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Voltammetric determination of bilirubin on disposable screen printed carbon electrode

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Abstract

Disposable screen printed carbon electrodes have been developed for the quantitative determination of free bilirubin. The electrodes were fabricated using graphite carbon ink and characterized with microscopy, spectroscopy and diffraction studies. The carbon ink for printing is made of graphite nanoparticles of size around 50 nm. Electrochemical oxidation of bilirubin was carried out voltammetrically in trizma buffer of pH 8.5. The sensor showed a dynamic detection range of 5-600 μM and a sensitivity of $95 \mu\text{A}\mu\text{M}^{-1}\text{cm}^{-2}$. The SPCE showed superior performance than many of the reported sensors in terms of dynamic range, sensitivity and oxidation potential. Molecules such as ascorbic acid, uric acid, dopamine, glucose, creatinine and ethanol were tested using SPCE and found to be non interfering with the detection of creatinine in the physiological conditions. The sensor was tested using bilirubin spiked serum samples and found that it is giving response to free bilirubin. The sensor was also used to study the affinity of free bilirubin to albumin and displacement of bilirubin from albumin by ibuprofen.

Keywords: Screen printed carbon electrode, non-enzymatic bilirubin sensor, electrochemical oxidation, bilirubin-albumin complex, ibuprofen

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