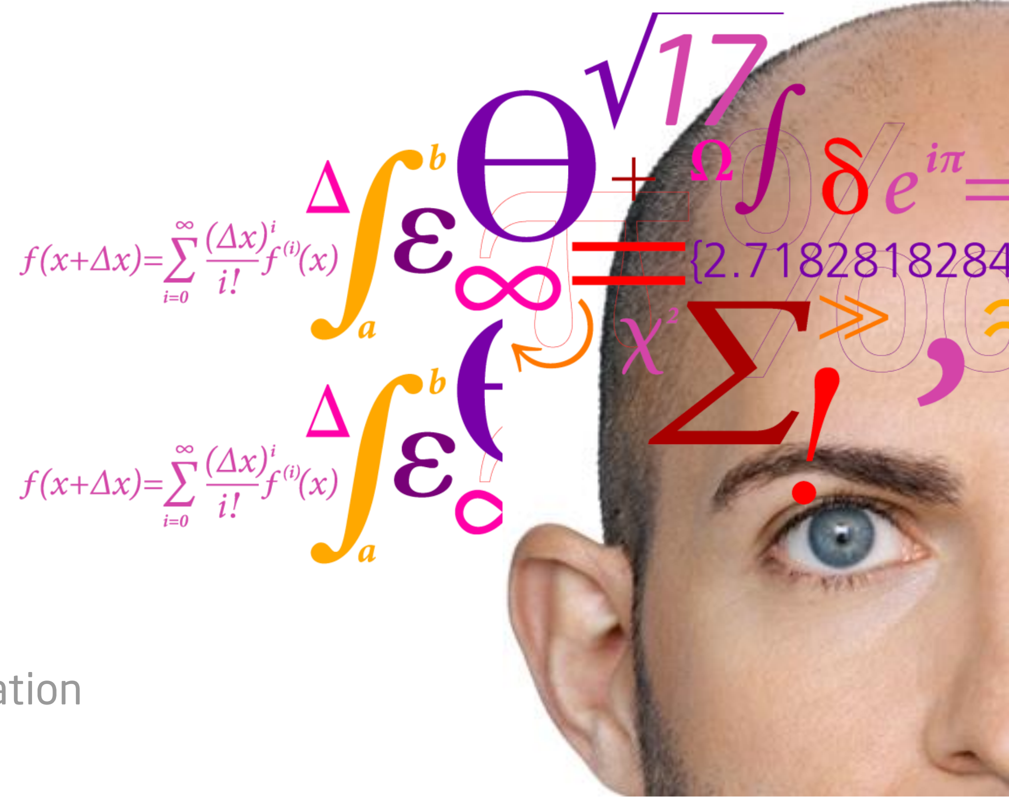
DTU

Lithography Tool Package

Post-processing



DTU Danchip
National Center for Micro- and Nanofabrication

After lithography: pattern transfer

- **Etching**
  - Transfer pattern to substrate or hard mask
  - Wet: liquid chemical, possibly heat
  - Dry: gas, possibly plasma
  - Scumming leads to micro-masking → roughness
- **Lift-off**
  - A thinfilm (usually metal) is deposited on top of the resist pattern
  - Requires directional deposition (non-conformal)
  - After deposition the resist is dissolved, leaving only the part film of the film that was deposited on substrate
  - Scumming leads to poor adhesion/contact
- **Implantation**
  - Selective doping of substrate using accelerated ions

