A study on direct electrochemistry and superficial characterization of cytochrome c self-assembled on mixed monolayer electrode

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Cytochrome c (cyt c) plays a very important role in the respiratory chain of mitochondria, and is known for very slow electron transfer kinetics and denaturation directly attached on the solid electrode. Thus, many useful biocompatible surfaces which can facilitate prompt electron transfer have been constructed, such as self-assembled monolayer or binary mixed self-assembled monolayer. Kasmi and his coworkers [1] have studied different mixed self-assembled monolayers and their effects on interfacial electron-transfer kinetics. Gobi et al [2] has successfully constructed superoxide sensors using cyt c with monolayers and mixed-monolayers of 3-mercaptopropionic acid with 3-mercaptopropanol. And recently Nakano et al [3] has thoroughly researched the redox of cyt c on 11-mercaptoundecanoic acid (11-MUA) modified gold electrode through covalent bonding by AFM, IR, QCM and direct electrochemistry.

In the present work, 11-MUA and 11-mercapto-1-undecanol (11-MU) were first assembled on the evaporated Au films with 50 nm to form a mixed monolayer, and then cyt c was immobilized on the mixed monolayer by electrostatic interaction. AFM was used to observe images of cyt c down to single-protein resolution. QCM was employed to determine the amount of cyt c. Cyclic voltammetry was also provided to investigate the electrochemical properties of cyt c molecules immobilized. Besides, surface plasmon resonance (SPR) spectroscopy was applied to determine the general film thickness variation and molecular conformational change of cyt c on the mixed monolayer.

Reference:

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