

Electrochemical and Spectroscopic Characterization of Simply Peptides Formed on Electrode Surfaces and Their Applications as a Biosensor

전극표면에 형성된 간단한 펩타이드의 전기화학적, 분광학적 특성과 바이오센서로서의 응용

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Surfaces modified with foreign metals or molecules often exhibit catalytic properties and selectivity toward many electrochemical reactions. Here we present a novel method to introduce metal ions on the electrode surface via the formation of some amino acids and peptides. The gold electrode was first modified with cysteine in which the thiol group acted as an anchoring point with Au forming a S-Au bond. Amine and carboxyl groups are then open to the metal ions to form a chelate. The successive peptide layer can be made by simply adding necessary amino acids to the cysteine-modified Au electrode. In this way we have constructed several peptide-modified electrodes coordinated with Cu^{2+} and Fe^{2+} ions. These electrodes showed electrochemical redox reactions and catalytic properties. For example, Au/cys-cys-cys/Cu displayed a catalytic effect for ascorbic acid and Au/cys-cys-cys/Fe for hydrogen peroxide. The surface formation of glutathione (glu) and the complexation with metal ions were also investigated by electrochemical, UV/vis, fluorescence spectroscopic and X-ray absorption methods. Glu formed a stable 1:1 complex with various metal ions. The Au/glu-his (his=histidine) system was successively applied to detect Cu^{2+} ion of sub ppb concentration. Fluorescence measurements were carried out for the Au/glu-F (F=fluorescein) system, in which fluorescence intensity upon coordination with Rh^{3+} decreased. It is our hope that this kind of system can find applications in biosensors.