameter, Ω = 200 rpm), at different concentrations of glucose in a 0.1 M phosphate buffer (pH = 7). Potential: 0.5 V (vs SCE). T = 25 °C. Redox mediator: ferrocenemethanol (0.14 mM).