

Lecture 6: Process Modules

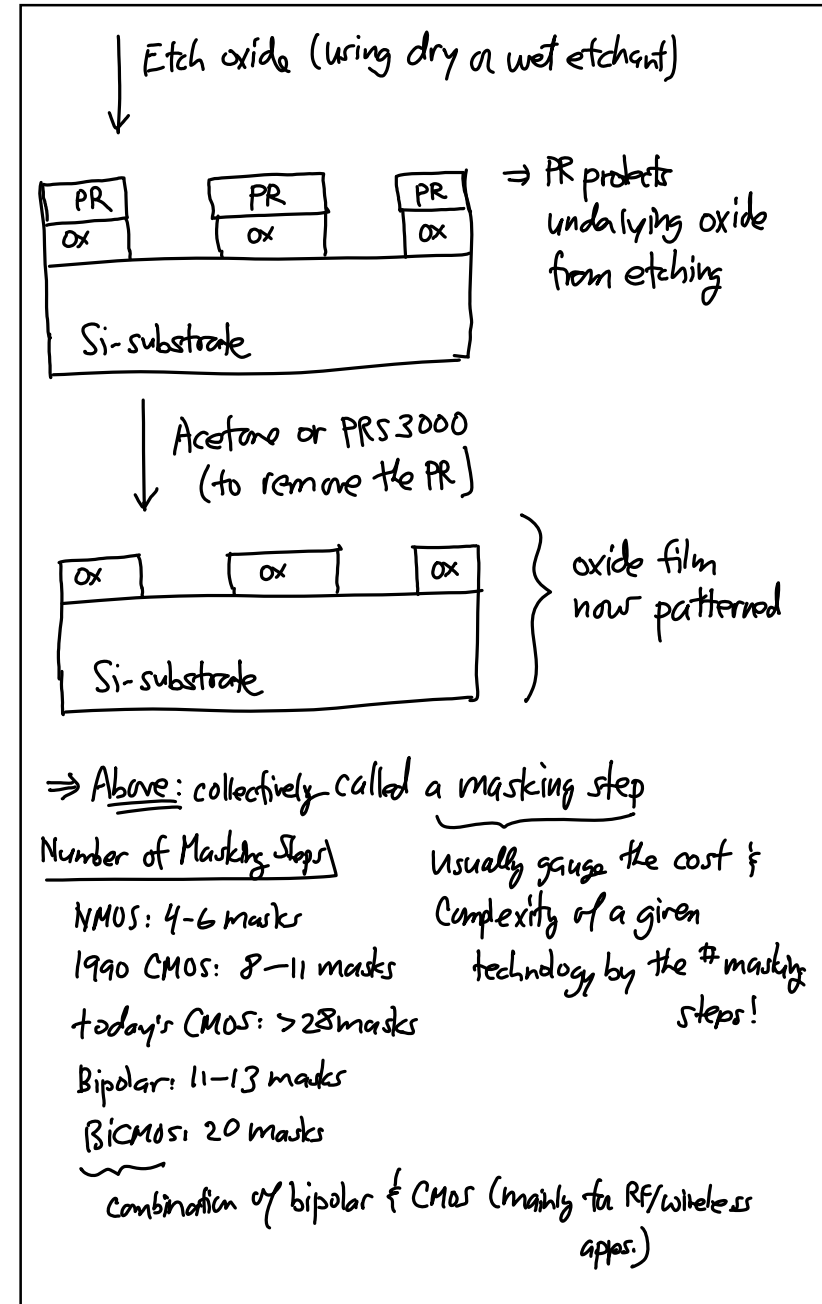
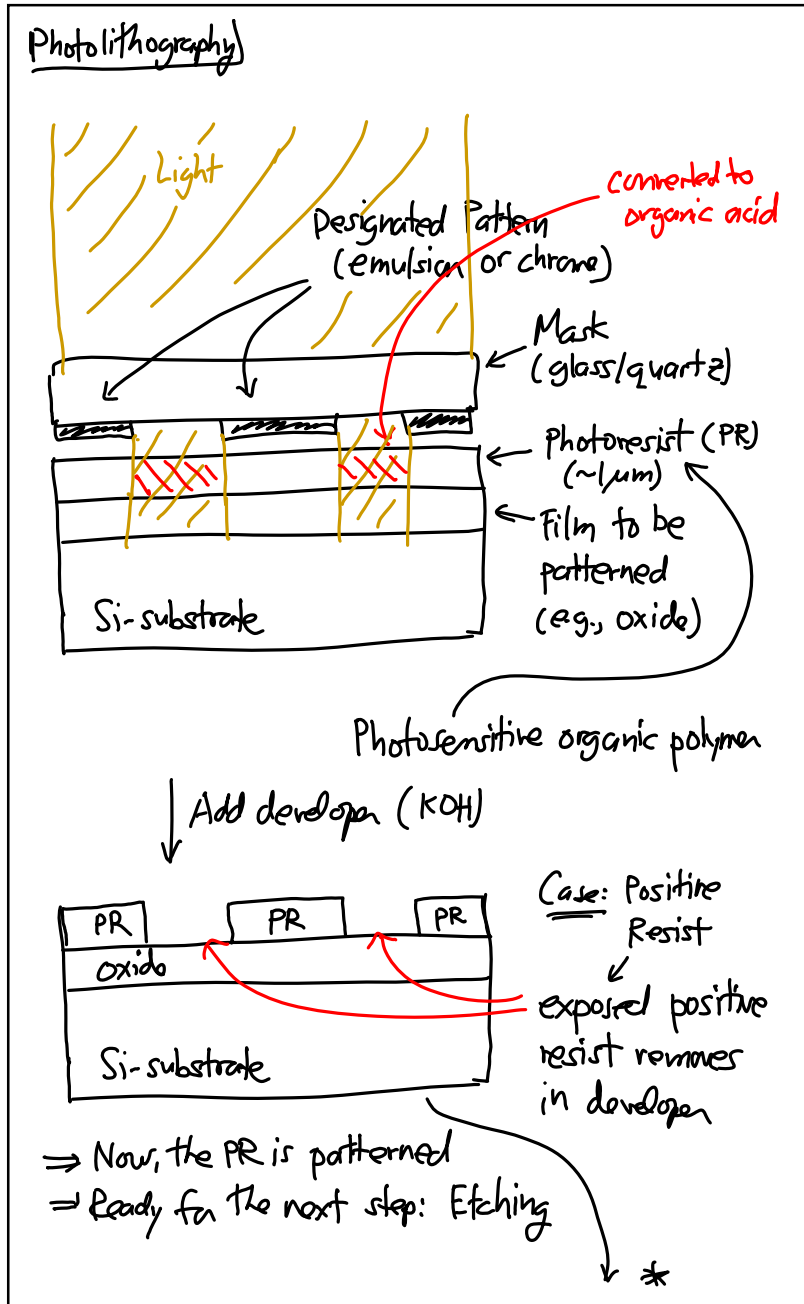
- Announcements:
 - HW#2 will be released today or tomorrow
 - Lecture Modules 3 & 4 on Process Modules online
 - Process Module Details lecture videos have been online
 - ↳ These give more details than I will give in class
 - ↳ Watch these if your background in microfabrication is weak or if you really would like to learn this material for research
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- Today:
 - Senturia, Chpt. 3; Jaeger, Chpt. 2, 3, 6
 - ↳ Example MEMS fabrication processes
 - ↳ Photolithography
 - ↳ Etching
 - ↳ Oxidation
 - ↳ Film Deposition
 - ↳ Ion Implantation
 - ↳ Diffusion
 - Reading: Senturia Chpt. 3, Jaeger Chpt. 11, Handout: "Surface Micromachining for Microelectromechanical Systems"
 - Lecture Topics:
 - ↳ Polysilicon surface micromachining
 - ↳ ...
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- Last Time:
 - Finished Micro Gas Analyzers and Benefits of Scaling
 - Started into Module 3; now continue this

