HEME-PROTEIN MIMETICS IN BIOSENSOR CONSTRUCTION

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Bioelectronic sensing devices (biosensors) represent a rapidly growing research area at the interface of chemistry, biochemistry, physics and nanotechnology.
Redox-active biomolecules (e.g. enzymes) are often used for the set-up of this kind of analytical devices. However, high-molecular weight enzymes are not amenable to direct electrical communication with the electrode, because the heterogeneous ET with the prosthetic redox center, usually a metal, is slow due to the unavailability of efficient ET routes [1].
The use of artificial and low molecular weight heme-enzymes can be exploited to overcome these limitations and it is here proposed for the construction of third generation electrochemical biosensors.
Mimochrome VI (M-VI) is a synthetic heme peptide adduct, which contains a helix heme-helix sandwich motif and designed to reproduce the catalytic activity of heme oxidases [2,3].
The electrochemical properties of this peroxidase-like heme-protein mimetic were investigated by cyclic voltammetry and time-resolved spectroelectro-chemistry.
In the first case, M-VI was immobilized through hydrophobic interactions on a gold electrode coated with a nonpolar SAM of decane-1-thiol [3]. In the second case, M-VI was chemi- and physisorbed on a transparent tridimensional indium-thin oxide (ITO) electrode [4].
In both cases, the immobilization produces a stable hybrid interface, which is characterized by fast heterogeneous electron transfer (ET) and which electrocatalytically turns over molecular oxygen.
This work sets the premise for the exploitation of totally synthetic mimochrome-modified electrode surfaces for clinical and pharmaceutical biosensing.

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