Keysight PicoLITH, Lithography and Nanomanipulation Package

Data Sheet

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Overview

The Keysight Technologies' Inc. 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.

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 Keysight'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

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.)

Applications

Keysight 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 Keysight's closed-loop scanners and stages with scripting capability, the user is provided with a unique scripting tool for lithography applications. With predefined 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).

Draw points
Resizable grid with snap-to-grid option
Draw lines and polylines
Draw polygons, rectangles, and circles
Partially or completely fill a shape
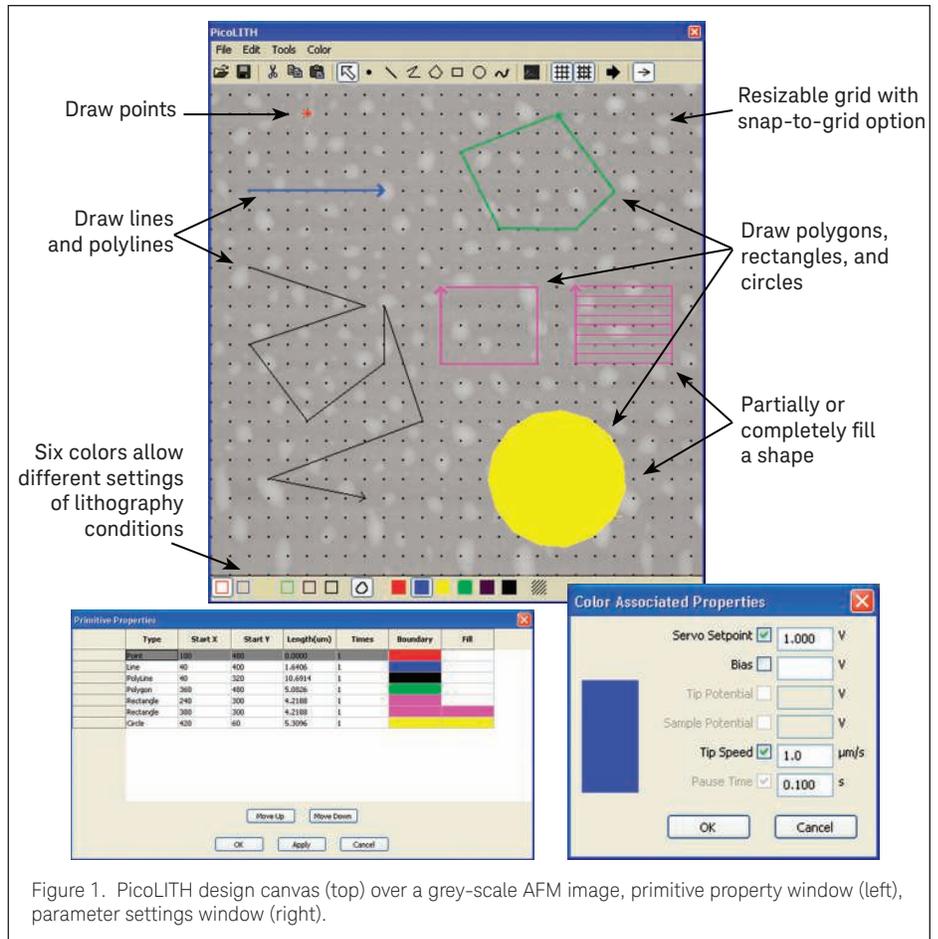Six colors allow different settings of lithography conditions

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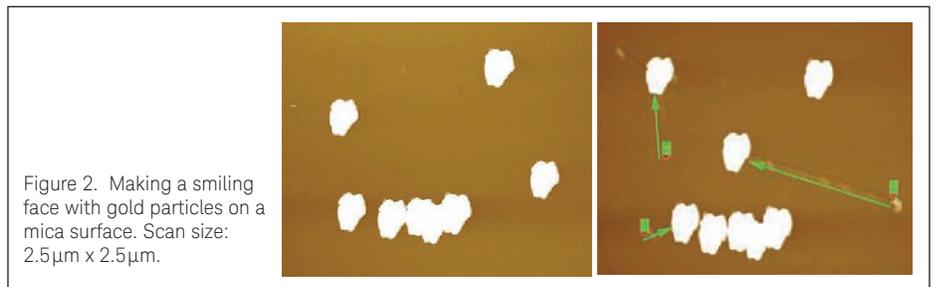

Figure 2. Making a smiling face with gold particles on a mica surface. Scan size: 2.5µm x 2.5µm.
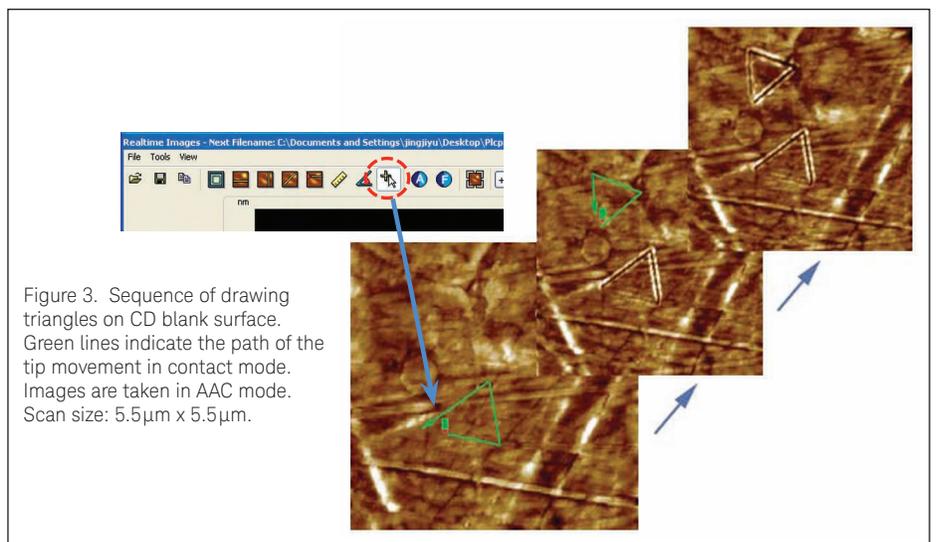

