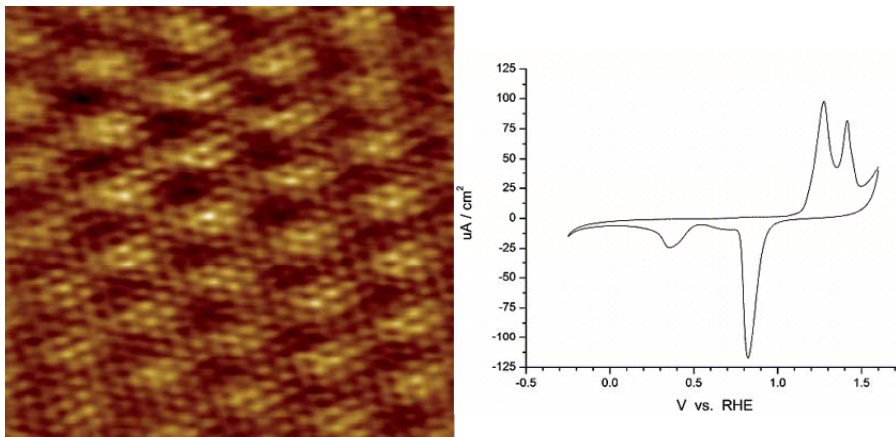


Doing Electrochemistry with an SPM tip: EC-SPM

Electrochemical SPM (EC-SPM) in liquid electrolytes provides an additional level of experimental control for *in-situ* studies of surfaces and redox active adsorbates. Independent control of the tip and surface electrode potentials enables atomic resolution imaging and spectroscopy of electrochemical surface processes. This method allows for real-time analysis of electrochemical processes occurring at the electrolyte-surface interface as compared to *ex-situ* methods and has proven to be an invaluable experimental tool in the fields of electrochemistry and surface science.

Here at the PicoLab, we have designed and fabricated a home-built EC-SPM platform that relies on Nanonis for a highly-flexible control system solution. In particular, our original approach system [1] was optimized using a truncated cycloid provided by the built-in function generator module. The integration of our bipotentiostat was straightforward thanks to the multiple free user inputs/outputs and allowed for control of all critical experimental parameters from one single user interface. In combination with the generic sweeper, standard electrochemical methods such as cyclic voltammetry can easily be carried out directly in the imaging environment.

Our recent work has focused on the development of combined STM/non-contact AFM methods. The Nanonis system continues to seamlessly evolve with our research projects through the various add-on modules such as the Oscillation Controller (OC4), tuning fork preamplifier (TFPA) and interferometer controller.



Potential-induced, rotated hexagonal superstructure of iodine modified Au (111) imaged in perchloric acid (left) and corresponding cyclic voltammogram (right).

For further reading on the design of this microscope, please read:
[1] Stieg et al. *Rev. Sci. Instr.* 78, 036110 (2007)

Authors:

Adam Z. Stieg and James K. Gimzewski

Department of Chemistry and the California NanoSystems Institute, UCLA, USA.

Nanonis Modules in Use:

- Base Package
- Function generator
- Generic sweeper

System:

- Home-built EC-SPM