Peptide-Molecular Wires as Conductive Supports in Electrochemical Bioassays

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We report a study on the electrochemical properties of a peptide molecular wire used as both conductive support for immobilizing ligands in affinity-based bioassays and as signal amplifier for the ultrasensitive detection of H_2O_2 in biological samples. A short helical peptide sequence with alternating polar and ionizable side chains was synthesized to modify the surface of the biosensor. The peptide was functionalized on-site with Methylene Blue (MB) at one end and anchored to the gold surface through the gold/thiol chemistry[1]. Thus, the modified peptide acted as a molecular wire, facilitating a two-step electron transfer (ET) process from MB to the gold surface[2]. To assess the kinetics of the electrode reaction, we analyzed the forward and backward components of the square wave voltammetric (SWV) signals obtained in the presence of the peptide wire. The experimental data were compared with simulated results, revealing a good fit for the surface EE mechanism[3].Two high-molecular-weight (HMW) targets (the anti-tumour-associated carbohydrate antigen-antibody, and the growth hormone secretagogue receptor) were detected via affinity interaction with their small ligands grafted onto the peptide wire. Another significant advancement is the ultrasensitive detection of H_2O_2, by leveraging the electrocatalytic properties of MB within the peptide/thiol mixed layer.

Keywords: biosensor, molecular wire, electron transfer

References

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