

## AFM Performance at the Limit of Technological Feasibility

### QPlus Upgrade for LT STM at a glance:

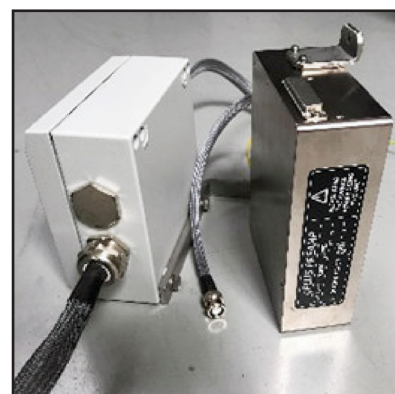
- New scanner and shielding design allows signal amplification/detection at atmospheric side
- Atomic resolution on isolating surfaces as well as on conducting materials competitive to STM imaging
- Ultimate performance using new generation QPlus sensors (included in this upgrade package)
- Fundamental AFM performance proof on isolators, HR imaging with functionalized tips
- AFM measurements in genuine  $\Delta f$  feedback
- On-site upgrade: minimized down-time without shipping risk



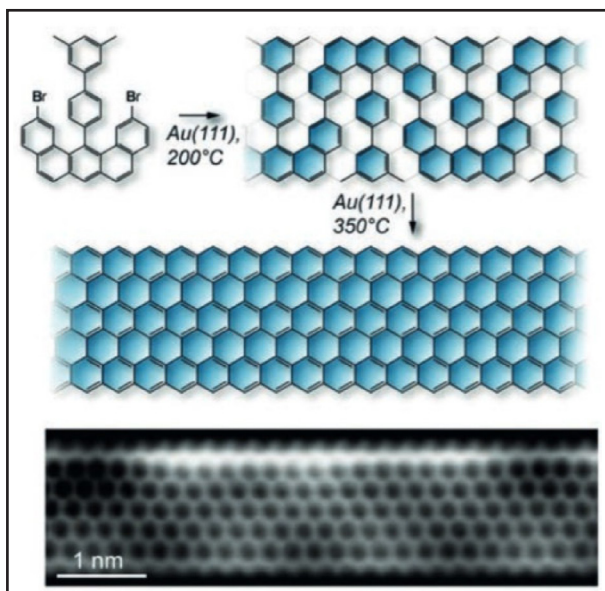
Scanner sensor reception



QPlus sensor new design



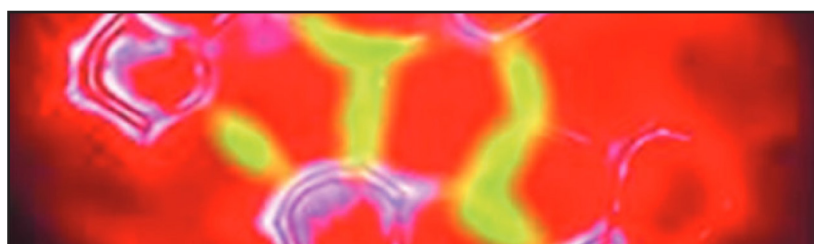
QPlus Preamplifier



Structure of precursor monomer and surface-assisted reaction step for the synthesis of 6-ZGNRs (top). Constant height nc-AFM frequency shift image taken with a CO-functionalized tip. The intraribbon resolution shows the formation of a 6-ZGNR with atomically precise CH edges.

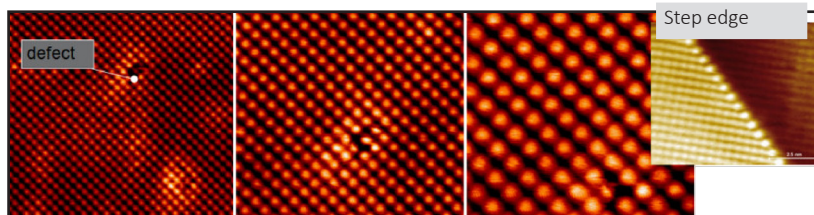
Oscillation amplitude  $A_{osc} = 0.7 \text{ \AA}$ ,  $V = 5 \text{ mV}$

Publication: Pascal Ruffieux et al., Nature 531, 489-492, 2016



Real-Space Identification of Intermolecular Bonding with Atomic Force Microscopy

Publication: Xiaohui Qiu et al., DOI: 10.1126/science.1242603



LT-STM QPlus atomic resolution on NaCl(100) single crystal at  $T=5 \text{ K}$

## Summary

### Upgrade Components:

- QPlus Scanner for LT/STM.
- ScientaOmicron Charge Amplifier Q4.
- PIC 8 cable for Scan/Coarse Drive and Excitation Control.
- BNC Feedthrough.
- Internal wiring (Coax cable for QPlus signal), connector plate.
- Set of QPlus sensors and holders.
- Set of sensor transfer plates.

### Requirements:

- ScientaOmicron LT STM Serial Number >106 (older on request).
- SPM controller with NC-AFM QPlus functionality and support for ScientaOmicron Charge Amplifier Q4.

### Options:

- Combined package with MATRIX AFM upgrade.
- Add an introductory QPlus training with an application specialist to get started quickly.
- Sample cable S/S0 not yet shielded? Combine with an upgrade to coaxial wiring enabling low noise STS at tip and sample side.

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