Electrocatalytic oxidation of NADH in a new nanostructured interface with an entrapped butylpyrene nitroaromatic derivative

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In a previous study, we revealed a new way to modify multi-walled carbon nanotubes (MWCNTs) with 3,5-dinitrobenzoic acid (35DNB). Furthermore, we proved that a 35DNB-MWCNTGC electrode efficiently catalysed the oxidation of NADH. In this paper, with the aim of obtaining a stronger bond of the electrocatalytic mediator 35DNB with the MWCNTs, we have synthesized a modified compound of 35DNB. The modification consisted of adding a 4-(piren-1-yl)butyl terminal to 35DNB to form 4-(pyren-1-yl)butyl 3,5-dinitrobenzoate (35DNBpy). The synthesis of 35DNBpy was obtained with a yield of 78.3% (mp = 202?204 °C). With this change, we improved the electrocatalytic activity by several oxidation cycles, conferring electrocatalytic stability. The preparation and modification of electrodes with carbon nanotubes and 35DNBpy is fast and simple. The electrochemical study was performed by cyclic voltammetry in 3 mM NADH solutions. Oxidation of NADH occurs at 0.1 (V vs Ag/AgCl) in aqueous media at pH 7 and the same electrode can be used for up to 50 min. In this work, the electrocatalytic activity of new modified electrodes with MWCNTs and 35DNBpy is reported. The electrocatalytic activity was evaluated by cyclic voltammetry. The electrocatalytic capacity of the electrode and the heterogeneous electron transfer rate constant were calculated. Sensitivity of the modified electrode 35DNBpy/MWCNT/GCE is measured by voltammetric method which showed linear variation with NADH concentration with limit of detection (LOD) and sensitivity of 0.885 ?M (3S/N) and 0.33 ?A/?M, respectively.