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Scanning Tunnelling Microscope

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* Nanovie STM Lepto for Research
* Nanovie STM Educa for Education
* Nanovie Auto Tip Maker

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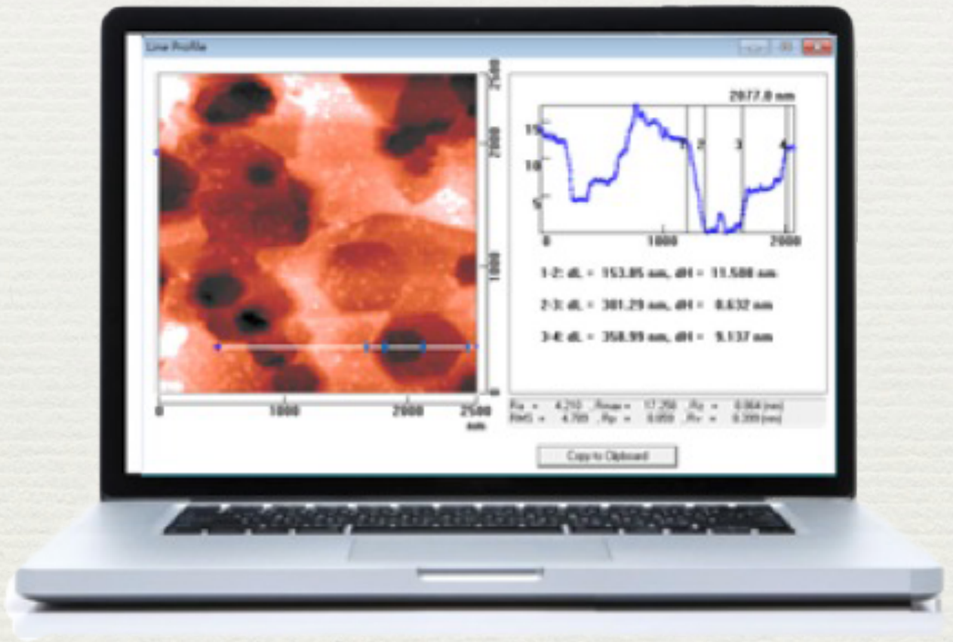
Portable 3D nanoscale microscope



A compact portable 3D nanoscale microscope for imaging in liquid as well as in air. With a laptop, research can be done anytime anywhere under ambient conditions, without the need of a vacuum chamber and a vibration isolation table.

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Feature highlights

Feature Highlights

* Optimal resolution: horizontal 2 nm, vertical 0.1 nm
* In-liquid scan
* Lithography – nanoscale manipulation & in-situ rescan
* I-V Curve - electrical characteristics analysis (STS)
* Automatic tip-to-sample approach
* Restoration of the damaged tip during scan

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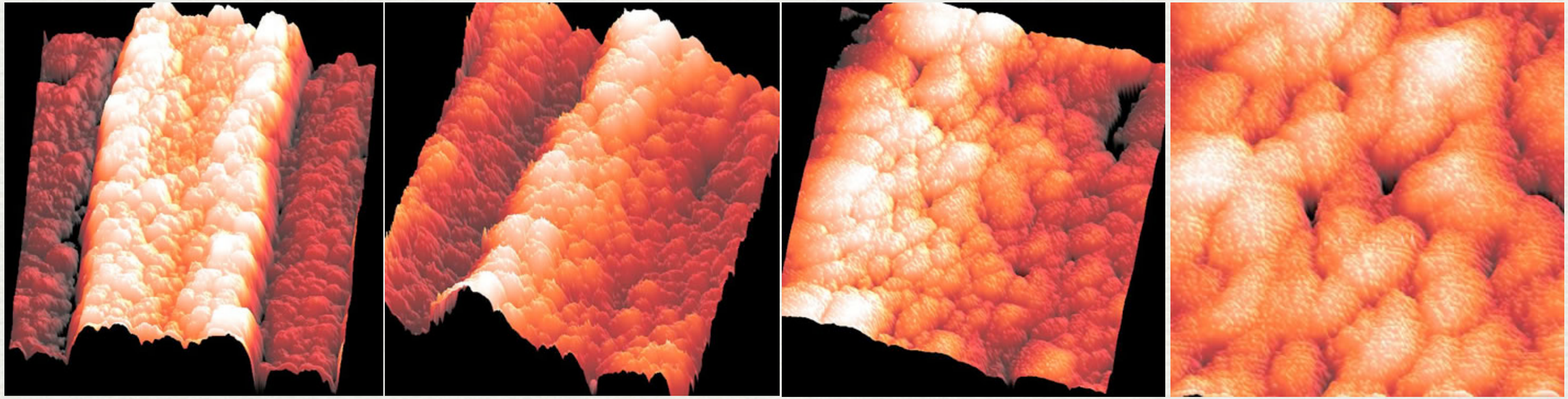
Imaging capability & 3D rendering

