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Enzymatic activity of biosensors based on polypyrrole/urease matrices for urea detection in milk samples

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Abstract – Electrosynthesized polypyrrole (PPY) was used as a matrix for immobilization of urease on Pt electrodes in order to detect urea in milk samples. The presence of urease entrapped in the PPY films was successively verified by cyclic voltammetry, scanning electron microscopy (SEM) and UV-VIS spectroscopy. Urea detection was performed by chronopotentiometry by controlling both urea concentration and milk volume

Electrochemical biosensors can be classified by the detection systems used to analyze compounds of interest and a biosensor can be fabricated by immobilization on the surface of a conducting polymer film for detection urea, for example[1,2]. Urea, a nitrogen fertilizers, is also a waste product in the human body when excess of nitrogen is expelled. The fabrication of urea biosensors based on the immobilization of urease on polypyrrole (PPY) film allows one to monitor the urea level. The high stability of PPY as an enzymatic matrix at moderate temperatures in the presence the oxygen offers a promise for wider analytical utilization of biosensors [3].

The PPY/urea biosensor was developed for analysing urea in milk samples based on both purified urease and crude extract urease of jack beans as enzymatic source. Our main aim was to investigate the viability of replacing more expensive purified urease by urease from jack beans for fabrication efficient biosensors.

Urease was incorporated into the PPY film by cyclic voltammetry on Pt electrodes. The PPY/urease films were characterized by cyclic voltammetry, scanning electron microscopy (SEM) and UV-VIS spectroscopy. Urea detection was performed by chronopotentiometry by controlling both urea concentration and milk volume (Figure 1 and Figure 2).

The resulting biosensor was found to be a viable alternative to obtain enzyme-based biosensors by using cheap crude extract of vegetables and an efficient response when compared to those obtained with similar biosensors with purified urease.

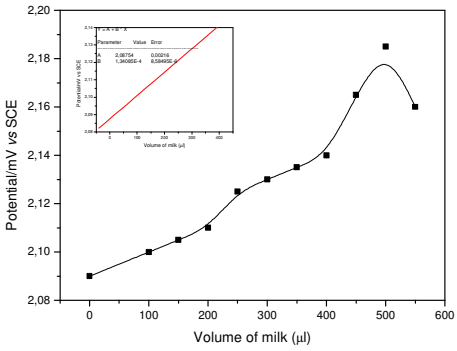

Figure 1: Chronopotentiometric response of PPY/ purified urease.

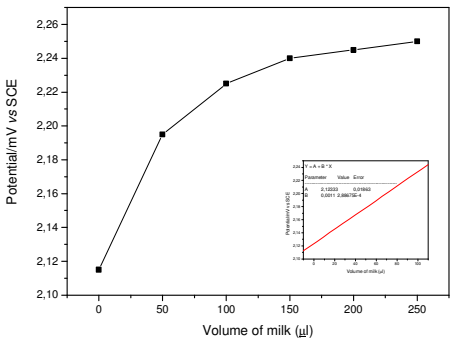

Figure 2: Chronopotentiometric response of PPY/ crude extract.

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