

**Manfred Buck**  
Reader in Physical Chemistry

e-mail: mb45@st-and.ac.uk

tel: 01334-467232

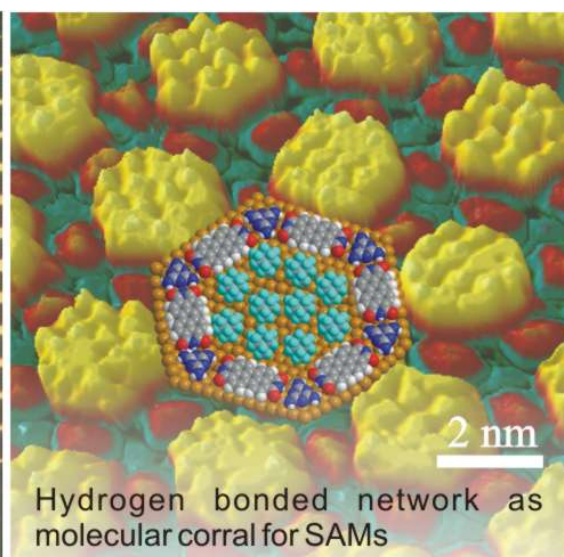
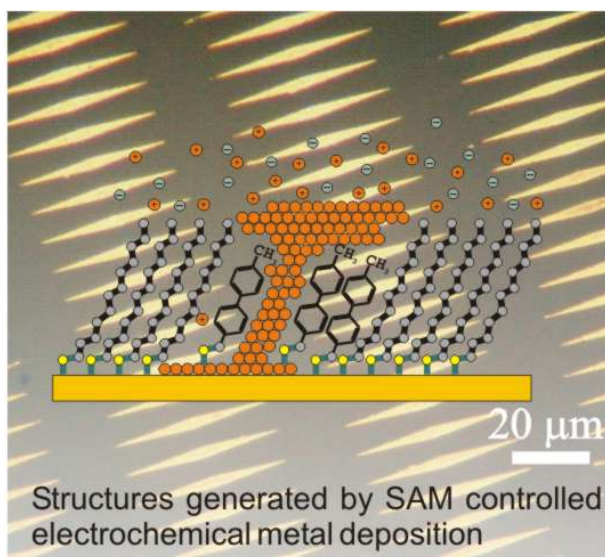
Research Interests: Nanostructures, molecular and supra-molecular self-assembly on surfaces, electrochemistry, scanning probe microscopy, nonlinear laser spectroscopy



Our areas of interest are self-assembled monolayers (SAMs) and two dimensional supramolecular systems which allow flexible tailoring of interfacial properties and surface patterning. Different types of SAMs, hydrogen bonded networks or metal-organic coordination networks (MOCN) are investigated. Aiming for a control of structures and processes at surfaces on a length scale down to molecular dimensions we are particularly interested in the combination of SAMs and hydrogen bonded networks as two complementary self-assembly strategies (right image).<sup>1</sup> Another major activity is the further development of a scheme for the generation of electrode structures<sup>2</sup> where SAMs are used as templates to laterally confine reactions such as electrochemical metal deposition (left image).

The work on nanoscale applications of self-assembled organic layers is paralleled by fundamental studies to unravel the factors determining the structure and properties of SAMs. For a precise design of these systems we aim for a better understanding of the mutual influence of intra and intermolecular forces, molecule-surface interactions and electrochemical properties.<sup>3-5</sup>

All the work is characterised by a solution based approach which makes *in situ* techniques, i.e., methods which are applicable at the liquid/solid interface, crucial for our experimental studies. Of particular interest to us is the electrochemical interface where we apply both nonlinear optical spectroscopies (second harmonic generation, *SHG*, and sum frequency generation, *SFG*) and microscopic techniques such as electrochemical tunneling microscopy (ECSTM).



### SELECTED RECENT PUBLICATIONS

1. Functionalizing hydrogen-bonded surface networks with self-assembled monolayers. R. Madueno, M. T. Räisänen, C. Silien, M. Buck, *Nature* **2008**, *454*, 618-621.
2. Replicative generation of metal microstructures by template directed electrometallization. I. Thom, G. Hähner, M. Buck, *Appl. Phys. Lett.* **2005**, *87*, 024101-3.
3. On the Role of Extrinsic and Intrinsic Defects in the Underpotential Deposition of Cu on Thiol-Modified Au(111) Electrodes. C. Silien, M. Buck, *J. Phys. Chem. C* **2008**, *112*, 3881-3890.
4. Self-Assembled Monolayers of a Bis(pyrazol-1-yl)pyridine-Substituted Thiol on Au(111). C. Shen, M. Haryono, A. Grohmann, M. Buck, T. Weidner, N. Ballav, M. Zharnikov, *Langmuir* **2008** *24*, 12883-12891.
5. Competition as a design concept: Polymorphism in Self-Assembled Monolayers of Biphenyl-Based Thiols. P. Cyganik, M. Buck, T. Strunskus, A. Shaporenko, J.D.E.T. Wilton-Ely, M. Zharnikov, C. Wöll, *J. Am. Chem. Soc.* **2006**, *128*, 13868-13878.