The following 3D images demonstrate the details of the groove structure on the DVD surface that is coated with gold thin film, from the scan of a large area to that of a higher resolution. With our dedicated software N-image, the obtained images can be rendered into three dimensional display with various lighting effects and colouring.



1000 X 1000 nm | 600 X 600 nm | 400 X 400 nm | 200 X 200 nm

Groove cycle length ~ 750 nm and depth ~ 25 nm / Gold particle diameter ~ 20nm and height ~ 2 nm

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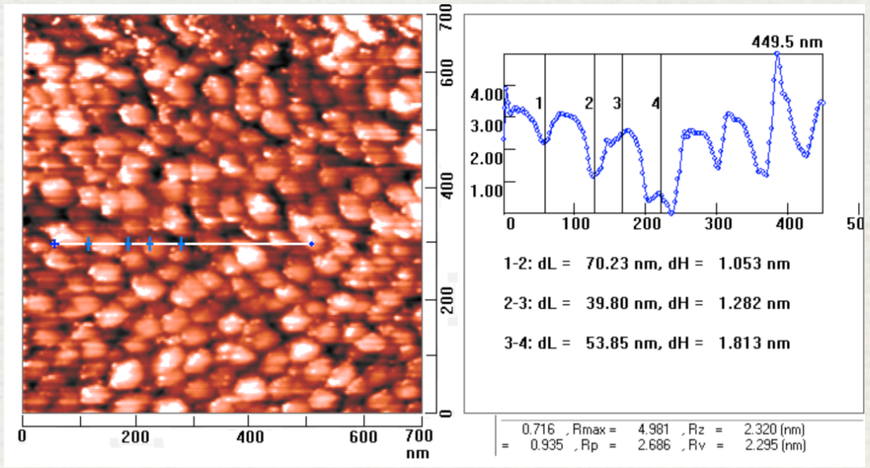
Image processing & analysis

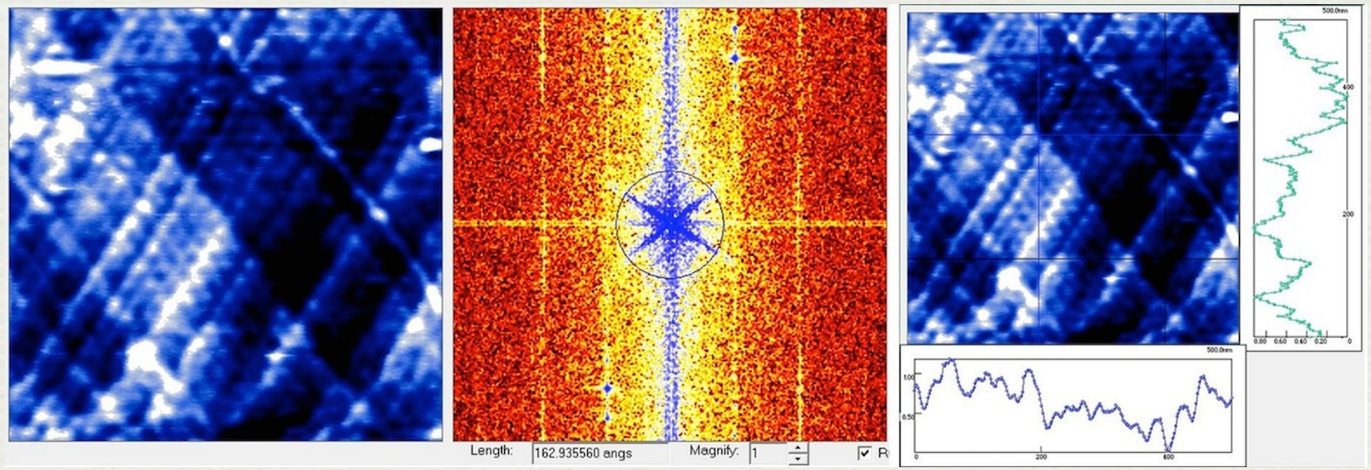
A comprehensive set of image processing & analysis tools

Visualisation: De-slope, noise reduction, Fourier transform, a variety of filters and 3D rendering.

