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Abstract

Potentials and Shortcomings of Electrochemical MIPs for Proteins †

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Abstract: After the pioneering work of Wulff and Mosbach in the development of MIPs by chemical polymerization, in the 1980s synthesis of MIPs by electropolymerization has been successfully introduced. Electrosynthesis of MIPs can be performed in aqueous solutions, where protein molecules preserve their natural conformation. The layer thickness can be precisely tuned by controlling the amount of charge passed. A frequently applied indirect method for the characterization of MIPs exploits voltammetry and impedance spectroscopy of ferricyanide. The changes of the current signals are caused by the removal or binding of the target, but also by "nonspecific" pores. Furthermore, target binding brings about minute decreases of the big current signal. Nevertheless, several papers describing MIPs for both low and high molecular weight substances claim measuring ranges over several orders of magnitude with subnanomolar lower limits of detection. On the other hand, evaluation of the enzymatic activity or of direct electron transfer gives a direct quantification of the target bound to the MIP. MIPs can be synthesized from only *one* monomer and exhibit measuring ranges from micromolar up to the subnanomolar concentration range. On the other hand, many basic and technological problems have not yet been adequately tackled. We describe in the present talk the electrosynthesis of MIPs and the analytical performance of the electrochemical MIP-sensors for the following proteins: Acetylcholinesterase, Butyrylcholinesterase, Cytochrome P450, Laccase, Tyrosinase, Ferritin, Transferrin, Hemoglobin, and Serum Albumin.

Keywords: molecularly imprinted polymers; acetylcholinesterase; butyrylcholinesterase; cytochrome P450; laccase; tyrosinase; ferritin; transferrin; hemoglobin; serum albumin