学術講演会

In Situ Scanning Tunneling Microscopy Revelation of Electrified Interfaces at Well-Ordered Electrodes

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主催：電気化学会北海道支部

共催：触媒化学研究センター談話会，北海道大学GCOE「触媒が先導する物質科学イノベーション」

日時：平成22年7月16日（金）15:00～16:30

場所：北海道大学・創成科学研究機構棟（四階セミナー室B）

講演内容：

In situ scanning tunneling microscopy (STM) is used to examine the adsorption of anions and molecules and the subsequent electrochemical processes occurring at well-defined single crystal electrode. The adsorption of aniline molecules on Au(111) electrode in solutions of sulfuric acid and perchloric acid are first described. Molecular-resolution STM imaging reveals highly ordered adlattices of $(5\times2\sqrt{3})$rect and $(3\times2\sqrt{3})$rect at 0.6 and 0.85 V (vs. RHE), respectively. Raising the potential furthermore positive to 0.9 V triggers the oxidation of aniline molecules to radical catons, which subsequently couples with aniline molecules to form polyaniline molecules. The resolution of our present STM imaging results renders visualization of the conformation and the internal structures of each polyaniline molecule. It is remarkable to find that polyaniline molecules at E > 0.9 V span readily more than 40 nm and assume predominantly linear conformation. Switching potential negatively to 0.5 V or more negative caused polyaniline molecules to restructure and possibly hydrolysis. We used X-ray photoelectron spectroscopy (XPS) and near edge X-ray absorption fine structure (NEXAFS) to gain insights into the potential-dependent restructuring event of polyaniline molecules.

The electroxidation of carbon monoxide on bare and Ru-modified Pt(111) electrodes was also examined by *in situ* STM, attempting to unveil how the structure of CO admolecules and how the reaction would be affected by the Ru modifier. Due to the limited time resolution of our STM equipment, the electrochemical potential was set at 0.5 V, the onset for CO electroxidation on Pt(111). The adsorbed CO molecules were slowly oxidized into CO_2, starting preferentially at defects such as steps and pits on terraces. Adsorbed CO molecules near these defects then followed suit and ordered CO adlayer was eventually eliminated.

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