Analysis: Line profiling, height histogram, roughness estimation, volume/perimeter calculation, island number counting, etc



Line profiling of Pt thin film deposited on silicon wafer.
Heights: 1 ~ 2 nm / Diameters: 40 ~ 70 nm



Two-dimensional Fourier transform of the triangular steps on Au (111) surface

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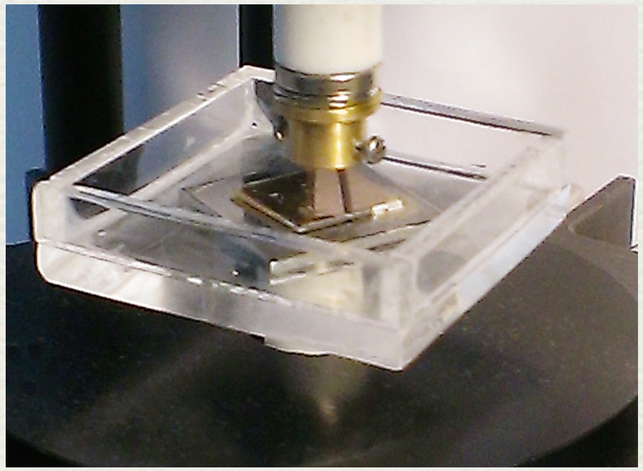
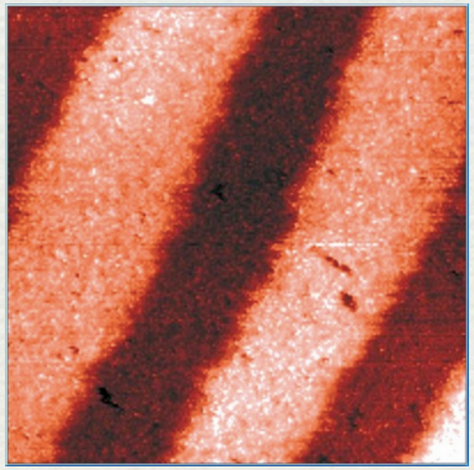
In-liquid scan with a liquid cell

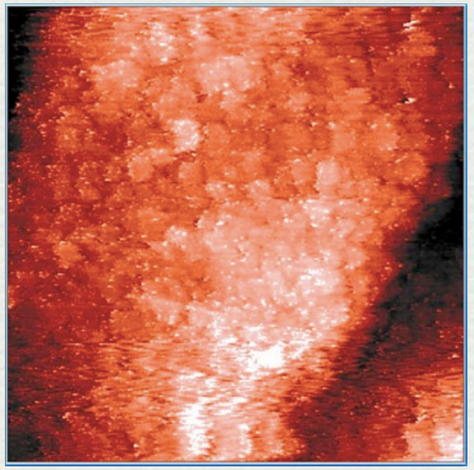
In-liquid imaging is useful for wet chemistry and electrochemistry. The procedures are the same as the in-air scan except the use of the liquid cell as the sample holder and the use of the insulated tip. The following scans are proceeded in the deionised (DI) water.



