Tailoring electroactive surfaces by non-template molecular assembly. Towards electrooxidation of L-cysteine

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Abstract

We have prepared a nanoelectrode ensemble containing vertically aligned single walled carbon nanotubes (SWCNTs) using a non-template molecular self-assembling strategy. We used a bottom-up construction approach to assemble amino functionalized SWCNTs (*af*-SWCNTs) in a well-defined architecture. These *af*-SWCNTs were linked and vertically aligned to pre-formed self-assembled monolayers of 4-MBA. A Cobalt(II) tetracarboxyphthalocyanine ($Co(COOH)_4Pc$) complex was covalently bonded to external portion of *af*-SWCNTs to complete the final nanoelectrode ensemble. X-ray photoelectron spectroscopy (XPS) and Atomic Force Microcopy (AFM) confirmed the effectiveness of the assembling steps on the gold surface starting from the Au/MBA SAMs. The system Au/4-MBA/*af*-SWCNTs shows an interface with large ordered array, which exhibits a high activity for the electrooxidation of L-cysteine (L-cys). Theoretical calculations suggest that the incorporation of the *af*-SWCNTs increased the activity of the assembly to electronic transfer and it was observed that the electrooxidation reaction is energetically favorable.