Figure 3. Sequence of drawing triangles on CD blank surface. Green lines indicate the path of the tip movement in contact mode. Images are taken in AAC mode. Scan size: 5.5µm x 5.5µm.
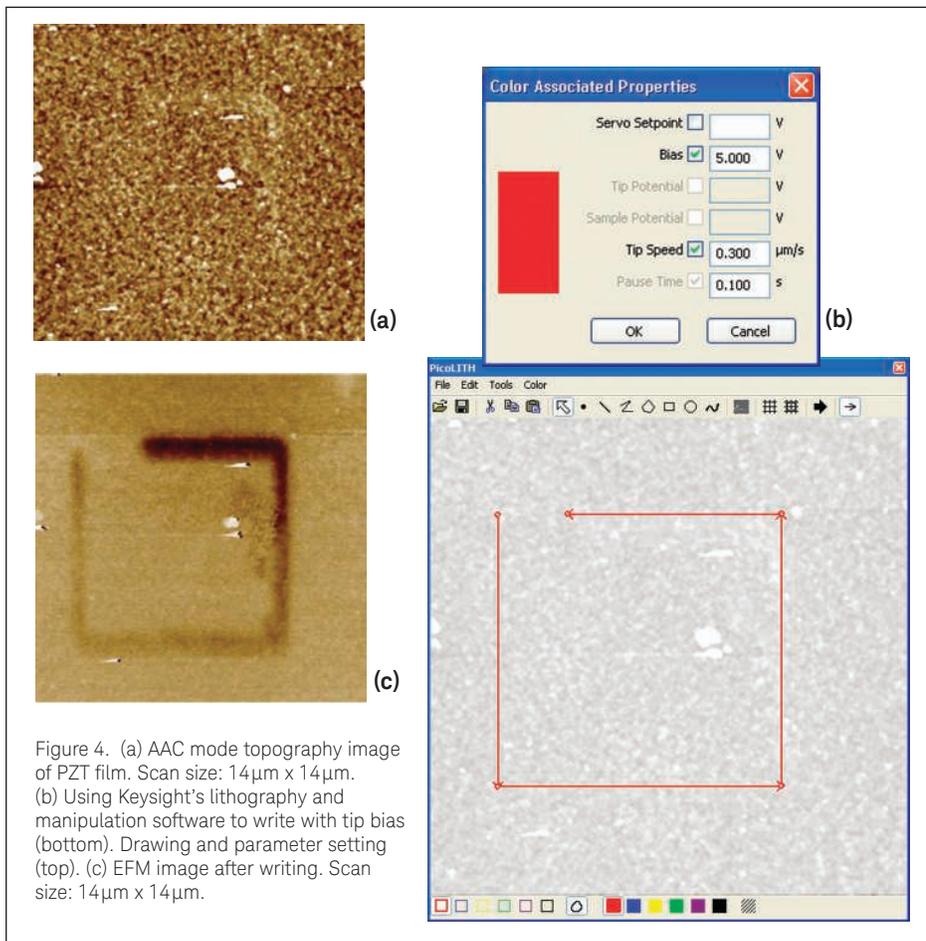
Figure 4. (a) AAC mode topography image of PZT film. Scan size: 14µm x 14µm. (b) Using Keysight's lithography and manipulation software to write with tip bias (bottom). Drawing and parameter setting (top). (c) EFM image after writing. Scan size: 14µm x 14µm.
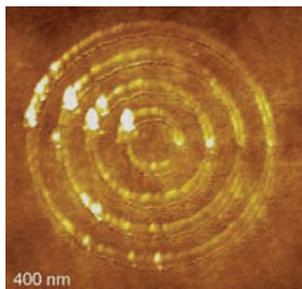

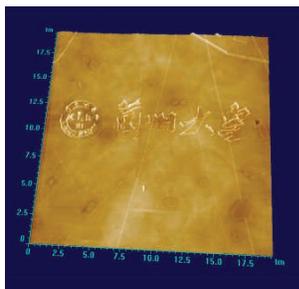Figure 5. Drawing circles on PMMA film. Scan size: 2.5µm x 2.5µm.

Figure 6. Drawing of Langzou University logo.

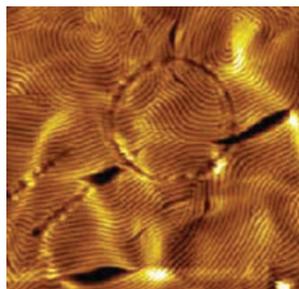Figure 7. Inscribing a circle and lines on a polymer film by increasing the tip-sample interaction force. Scan size: 5µm x 5µm.

AFM Instrumentation from Keysight Technologies

Keysight Technologies offers high precision, modular AFM solutions for research, industry, and education. Exceptional worldwide support is provided by experienced application scientists and technical service personnel. Keysight's leading-edge R&D laboratories are dedicated to the timely introduction and optimization of innovative, easy-to-use AFM technologies.

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