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Electrically controlled Michael addition: addressing of covalent immobilization of biological receptors

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ABSTRACT

Electrically addressed covalent immobilization of biomolecules to the defined electrodes of an electrode array is described. It is based on Michael addition of the thiol group of biomolecules to the α,β -unsaturated carbonyl groups of benzoquinone. This “click” reaction was tested by immobilization of a number of thiolated compounds on the simplest array consisting of two gold electrodes coated by a self-assembled monolayer of benzoquinone terminated hexanethiol. Electrically controlled binding of hexanethiol, ferrocenyl-hexanethiol, human serum albumin and thiol-terminated single-stranded DNA (ssDNA) was studied. The binding was studied using cyclic voltammetry, X-ray photoelectron spectroscopy and surface plasmon resonance. The reaction requires the oxidized state of the benzoquinone moiety; this can be

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