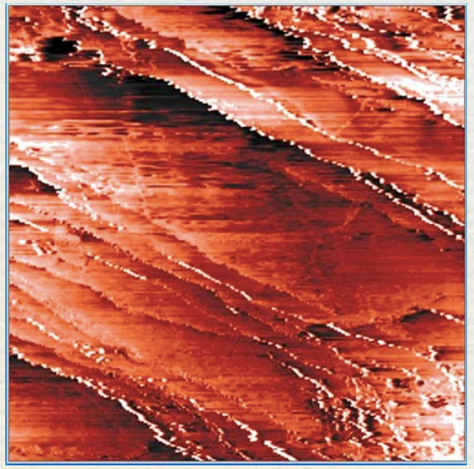
Sample in the liquid cell



Gold particles on DVD surface
1600 nm X 1600 nm
850 mV / 5.9 nA



Gold particles on DVD surface
560 nm X 560 nm
550 mV / 3.8 nA



Atomic-scale graphite steps
1500 nm X 1500 nm
560 mV / 5.1 nA

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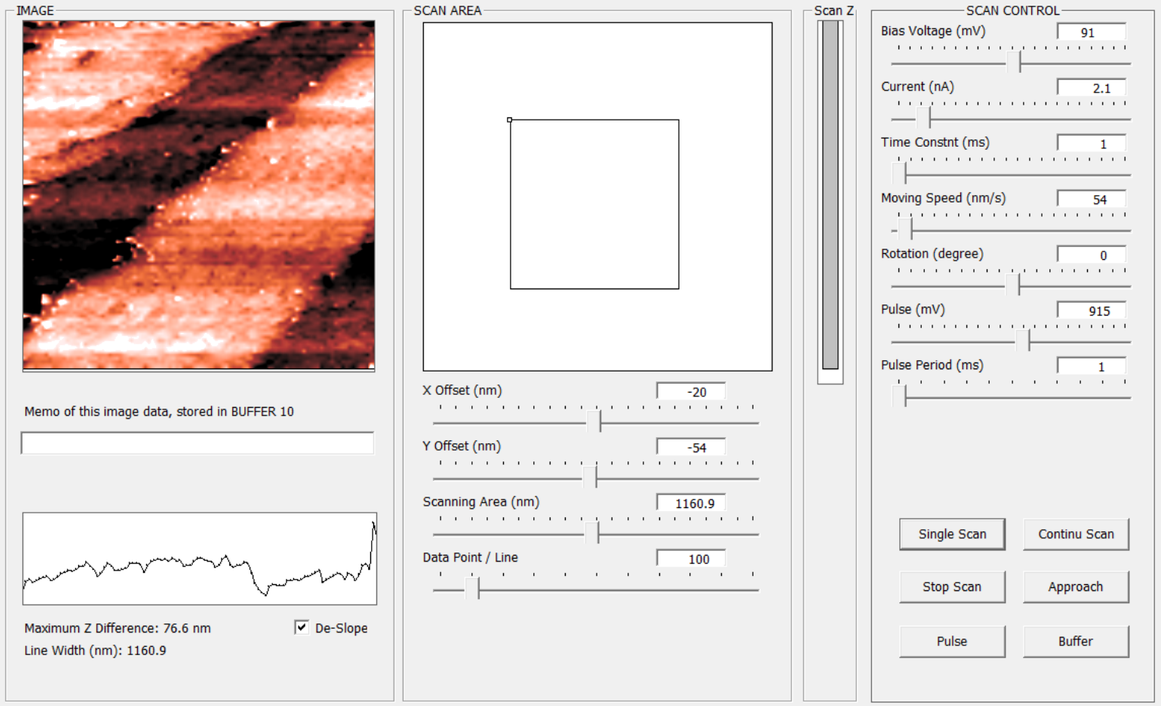
Scanning Tunnelling Spectroscopy



Prescan for STS
Low data points & quick scan settings
Scan area: 1160 nm X 1160 nm

STS (I-V Curve) Procedures:

(1) Make a first scan

(2) Pin the points for measurement

(3) Adjust the voltage range

Intuitive scanning control interface:

