Novel NAD(P)H Biosensor using Fe_2O_3/carbon/CB Nanocomposite Electrode Based on a Mediator-Free Electrochemical Method

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There are some advantages and disadvantages using a mediator in electrochemical redox reaction. With a mediator, only a low overpotential is required, but the structure is complex. Without a mediator, however, the structure is simple but requires a high overpotential. High overpotential is accompaned by a low sensitivity, undesired side reactions and the electrode fouling. The main drawback of amperometric biosensors is a high overpotential, more than +0.7V. This could usually be overcome by using a mediator so far. We present here a novel method to solve this problem using an electrode modified with Fe_2O_3/carbon/CB nano-composite based on a mediator-free electrochemical method. Applying the Fe_2O_3/carbon/CB nanocomposite electrode can result in a huge increase in the sensitivity. The anodic peak potentials of the electrode with and without NADH were 0.185V and 0.146V (vs Ag/Agcl; pH 7.0) respectively. Under optimal conditions, NADH could be detected in a linear range from 10μM to more than 2000μM and the limit of detection was 2.5μM (S/N=3). The sensitivity was 494μA/mM (R^2=0.997).