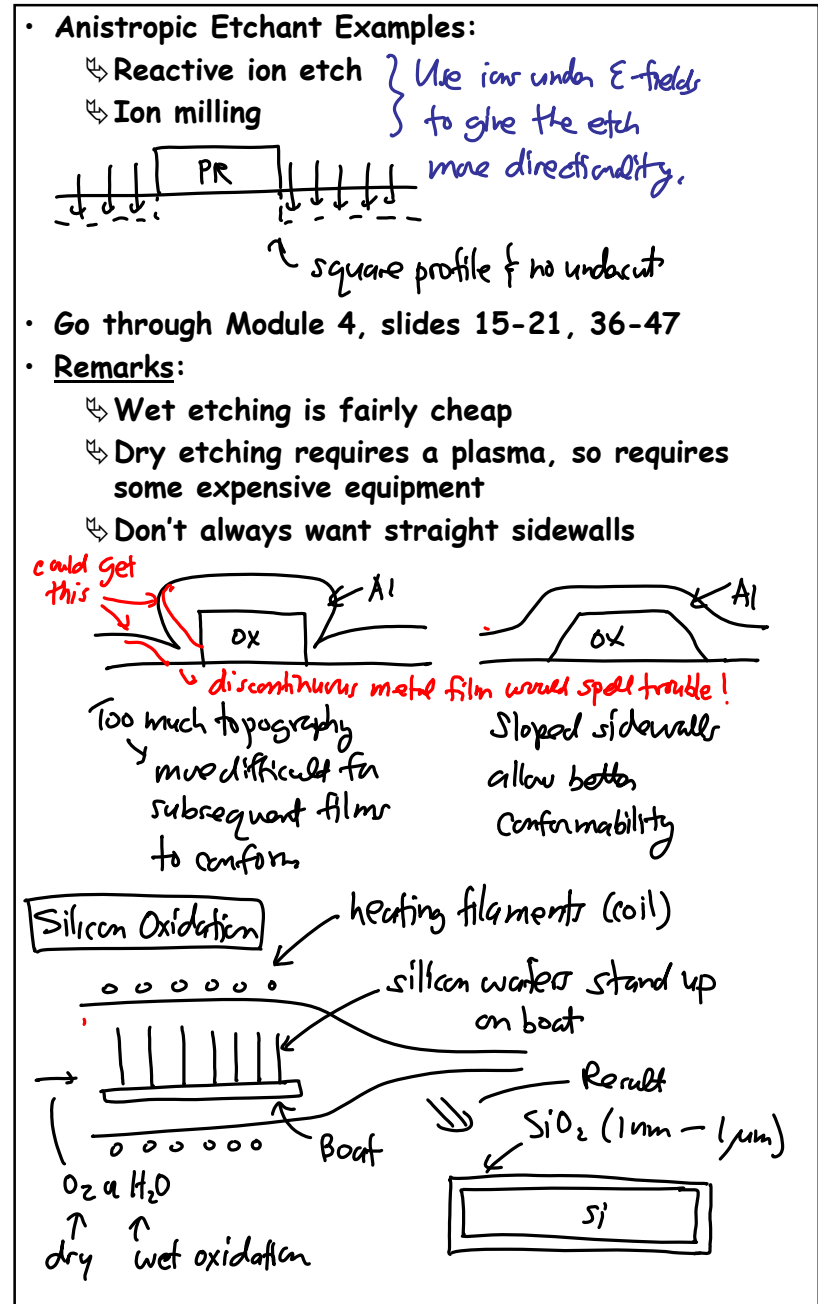
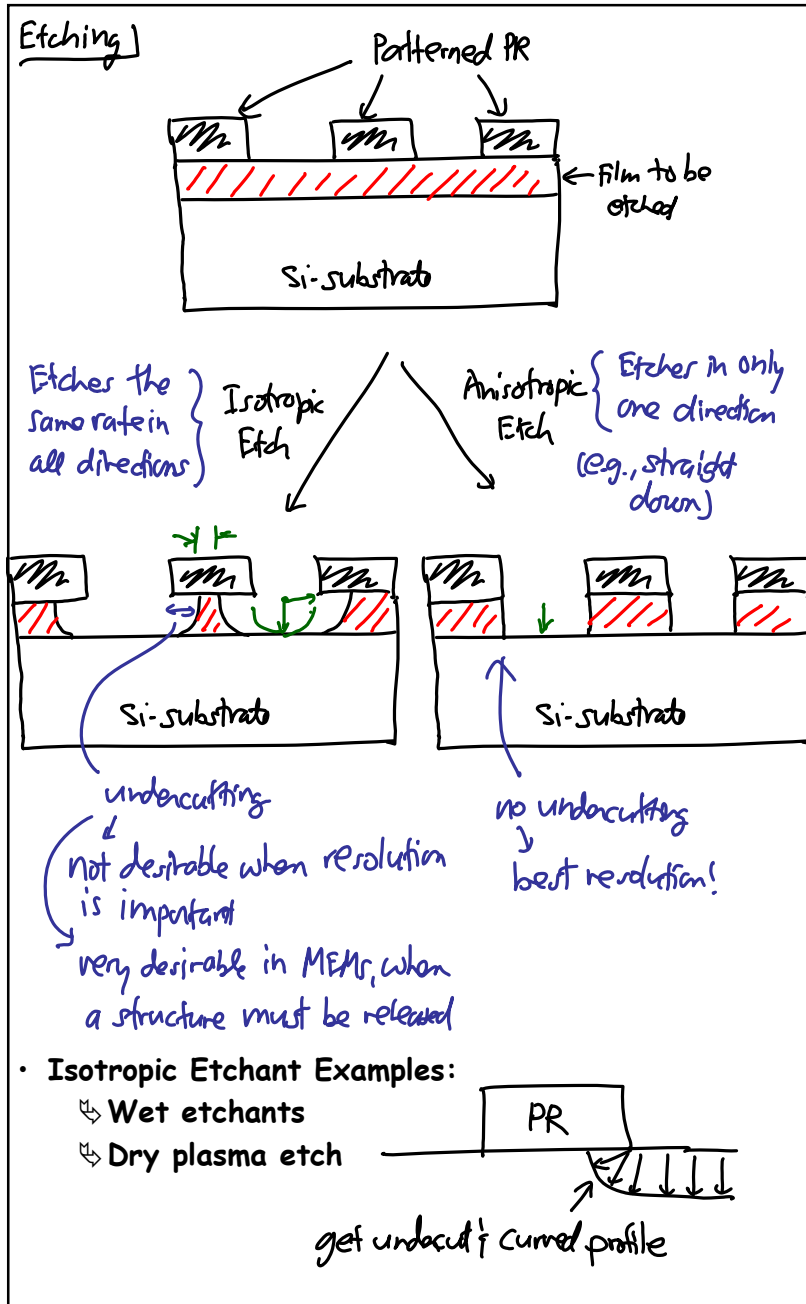
Process Module Overview:

- Lecture Topics:
 - ↳ Photolithography
 - ↳ Etching
 - ↳ Oxidation
 - ↳ Film Deposition
 - ↳ Ion Implantation
 - ↳ Diffusion
- As stated earlier, this is now assumed knowledge
- I will gloss over this material to review it a bit, but will not go over it in detail
- You can watch my lectures from EE245, Fall 2012, on the Webcast Berkeley site for more in depth coverage: Lectures 6-8

Process Modules

- ⇒ there are actually only a few basic modules used for processing
- ↓
- Combination of these in the correct sequence yields an integrated circuit technology that provides transistors, MEMS, nanodevices, etc.
- ⇒ For each module, need to understand:
- ① Physics and engineering of each module in detail.
 - ② Interactions between modules.
 - ③ The effect of each module on the finished device.





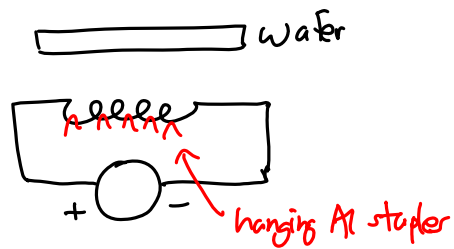
• Remarks:

- ↳ Uniformity can be better than 2% across the wafer from lot to lot
- ↳ Need to flow the O_2 fairly fast in order to minimize reactant losses from the first boat to the last one

Thin-Film Deposition:

- For deposition of films like Al (and other metals), SiO_2 , Si_3N_4 , and polysilicon
- Deposition, not thermal growth

Example: Evaporation



Example: Sputtering