(1) Scan area, direction & data points

(2) Bias voltage, set current & scan speed

(3) Automatic tip-to-surface approach

(4) Real-time image processing & line profiling

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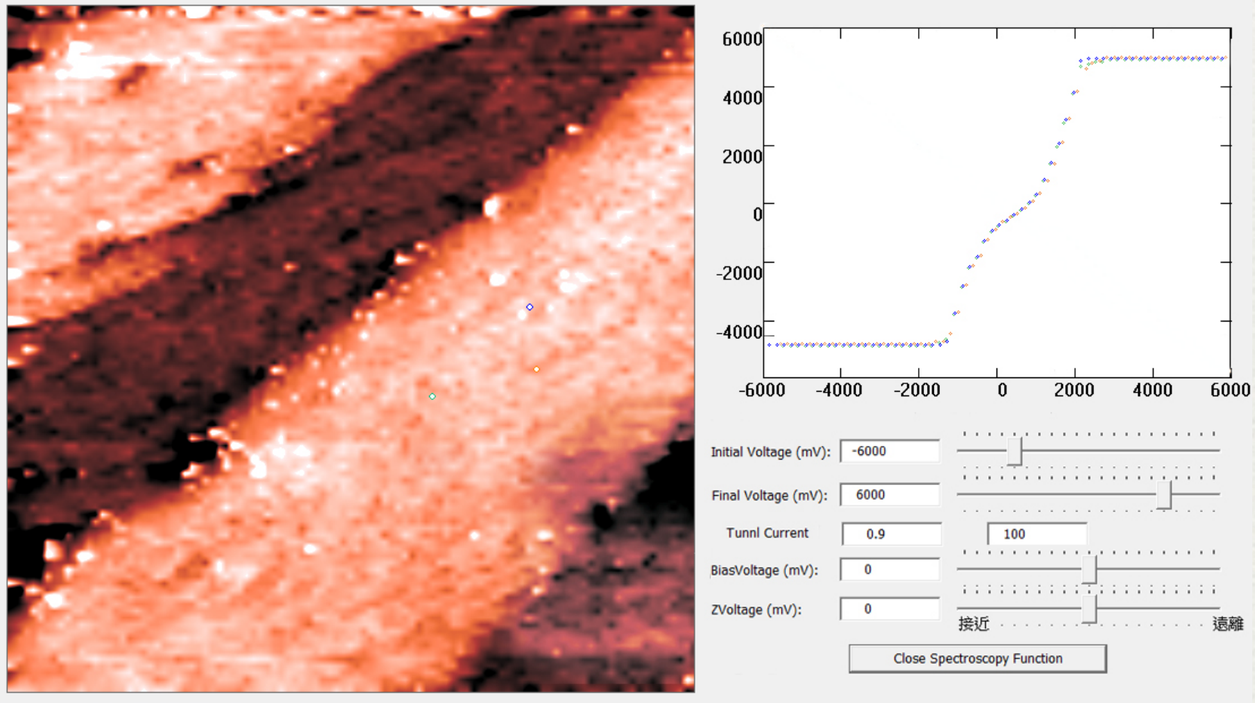
Scanning Tunnelling Spectroscopy



STS Panel

Three points were selected for measurement (marked in different colours). Three I-V curves are obtained with the voltage range from - 6000 mV to + 6000 mV.

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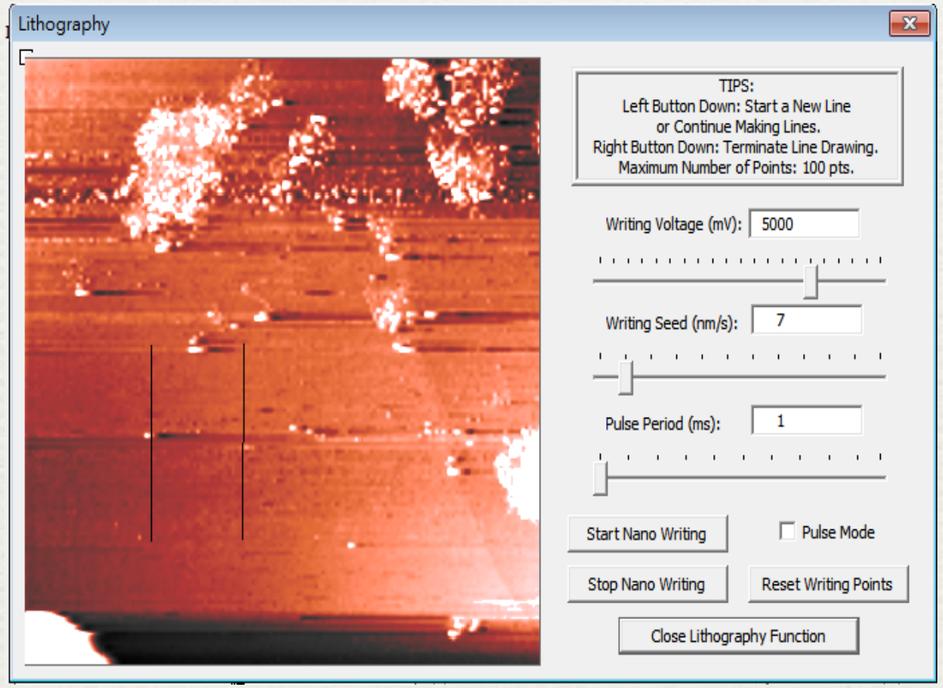
Nano-lithography and in-situ rescan



