

IN SITU STM STUDIES OF MIXED THIOL-TERTHIOPHENE SELF-ASSEMBLED MONOLAYERS ON Au(111) ELECTRODES

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Mixed organic monolayers formed by self-assembly (SAMs) offer attractive possibilities for the formation of functional structures with controlled densities of the active groups on the nanometer scale. In this study mixed self-assembled monolayers of alkanethiol-substituted terthiophenes dispersed in a matrix of octanethiols were formed on Au(111) and studied in situ in electrochemical environment by scanning tunneling microscopy (STM). Main long-term objective of this work is to form novel (electro-) catalytically active systems and to correlate their structure and catalytical properties.

The single crystalline Au substrates were flame annealed and subsequently immersed for 12 h in ethanol solutions containing terthiophenes and octanethiols at variable mixing ratios. For comparison also pure octanethiol monolayers were prepared under identical conditions. After transfer into 0.1 M H₂SO₄ solution the morphology and atomic-scale structure of these self-assembled monolayers were characterized under potential control by in situ STM. For pure octanethiol SAMs the STM observations reveal a Au surface covered by monoatomic etch pits and domains of the c(4x2) thiol adlayer structure, well known from previous studies. In the case of mixed SAMs additional structures can be observed, which can be identified with terthiophene molecules that are statistically distributed in the c(4x2) octanethiol adlayer phase.