Electrocatalytic Features of Selectively Attached Microperoxidase-11 on to Nano-carbon structures

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Application of protein film voltammetry to study the heterogeneous electron transfer process of immobilized redox enzymes on electrodes provides insights into the kinetic aspects of electron transfer and catalysis upon providing a reactant. Additionally, by tailoring the surface chemistry of electrodes, we can selectively control the orientation of redox proteins with minimized electron tunneling distance. Here, we have investigated the influence of structurally controlled immobilization of a peroxidase enzyme on to specially tailored nanostructured electrodes on the resulting electrocatalytic efficiency. We have chosen microperoxidase-11 (MP-11), a simple undecapeptide, consists of an iron protoporphyrin IX covalently bound by thioether bridges of Cys 14 and Cys 17, as a model peroxidase enzyme in this study.

The interesting structural features of MP-11 make it as a suitable candidate to investigate the site specific interaction of the enzyme with the electrode surface and the associated electrochemical properties. We present that the rate of heterogeneous electron transfer and catalytic properties of specifically immobilized covalent MP-11 films are superior over the corresponding randomly adsorbed enzyme films. Such investigation can immensely help in the construction of novel high performance miniscule bioreactors with tunable catalytic activity.

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