Today’s Lecture

• Review Metrology Systems
• Quiz 3 – Process Flow / Etching
• Discuss Traveler and Process
• Discuss Front-to-Backside Alignment
• PTE Numbers
Front-to-Backside Alignment

- **Purpose**
  - Backside release etch mask
  - Pressure sensor membranes

- **Equipment**
  - Karl Suss MA-6

- **How it is done**
  - Take picture of the mask
  - Bottom movable objectives allow the topside to be seen
  - Superimpose both images
  - Align
Cross Sections
Deposit and Pattern PR

Etch Nitride to Define Device Structures
Remove PR

CROSS SECTION A-A':

PHOTOLITHOGRAPHY MASK (NITB): Backside Opening Mask

LAYOUT CAPTURE:
Top View Pictures of Last Year’s Devices
Accelerometer

Magnetic Sensor
Magnetic Actuator (unchanged)

Week 3

Week 4

Pressure Sensor (unchanged)

Week 3

Week 4
Alignment Marks

WEEK 3

Etch Holes on Backside Nitride

WEEK 4

TOP VIEW:

CROSS SECTION A-A':

SI SUBSTRATE ~500 µm
SILICON NITRIDE 1 µm
POLYSILICON 1 µm
SILICON NITRIDE 1 µm

3: Front-to-Backside Alignment and Dry Etching
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EE M150L Lecture 3: Front-to-Backside Alignment and Dry Etching

Remove PR

CROSS SECTION A-A':

PHOTOLITHOGRAPHY MASK (NIC1, FIRST TIME): Seed Layer Mask

LAYOUT CAPTURE:
Deposit and Pattern PR

Cross Section A-A':

Deposit Metal (Seed Layer)

Cross Section A-A':
Remove PR and Some Metal

Deposit Conduction Layer
PHOTOLITHOGRAPHY MASK (NIC1, SECOND TIME): Interconnect Mask

LAYOUT CAPTURE:

PHOTORESIST 5 \( \mu \)m

SI SUBSTRATE ~500 \( \mu \)m

SILICON NITRIDE 1 \( \mu \)m

POLYSILICON 1 \( \mu \)m

SILICON NITRIDE 1 \( \mu \)m

CROSS SECTION A-A':

Deposit and Pattern PR

TOP VIEW:

CROSS SECTION A-A':

PHOTORESIST 5 \( \mu \)m

SILICON NITRIDE 1 \( \mu \)m

SILICON NITRIDE 1 \( \mu \)m

SI SUBSTRATE ~500 \( \mu \)m
TOP VIEW: **Remove Conduction Layer over Seed Layer**

CROSS SECTION A-A':

TOP VIEW: **Deposit Metal (Wires)**

CROSS SECTION A-A':
EE M150L Lecture 3: Front-to-Backside Alignment and Dry Etching

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Remove PR

CROSS SECTION A-A':

PHOTOLITHOGRAPHY MASK (NIC2): Proof Mass Mask

LAYOUT CAPTURE:

REGION SHOWN ON TOP AND CROSS SECTION VIEWS
TOP VIEW: Deposit and Pattern PR

CROSS SECTION A-A':

SI SUBSTRATE ~500 µm
SILICON NITRIDE 1 µm
POLYSILICON 1 µm
SILICON NITRIDE 1 µm
NICKEL 5 µm
PHOTORESIST 5 µm

TOP VIEW: Deposit Metal (Proof Mass)

CROSS SECTION A-A':

SI SUBSTRATE ~500 µm
SILICON NITRIDE 1 µm
PHOTORESIST 5 µm
SILICON NITRIDE 1 µm
NICKEL 5 µm
NICKEL 40 µm

EE M150L Lecture 3: Front-to-Backside Alignment and Dry Etching

Remove PR

Remove Conduction Layer
Next Lecture

- **Preparation (Readings):**
  - Read Chapter 4:
    - Section 4.9 (Equipment)
  - Read the traveler
    - for this week on page 118
  - Optional: Jaeger 6.1

- **Lecture:**
  - Quiz 3 – Process Flow / Etching
  - Discuss Traveler and Process
  - Discuss Front-to-Backside Alignment
  - PTE Numbers