After lithography: post-processing

De-scum

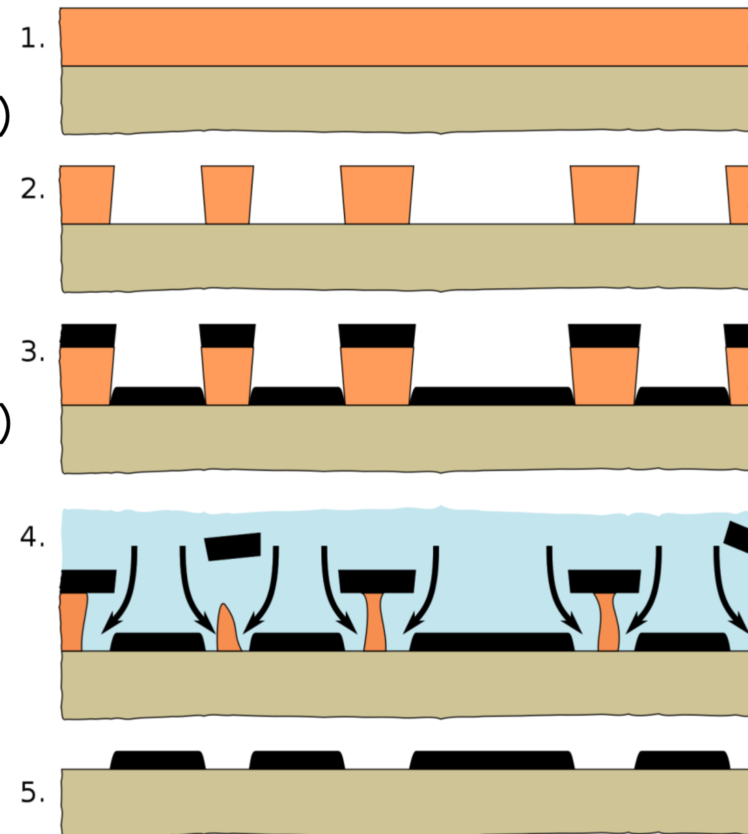
- Before pattern transfer
- Methods:
  - Plasma ashing (low power and short time)
  - BHF (silicon substrate)

Resist strip

- After pattern transfer
- Methods:
  - Plasma ashing (high power and long time)
  - Solvent and ultrasound

Lift-off

- After deposition
- Method:
  - Solvent and ultrasound
  - Best result with negative sidewalls



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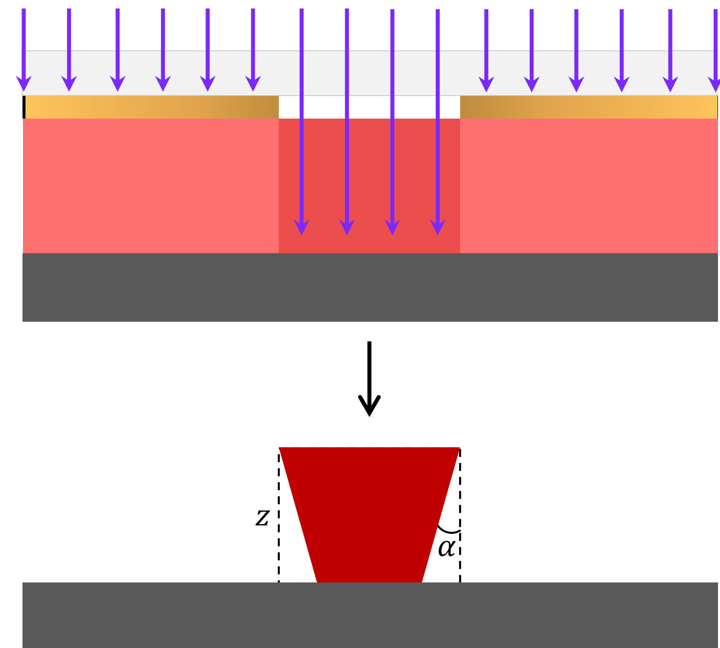
After lithography: exercise

- In contact lithography for lift-off, would the resolution be limited by diffraction, or by the 15° negative sidewall angle of the resist?
- Assume:
  - i-line lithography (λ=365nm)
  - Resist thickness 2µm
  - No gap during exposure



- R_c = 0.91µm
- R_a = 1.07µm (assuming c=0)
- Sidewall angle limits resolution

$$R_c = \frac{3}{2}\sqrt{\lambda\left(\frac{z}{2}\right)}$$

$$R_a = 2z\tan\alpha \ \ (+c)$$