Lithography procedures:

(1) Make a first scan

(2) Draw the paths

(3) Adjust the parameters

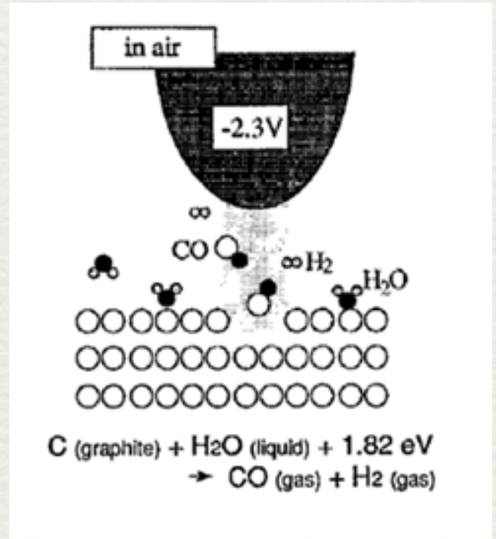
Lithography parameters:

(1) Writing voltage

(2) Writing speed

(3) Pulse Period

Sublimation and chemical reaction induced by tunnelling electrons



S.Kondn, S.Heike, M.Lutwyche and Y.Wada, J.Appl.Phys. 78(1), 155(1995)

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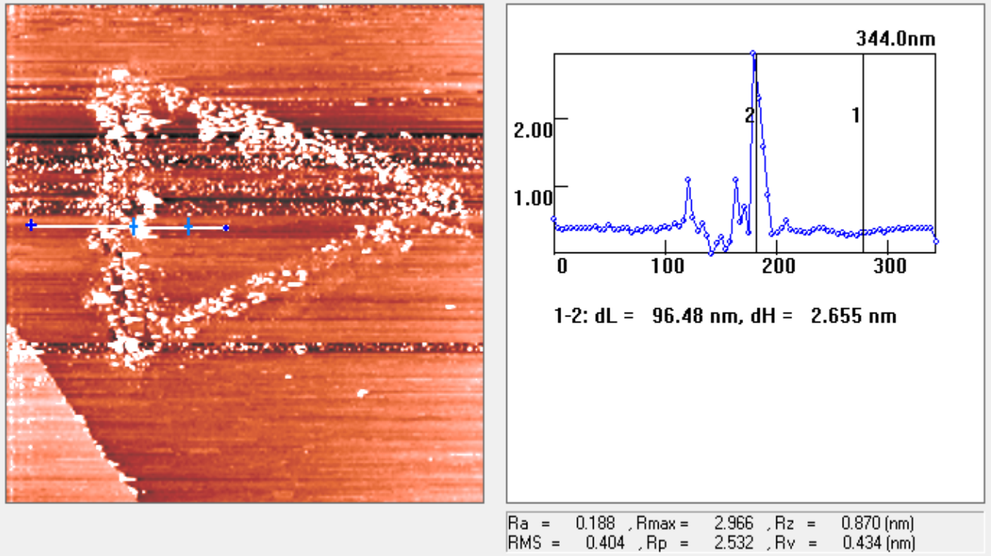
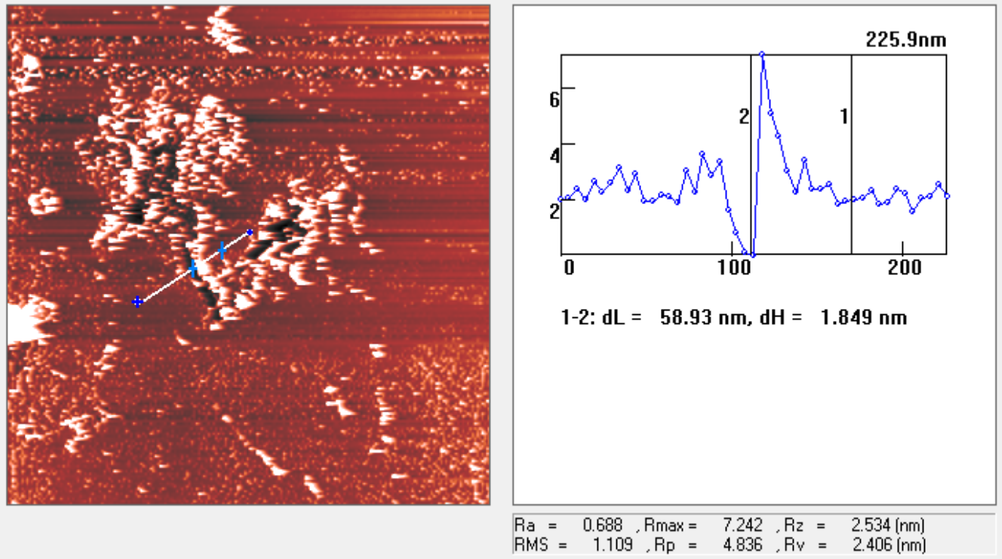
Nano-lithography and in-situ rescan

