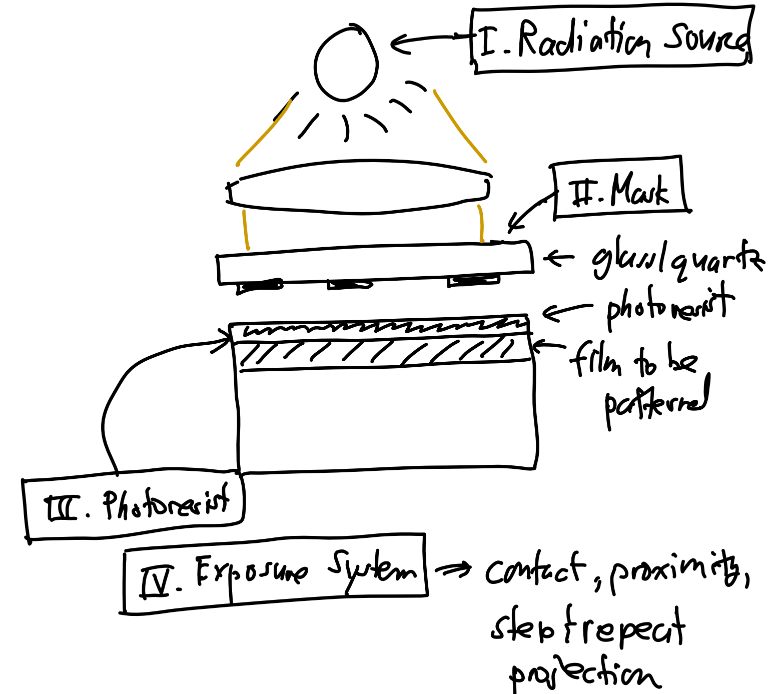
Lecture 8: Lithography II

- Announcements:
  - Next week, Monday is Presidents Day
  - People in the Monday lab section have no lab section next week; rather, they will do next week's lab on Monday the week after
  - This puts them a week behind for the rest of the semester, but really only a few days behind
- -----------------------------------
- Lecture Topics:
  - Four main components of lithography
    - Radiation source
    - Mask
    - Photoresist
    - Exposure system
  - Resolution
  - Linewidth control
  - Alignment accuracy
- -----------------------------------
- Last Time:

