PicoLITH, Agilent Lithography and Nanomanipulation Package

Data Sheet

Features and Benefits

- CAD-style drawing program offers user-friendly interface for easy operation
- Ability to design and save shapes for reuse helps conserve time and effort
- Ability to control parameters such as force or probe bias increases utility
- Ability to work "on-the-fly" or through scripts provides enhanced flexibility
- Move-tip tool provides real-time lithography
- C/C++, Labview, MATLAB, Python scripting enables custom, programmable lithography
- Seamless integration with Agilent's AFM systems

Additional Capabilities

- Micro-machining via force variations
- Nano-patterning via probe bias and EC etching
- Nano-writing via surface potential controlled deposition and modification

Overview

Agilent's lithography and nanomanipulation software is a CAD-style package that provides a nanolithography tool for scanning probe microscopy (SPM) researchers. It allows users to sketch various shapes on a canvas (including lines, poly-lines, circles, and boxes) that can then be mapped to a real sample surface. Individual shapes can be assigned a unique set of parameters. Each parameter set is associated

with a color for easy visual reference. Accessible parameters include force, probe bias, sample bias or potential, and probe speed. As shown in Figure 1, a user-friendly interface enables the user to edit parameters and segment properties, such as start and end points and the order of execution. The software offers users the ability to cut and paste predesigned shapes to assist in the building of more complex patterns. Once designed, shapes can be reused in future experiments and are easily resized.

Move-Tip Tool Applications

The move-tip tool provides a complete set of functions for nanomanipulation. With numerous parameter settings, such as force set-point or tip bias, the user can inscribe a line, inscribe a pattern, or manipulate particles in real time. (See Figures 2 and 3.)

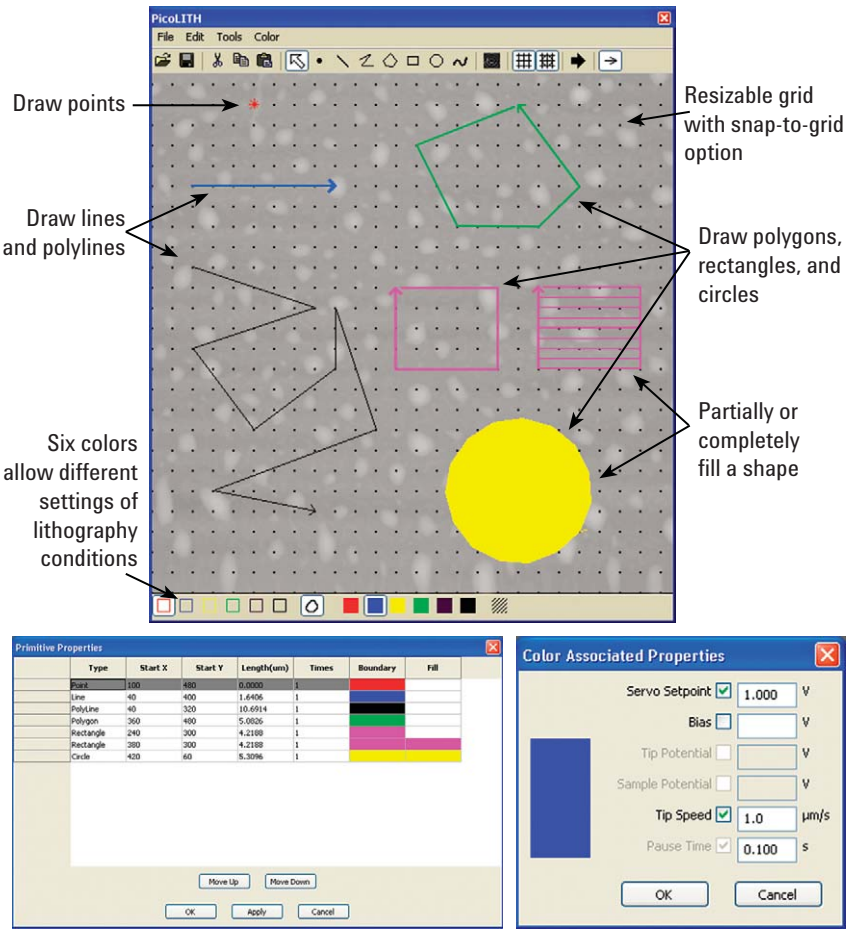

Figure 1. PicoLITH design canvas (top) over a grey-scale AFM image, primitive property window (left), parameter settings window (right).

