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Optimization of stearic acid modified porous carbon electrode for HSA detection

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Human serum albumin (HSA) is the most abundant protein in human blood plasma. HSA plays an important role in many body functions. In this work, a screen printed porous carbon electrodes (SPPCE) modified with stearic acid for detecting was developed. Porous carbon architecture was achieved using calcium carbonate to increase the working electrode area for enhancing the sensing ability and stearic acid was used to create carboxyl group on electrode surface for anti-HSA immobilization. Optimizing stearic acid concentration, calcium carbonate concentration, and mixing time can have most carboxylic group for immobilizing antibody and this will improve detection limits and sensitivity. The characteristics of SPPCE were assessed with cyclic voltammetry (CV) and X-ray photoelectron spectroscopy (XPS). The results showed the optimized combination of 35% calcium carbonate, 5% stearic acid, and 240-s mixing time attained the best electrochemical performance. In CV characterization, the peak current is 2.35 μA, which is 2.54 times that of the bare carbon electrode. The XPS analysis revealed that 17.51% of the electrode surface was covered with carboxylic (-COOH) group. This approach provided a high content of surface confined carboxyl groups suitable for linking EDC and sulfo-NHS to covalently bind to anti-HSA monoclonal antibody. The anti-HSA/EDC+sulfo-NHS/SPPCE structure was used to detect HAS and the results showed a significant change of current response at 150 μg/ml of HSA. In summary, a simple, low-cost, and sensitive SPPCE structure with carboxylic group surface that can immobilize any kind of antibody, promising for HSA detection in medical applications was developed.

Biography

Y F Lin is a MS student of Electrical Engineering in National Central University, Jung-Li City, Taiwan. He received the BS degree in electrical engineering from Chang Gung University, Taoyuan City, Taiwan. His current research interests include biomedical signal processing, biosensor, micro-processor and C and Matlab programing.

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