

Hints, Tips and Solutions

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Q. What kinds of Optical Lithography can ATHENA Model ?

A. ATHENA's *Optolith* module is designed to simulate the 3 basic lithography technologies; contact printing, proximity and projection lithography. The imaging calculations within *Optolith* are flexible enough to handle all three situations. Optolith is based upon a solution of the Helmholtz equation for media with complex refractive indices and the Beam Propagation Method [1]. This allows Optolith to take account of both diffraction effects and any non-linear local optical properties of the resist material.

To illustrate proximity printing with ATHENA a simulation is performed of the simple mask shown in Figure 1. The mask is composed of two elbows and a contact hole. The critical dimensions of the mask layers are 1um.

The distance between the surface of the mask and the optical system is varied from between 0.2 and 0.8um in 0.2um steps. Figure 2 shows the light intensity distributions for the 4 values. It is very clear from the light intensity contours that as this distance is increased the exposure of the photoresist is significantly degraded.

References

1. "New Model for Simulation of Exposure Process in Complex Nonplanar Resist-Substrate Structures", Simulation Standard, Vol. 11, No. 8, 2000.

Q. Can ATHENA easily create a trench with angled sidewalls?

The Athena ETCH command has been augmented to allow angled sidewalls to be etched geometrically. The

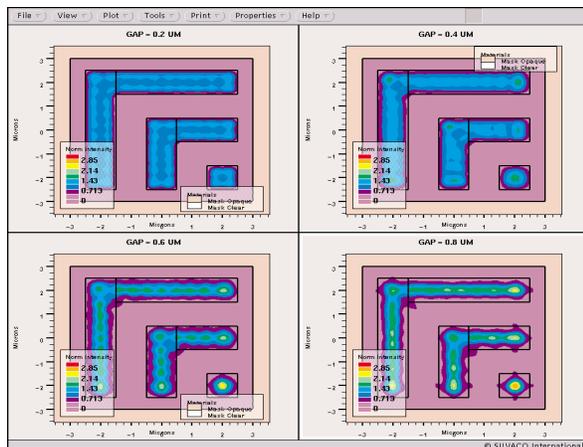


Figure 2. Simulated light intensity distribution for four GAP values between the mask and the projection system.

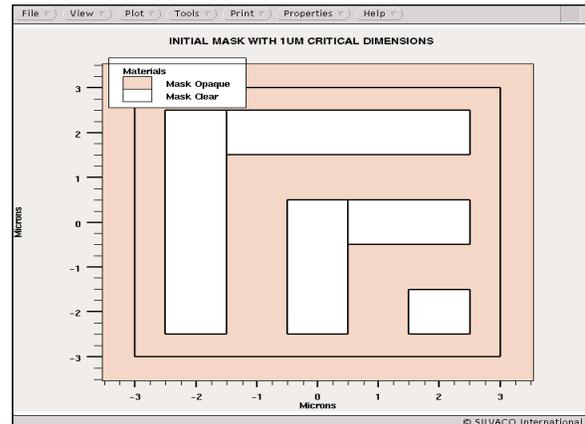


Figure 1. Simple test mask of two elbows and a contact hole.

following command will etch a 0.4um deep trench with a sidewall angle of 89 degrees.

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ETCH SILICON THICKNESS=0.4 ANGLE=89
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Figure 3 illustrates the result of this command on a structure where a 0.1um window has been opened to the silicon surface.

NOTE: These features have been implemented into version 5.6.0.R of ATHENA. If you wish to upgrade please contact your Silvaco representative or email support@silvaco.com directly

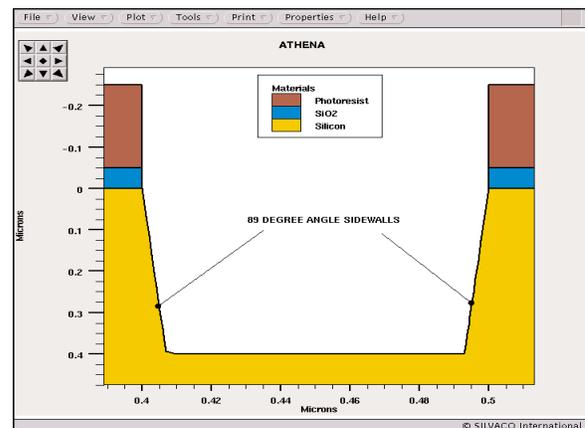


Figure 3. The ETCH command has been used to create a trench with a predefined angle to the sidewalls.

Call for Questions

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