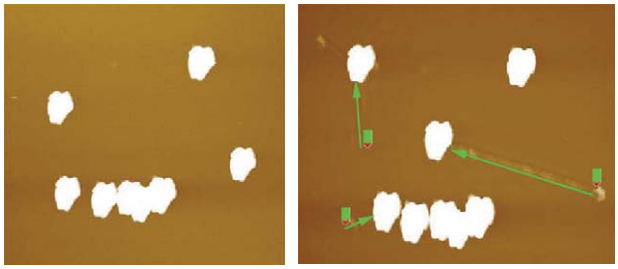

Figure 2. Making a smiling face with gold particles on a mica surface. Scan size: 2.5 µm x 2.5 µm.

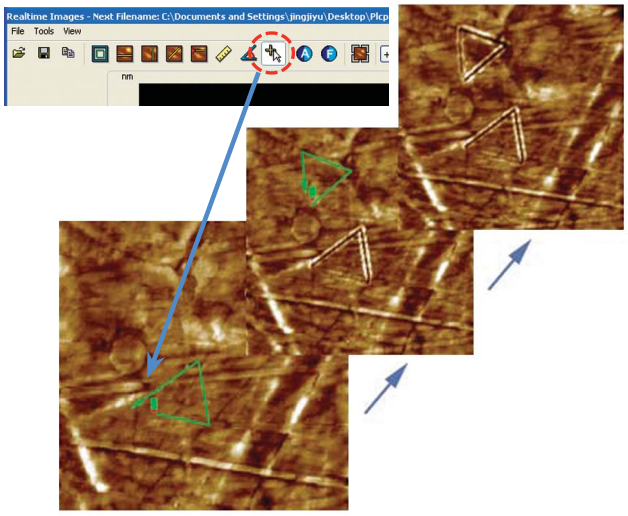

Figure 3. Sequence of drawing triangles on CD blank surface. Green lines indicate the path of the tip movement in contact mode. Images are taken in AAC mode. Scan size: 5.5 µm x 5.5 µm.

Applications

Agilent AFM Systems come with a 32–32 bit Windows XP-based software package that incorporates scripting capabilities. Scripting allows the user to program most of the functions in the microscope software and define special sequences of desired action. By combining Agilent's closed-loop scanners and stages with scripting capability, the user is provided with a unique scripting tool for lithography applications. With predefi ned parameter settings (including STM/AFM tip bias, force set-point, and more), scripting makes drawing a line or a circle on the sample surface a straightforward procedure (Figure 4).

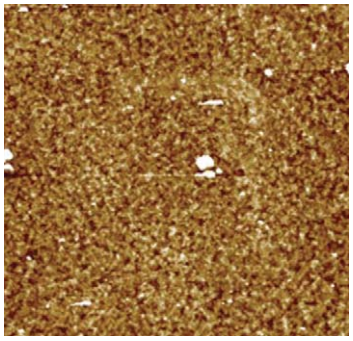

Figure 4a. AAC mode topography image of PZT film.
Scan size: 14 µm x 14 µm.

