Park NX10 Atomic Force Microscope

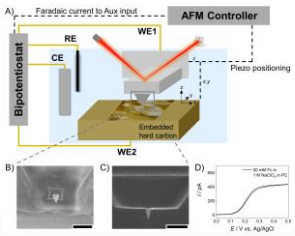
POLiS
Post Lithium Storage
Cluster of Excellence

Specifications

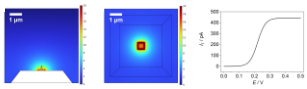
Local measurements of properties in Argon atmosphere or in liquids, e.g.:

- Conductivity at dry conditions (C AFM)
- Faradaic current (SECM, SICM, SECCM)
- Mechanic properties (PinPoint)
- Surface Potential/Workfunction (KPFM)

Scan range: 80 x 80 µm
Z range: 10 µm
Sample size: up to 100 mm x 100 mm, d = 20 mm



Schematical setup of a AFM-SECM experiment.

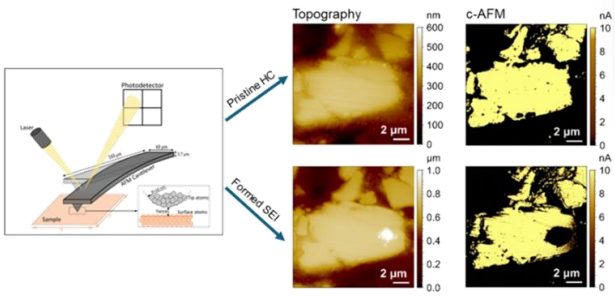


Simulations to verify the experimental results

Description

Atomic Force Microscopy (AFM) is a high-resolution technique for characterizing material surfaces at the nanoscale.

- Operates by scanning a probe over the sample to measure forces, generating topographical, mechanical, and electrical property maps, a cantilever acts as a force sensitive spring
- Investigates surface morphology and phase distribution; tracks degradation mechanisms over charge/discharge cycles; Assesses mechanical stability and structural changes
- Can be equipped with current amplifier, Lock-in amplifiers, potentiostats and thus, can be hyphenated with different techniques



The local formation of SEI on hard carbon is demonstrated by scanning electrochemical cell microscopy (SECCM). The formation of SEI micro-spots allows the direct study of the effects of the electrolyte composition and experimental parameters on the morphology, height, passivation and nano-mechanical properties of the SEI using an SPM instrument, capable of switching the scan head from SECCM to AFM.

Further information

Electrical properties

- **EFM/KPFM**
  Localized charge, Surface potential, Work function
- **C AFM**
  Current, Conductivity
- **PFM**
  Piezoelectric response
- **SSRM**
  (Spread) Resistance
- **SCM**
  Capacitance
- **PCM**
  Photocurrent

Mechanical properties

- **FD curve**
  Modulus, Adhesion value
- **PinPoint mode**
  Modulus, Adhesion value and image
- **FMM**
  Relative mechanical property
- **Nanoindentation**
  Modulus, Hardness
- **LFM**
  Lateral force
- **Nanolithography**
  Surface modification

Other properties

- **MFM**
  Magnetic property
- **SThM**
  Thermal property
- **EC-AFM**
  Height change by EC response
- **AFM-SECM**
  Electrochemical activity

Pipette based

- **SICM**
  Height image without surface contact, Ion current
- **SECCM**
  Localized EC response
- **SICM-SECM**
  Height, EC response

Publications

[1] S. Daboss, T. Philipp, K. Palanisamy, J. Flowers, H. S. Stein, C. Kranz, *Electrochim. Acta* **2023**, *453*, 142345.
[2] S. Daboss, F. Rahmanian, H. S. Stein, C. Kranz, *Electrochem. Sci. Adv.* **2022**, *2*, 1–10.
[3] S. Saleh, S. Daboss, T. Philipp, D. Schaefer, M. Rohnke, C. Kranz, *ChemElectroChem* **2025**, e202400707.
[4] S. Daboss, N. Franke, B. Fraboni, C. Kranz, T. Cramer, *J. Microsc.* **2025**, accepted.