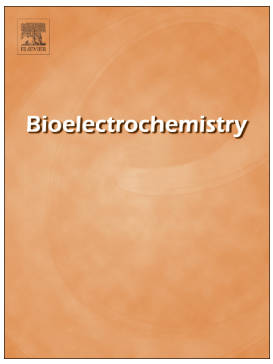

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Electrodeposited styrylquinolinium dye as molecular electrocatalyst for coupled redox reactions

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Abstract

Modification of carbonaceous materials with different conductive coatings is a successful approach to enhance their electrocatalytic activity and thus to increase the electrical outputs when used as electrodes in biofuel cells. In this study, a methodology for electrodeposition of styrylquinolinium dye on carbon felt was developed. The produced dye electrodeposits were characterized by means of AFM, ESI-MS/MS and NMR spectroscopy. The obtained data reveal that the dye forms overlaid layers consisting of monomer molecules most likely with an antiparallel orientation. The UV-VIS spectroscopy, CV and EIS analyses show that the dye molecules preserve their redox activity within the coating and a charge transfer between $NADH/NAD^+$ and electrodeposit is possible as a coupled redox reaction. The fabricated nano-modified electrodes were also tested as anodes in batch-mode operating yeast-based biofuel cell. The results indicate that the electrodeposited dye acts as an immobilized exogenous mediator, contributing to enhanced extracellular electron transfer.

Keywords: styrylquinolinium dye electrodeposition; electrocatalyst; coupled redox reaction; $NADH/NAD^+$ interconversion; microbial fuel cell; modified anode.

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