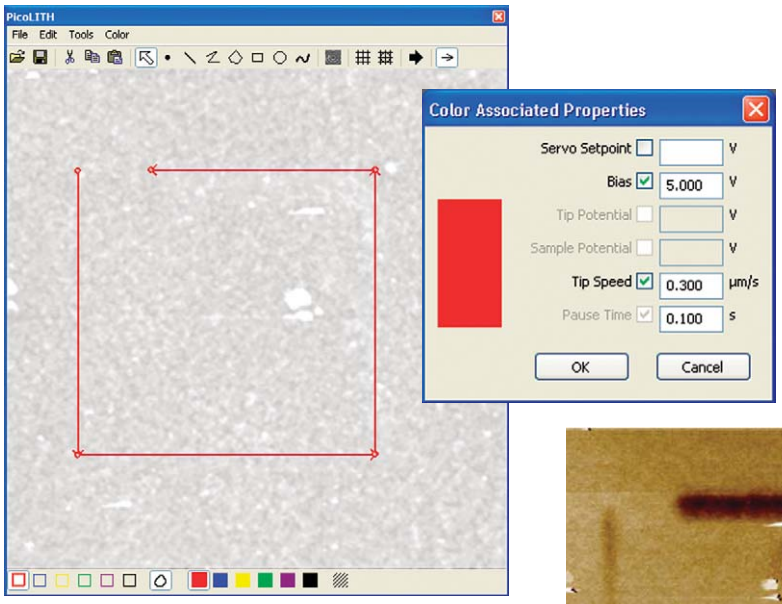

Figure 4b. Using Agilent's lithography and manipulation software to write with tip bias (left). Drawing and parameter setting (right).

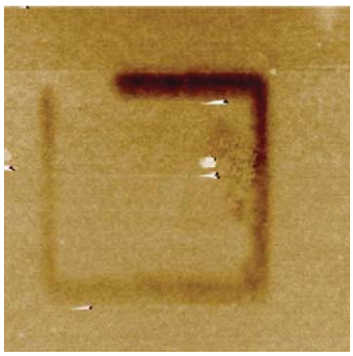

Figure 4c. EFM image after writing.
Scan size: 14 µm x 14 µm.

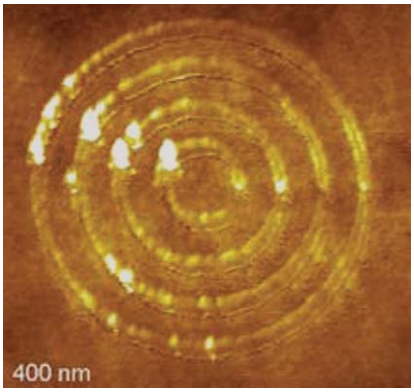

Figure 5. Drawing circles on PMMA film.
Scan size: 2.5 µm x 2.5 µm.

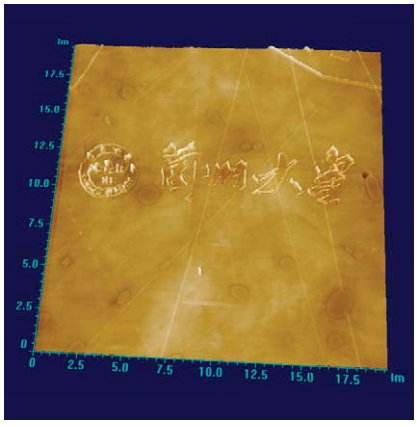

Figure 6. Drawing of Langzou University logo.

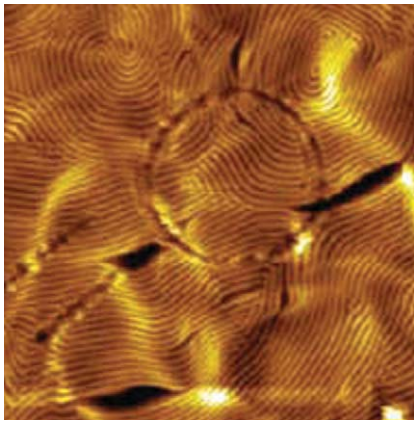

Figure 7. Inscribing a circle and lines on a polymer film by increasing the tip-sample interaction force. Scan size: 5 µm x 5 µm.

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