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Abstract

PEG-Based Antifouling Strategies for Electrochemical Aptasensors †

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Abstract: The application of biosensors for complex samples is limited by non-specific adsorption of interfering compounds. These so-called fouling agents include a broad range of biomolecules, such as proteins and nucleic acids, as well as whole cells. Their adsorption to the electrode significantly affects the analytical characteristics of the sensor including sensitivity, reproducibility, stability, and overall reliability. Biofouling therefore is a serious challenge that has to be overcome. The majority of antifouling techniques developed for this purpose are limited in their application to optical or mass sensitive sensors because they incorporate high molecular weight compounds. Since these are highly disadvantageous for electrochemical transfer reactions, further research has to be conducted for the fabrication of electrochemical sensors. The gold standard of antifouling agents is Polyethylene glycol, which, when attached to the electrodes' surface, forms thick and compact monolayers that unfortunately inhibit electrochemical transfer reactions. In our work, we therefore aim to investigate different strategies based on PEG that combine the polymers' excellent antifouling properties with sufficient spacing to allow electron transfer and enable their application in electrochemical sensors. We thereby focus on the development of impedimetric sensors that utilize aptamers as bioreceptors for the fast, sensitive, and reliable detection of protein biomarkers in clinical samples.

Keywords: aptasensor; electrochemistry; biofouling; PEG