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Electrochemical stability and repulsion of polypyrrole film

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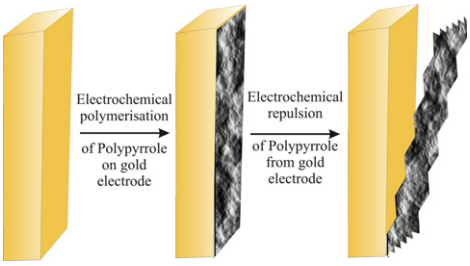
HIGHLIGHTS

- Electrochemical synthesis of polypyrrole (Ppy) film was performed on the gold electrode.
- Stability of Ppy films during electrochemical treatment was investigated.
- Cyclic voltammetry as electrochemical repulsion method was applied.
- Electrochemical repulsion conditions of Ppy from the electrode surface were evaluated.

GRAPHICAL ABSTRACT



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ABSTRACT

This study reports the electrochemical synthesis of polypyrrole (Ppy) film on the gold surface and the evaluation of this film repulsion conditions from the electrode surface. It is known that overall stability of the conducting polymer layer on the electrode is critical for many applications including biosensors. It can be affected by many factors however electrochemical treatment of electrode is mostly well-known among them. This work was mainly based on the preparation of the polymeric layer and the investigation of its stability. Overoxidised polypyrrole film was synthesized on the gold electrode. Later this layer was treated by potential cycling in wide potential intervals. The stability of Ppy layers deposited on electrode was evaluated. It was determined that Ppy layer was stable within 0–0.9 V potential range, scan rate was 20 mV/s, vs. Ag/AgCl/$KCl_{sat.}$ while it was repulsed from the gold electrode by 10 potential cycles within 0.0–1.0 V potential range at the same scan rate. Some possible future applications of repulsed Ppy films are predicted.

1. Introduction

Over the past few decades, intensive research activities have been devoted to the development of sensorics with high sensitivity, fast response and excellent selectivity. From the point of this view, the necessity to analyze biologically active compounds and the existing knowledge about commonly detected concentration in complex biological samples have shown that biosensors are among the most convenient analytical methods [1,2]. The main advantages of biosensors are the sufficient selectivity, high sensitivity, simple applicability; moreover they are not expensive and suitable for the mass production. The improvement of sensor performance is possible by electrochemical and/or chemical modification of signal transducer [1]. For this aim, polymers have been used in sensor and biosensor design as matrixes for the formation of analyte-sensitive layer. All here referred properties of analytical

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