

Monoayers or Multilayers: Self-Assembly of Ferrocene Alkyl Thiols Gold (111) Surfaces.

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The spontaneous adsorption and subsequent organization of ferrocene alkyl thiols on Au (111) electrodes were examined from dilute and concentrated solutions of the thiols. Whereas dilute concentrations (1 mM) resulted in organised monolayers, concentrated solutions (>20 mM) yielded films with redox charges consistent with the formation of multilayers.

Electrochemical desorption studies indicated that the amount of thiolate groups attached to the surface is the same for mono and multilayers.

Surface probe microscopies (STM and AFM) showed that the presence of the thiols induces mobility in the step edges of the Au surface. The images presented in this abstract show the progressive etching, as a function of time, of the Au(111) surface upon exposure to a thiol solution (images shown for 25, 36, 43 and 47 min).

No pitting of the terraces was observed when using dilute concentrations of the thiol.

We could not obtain stable STM images from concentrated solutions of the thiols, which is likely to result from difficulty in obtaining a stable tunnelling current response through the thicker layer. Tapping mode AFM confirmed the presence of multilayers which had a characteristic feature consisting of annular structures that penetrate into the surface. These data were in agreement with ellipsometric measurements.

In situ FTIR spectroscopy (SNIFTIRS) was used to monitor the changes that accompany the redox switching of mono and multilayers. The data point towards hydrogen bonding as the reason for the stability of the multilayers.

References:

- 1) A. Viana, A. Jones, L. Abrantes, M. Kalaji; J. Electroanal. Chem; 2001, 500, 290-298-229.
- 2) A. Viana, L. Abrantes, G. Jin, R. Nichols, S. Floate, M. Kalaji; PCCP; submitted.

