Micro/Nanosystems Technology

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Lab Course UV-Lithography

Proximity Printing

\[ R = \frac{3}{2} \sqrt{0.44 \cdot 10^{-6} \left(8 \cdot 10^{-6} + \frac{2.3}{2}\right)} \approx 3 \mu m \]

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

Exposure parameter:

- Proximity mode (gap: 8\( \mu \)m)
- Intensity: 26,67 W/cm\(^2\)
- Time: 1,9 s
- Dose: 50 mJ

Siemens star

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

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

\[ d = 0.3*D \]

\[ d = 0.15*D \]
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Tone of resist (Group 1): positive resist

Siemens star:

- dark: resist
- light: uncovered

\[ d = 116.3 \, \mu m \]
\[ \Rightarrow R = 5.07 \, \mu m \]
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Positive resist

- $b_{\text{min}} = 7 \mu m \triangleq$ resolution limit
- good pattern fidelity for 7 µm
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Positive resist

lines and spaces:
• not resolved for $b = 5 \mu m$
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Positive resist / after Lift-Off

dark: resist
medium: thin layer of Cr
light: Wafer

lines and spaces:
• $b_{\text{min}} = 10 \, \mu m$ with good resolution, $7 \, \mu m$ with bad quality $\rightarrow$ lift-off was not completed
• partial lift-off $\rightarrow$ poor pattern fidelity

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Positive resist / after Lift-Off

Siemens star:
diameter of distortion

\[ d = 162,8 \, \mu m \]
\[ \Rightarrow R = 7,1 \, \mu m \]

→ The resolution gets worse after sputtering of Cr
→ From 5 µm to 7 µm