Writing paths:



Raised triangle formed by atomic emission
Writing speed: 5 nm/s
Scan area: 800 nm X 800 nm



Two concave grooves etched on graphite surface
Scan area: 600 nm X 600 nm
Width: ~ 20 nm Depth: ~ 2 nm

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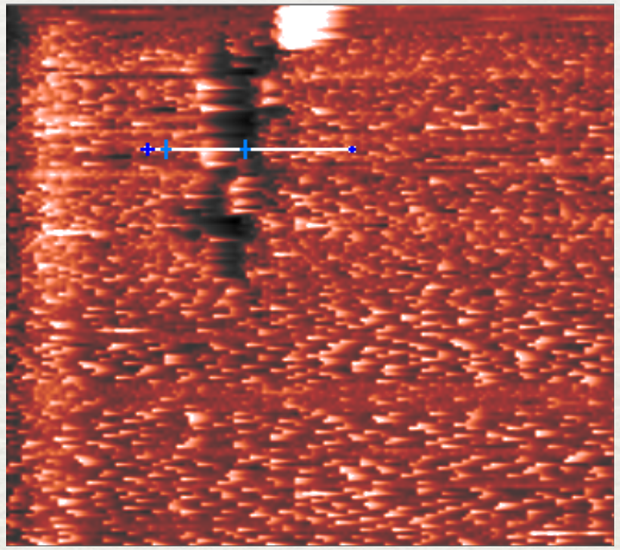
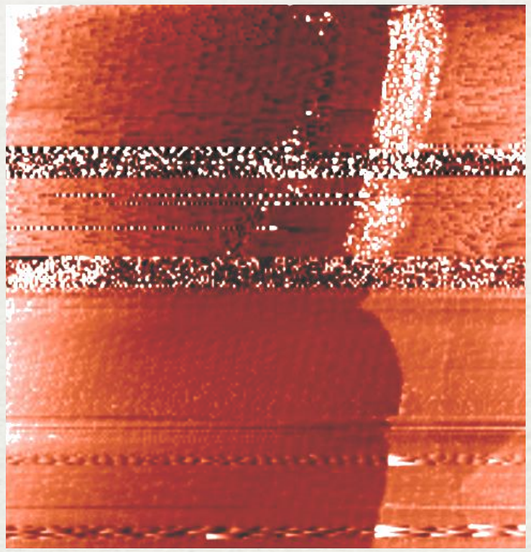
Real-time tip restoration



The noises or blurry images may indicate the tip is damaged. Replacing the tip result in the missing of the current scan area.



The first band of the white dots (noises) indicates the tip apex was degraded. With the real-time tip restoration function, the image quality of the graphite surface was improved immediately, and noticeably.

Tip restoration is important to in-situ rescan after lithography, where the tip is more susceptible to degradation due to the high voltage pulses.

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Application

APPLICATION

* Nanotechnology, Surface Materials,
* Electrochemistry, Wet Chemistry,
* Physics, Molecular Electronics,
* Optoelectronics, Semiconductor,
* Pre-test prior to UHV STM scan,
* Training prior to UHV STM operation

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