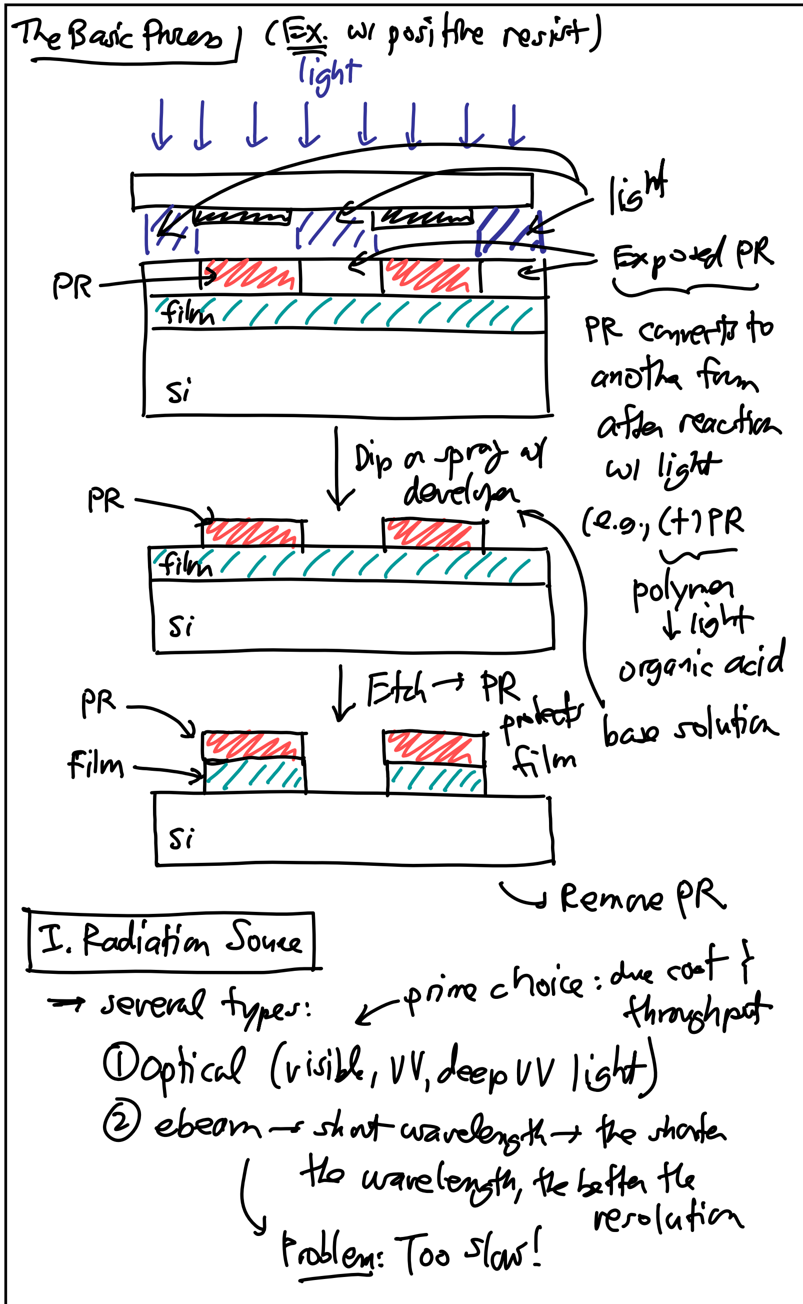
Lithography

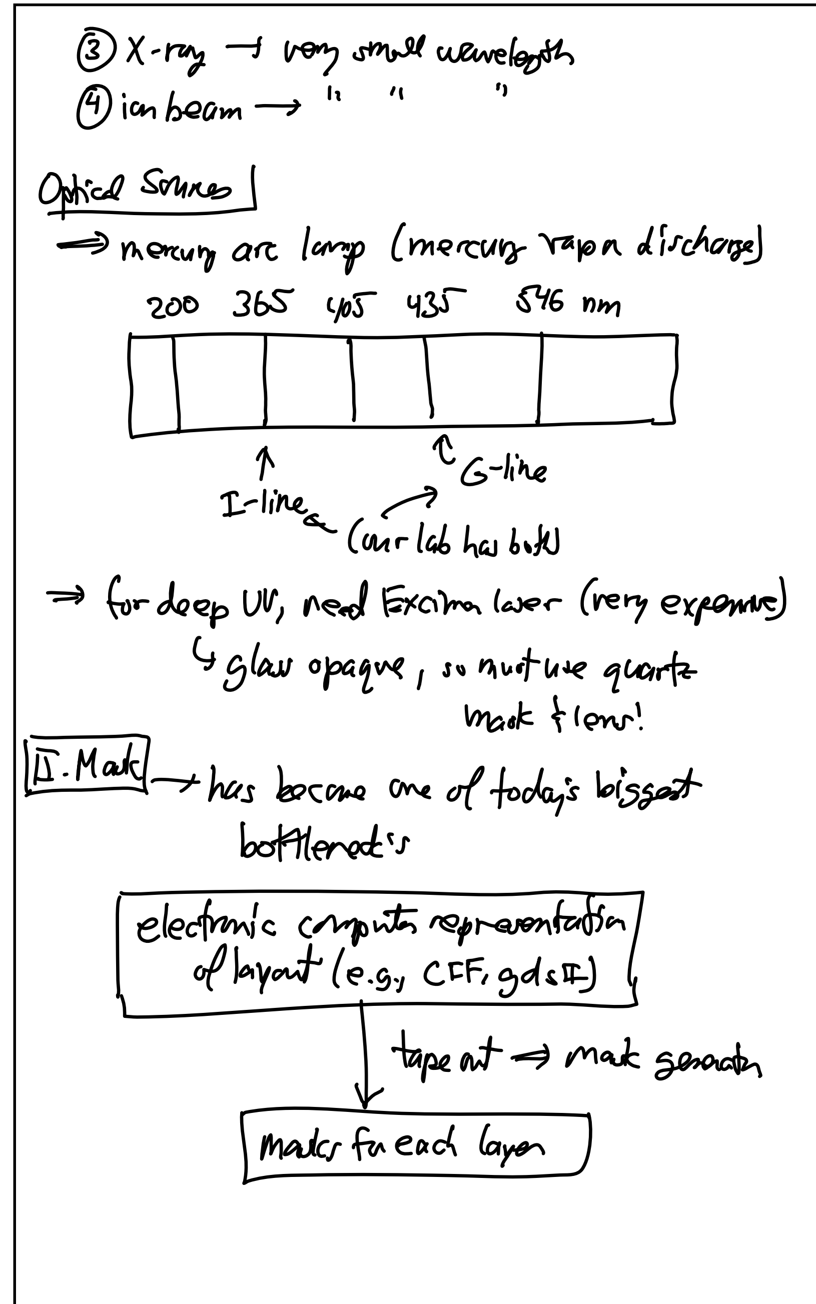
→ method for massive patterning of features on a wafer → pattern billions of devices in just a few steps

