Etched Silicon Structures Metrology – NonContact Mode

Sample:
Top: Etched Si (111) with etch angle 54.7 degrees
Bottom: Etched Si Structure

Image Conditions:
True Non-Contact

System Requirement:
Closed-loop AFM System, Decoupled XY and Z Scanners, High Flatness XY Scanner.

The Benefits
The key factors effecting angle measurement are:
- the orthogonality of the scanners used to image the sample,
- half cone angle of cantilever tip, and
- system drift.

The decoupled XY and Z scanner design minimizes artifacts resulting in enhanced wall angle measurement repeatability.

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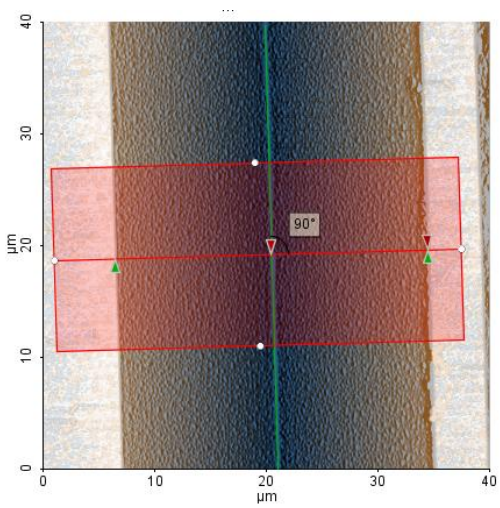
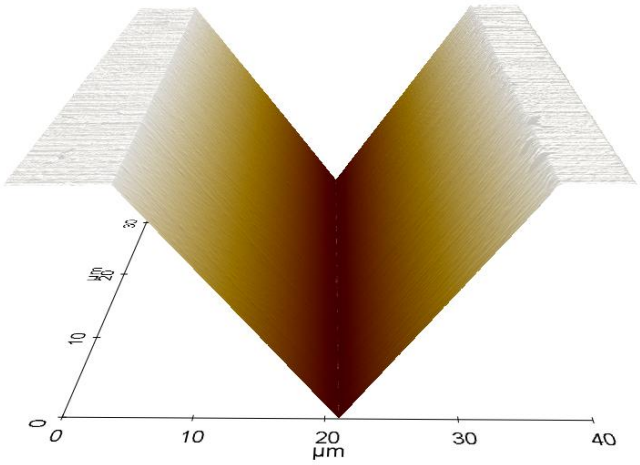
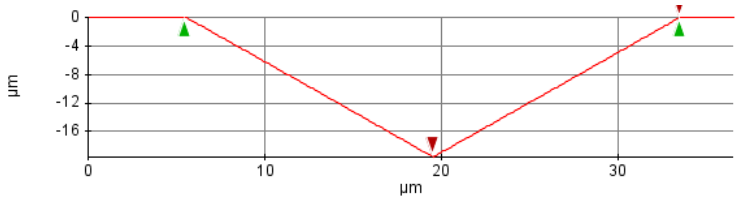
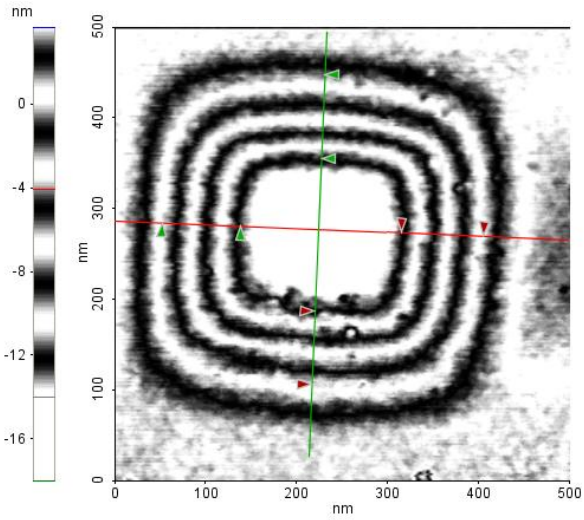
With the increasing shrinkage of device sizes, the characterization of thin films and their structures becomes critical to optimizing the resulting device at the end of line. For example, CD etch variation is directly related to the angle of the resist profile. In the images below, the strength of the XE-series instruments to measure wall angles is demonstrated.

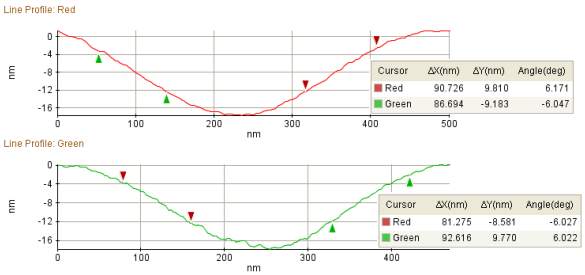






The etch angle between Silicon (111) and (100) is 54.7 degrees. The measured etch angle of the silicon structure is approximately 54.6 degrees.





The measured angle of the etched silicon holes shows a consistent angle on all sides. Very low angle measurements, such as these, can be measured with confidence using the high flatness scanner of the XE series AFM.