Lab Course UV-Lithography

Proximity Printing

\[ R = b_{\text{min}} = \frac{3}{2} \sqrt{\frac{\lambda}{s + \frac{z}{2}}} \]

\( S = 8 \, \mu m \)

\( \lambda = 405 \, \text{nm} = 0.405 \, \mu m \)

\[ R = \frac{3}{2} \sqrt{0.405 \, \mu m (8 \, \mu m + \frac{2 \, \mu m}{2})} = 2.86 \, \mu m \]

\( z = 2 \, \mu m \)

Siemens star

- Resolution of printing device can be measured by the diameter \( d \) of the blurred region:

\[ R = \frac{2\pi r}{\# \text{segments}} = \frac{\pi d}{\# \text{segments}} \]

\( d = 0.3 \times D \)

\( d = 0.15 \times D \)
Image Reversal resist (Group 2)

Siemens star:

\[ d = 33.9 \, \mu m \]
\[ \# \text{segments} = 72 \]

\[ R = \frac{2\pi r}{\# \text{segments}} = \frac{\pi d}{\# \text{segments}} \]

\[ R = \frac{\pi (33.9 \, \mu m)}{72} \]

\[ R = 1.48 \, \mu m \]
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Image Reversal resist

lines and spaces:

- \( b_{\text{min}} = 1 \, \mu m \)
- Patterns until 1 \( \mu m \) were homogeneous, at 0.7 \( \mu m \) the edge thickness increased
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Image Reversal resist

lines and spaces:
• not resolved for $b = 0.7 \mu m$,
  • At $0.7 \mu m$, the resolution was still resolved but the edges showed higher thickness
Image Reversal resist
(after Lift-Off)

lines and spaces:
- $b_{\text{min}} = 1 \, \mu\text{m}$
- Defects were observed only at $2 \, \mu\text{m}$

Wagner / Meyners
Image Reversal resist (after Lift-Off)

Siemens star:
diameter of distortion

\[ d \ (54 \ \mu m) \]
\[ \# \ segments = 72 \]

\[ R = \frac{2\pi r}{\# \ segments} = \frac{\pi d}{\# \ segments} \]

\[ R = \frac{\pi (54 \mu m)}{72} \]

\[ R = 2.36 \ \mu m \]
Image Reversal resist (after Lift-Off)

Siemens star: diameter of distortion

\[ d \ (54 \ \mu m) \]
\[ \# \text{ segments} = 72 \]
\[ R = \frac{2\pi r}{\# \text{ segments}} = \frac{\pi d}{\# \text{ segments}} \]

\[ R = \frac{\pi (54 \ \mu m)}{72} \]

\[ R = 2.36 \ \mu m \]