Four Main Components: (that affect resolution)



Copyright © 2010 Regents of the University of California





Copyright © 2010 Regents of the University of California

Mask Material -

1. Fused silica (glass) → inexpensive, but larger thermal expansion coefficient (relatively)
2. Quartz → expensive, but smaller TC_f

dF, cF

III. Photoresist (optical)

Two types: 1. negative
2. positive

	Negative	Positive
Exposed Area:	remains	removed

PR, film, Si

↓ Develop

	Negative	Positive
Mechanism:	photoactivation ↓ polymerization (long, linked carbon chains) ↓ developer solvent removes unreacted PR	photoactivation ↓ converts exposed PR to organic acid ↓ developer: alkaline (e.g., KOH) removes acid

interlinked polymer

Disadvantages:

Negative: polymerized PR swells in solvent → bridging problem!

light | light

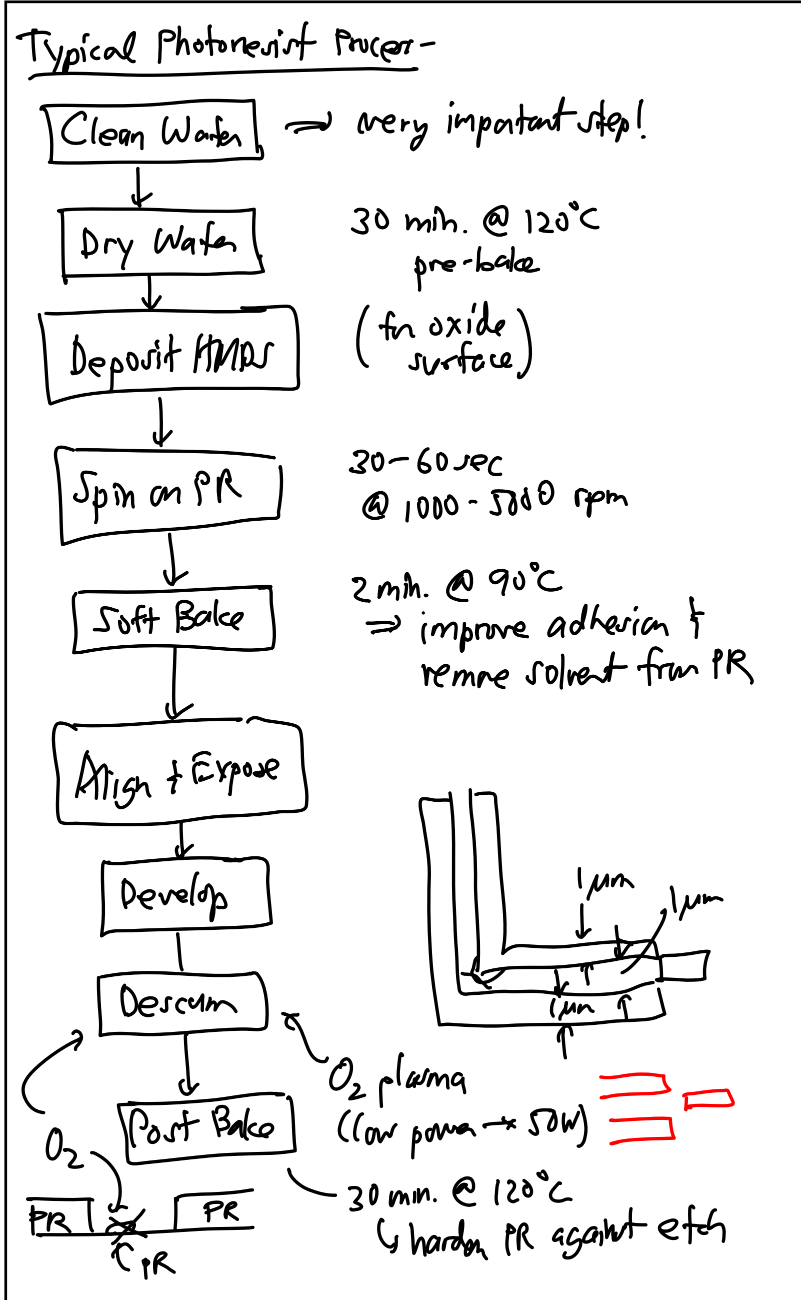
exposed & polymerized

Problem: resolution degraded

Positive: doesn't adhere well to SiO_2
⇒ need primer: HMDS
hexamethyl disilazane

PR, SiO_2, poor adhesion → HMDS → PR, HMDS, SiO_2, adhesion layer

Copyright © 2010 Regents of the University of California



- Go through Module 1, pp. 12-13

Copyright © 2010 Regents of the University of California