

CHAPTER 4

Conclusion

The molecular imprinting for the fabrication of artificial receptor-like binding sites with memory effect has become a potential technique to construct the best electrochemical sensors involving PANI and GP. It showed many benefits in the field of analytical chemistry. The MIPANI can be prepared via imprinting with the shape and functional group positions of the template molecule. In this thesis, one particular goal is to be able to prepare MIPANI-GP electrode with a homogeneous population of binding sites which is similar to antigen-antibody immunointeraction or lock-key model of enzyme. The simple electropolymerisation, giving higher selectivity in the sensors, was employed for fabrication of the electrode. MIPANI film on the SPCE was successfully synthesised by this technique. In addition, the effects of synthetic parameters such as template concentration, the number of CV cycles for the electropolymerisation of ANI on the surface of GP-modified SPCE, and monomer concentration on the DPV response of the DA oxidation at MIPANI-GP-modified SPCE were evaluated. The testing parameters such as pH and temperature for detection of DA towards electro-oxidation were also optimised. Electrochemical measurement results confirmed that the MIPANI membrane electrode can selectively rebind the analytes. This sensor based on such electrode showed promising analytical features. With high selectivity and specificity, molecular imprinting is a competent approach for quantitative analysis of DA. The electrochemical sensor using the MIPANI-GP-modified SPCE showed accurate determination of DA in both standard solution and urine spiked with DA. The MIPANI film was prepared by electropolymerisation of ANI in the presence of DA as target molecule. The MIPANI on GP-modified SPCE was characterised by electrochemical methods employing $[\text{Fe}(\text{CN})_6]^{3-/4-}$ process as a redox reaction. Detection abilities of the MIPANI and nonMIPANI films on GP-modified SPCEs were assessed by DPV technique. It was found that the current response showed two linear ranges of 1.0-100

nM ($R^2 = 0.9948$) and 0.10-400 μM ($R^2 = 0.9986$), respectively. As compared to the performances of nonMIPANI sensors, the MIPANI film provided higher sensitivities which were improved approximately 49% ($28.28 \mu\text{A}\cdot\text{cm}^{-2}\cdot\mu\text{M}$) for the low concentration range, and approximately 74% ($0.47 \mu\text{A}\cdot\text{cm}^{-2}\cdot\mu\text{M}$) for the high concentration range, respectively. The MIPANI electrode provided higher specificity, higher selectivity, and lower limit of detection (0.190 nM, $n = 3$), indicating good recognition to DA. After 30 days, the MIPANI-GP electrode retained 85% of initial current response due to the DA oxidation process when stored at 4 °C, indicating a good stability. Therefore, the electrode developed in this work is easy to be prepared with obtaining high selectivity, high stability and high sensitivity. The MIPANI electrode is a thus promising candidate for determination of DA.



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