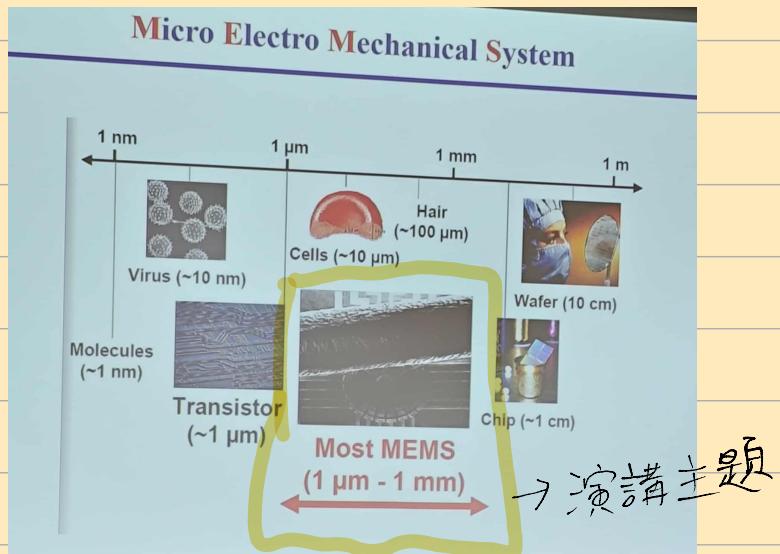


奈微機電系統技術及應用

講者：戴慶良教授

微機電系統 (Micro Electro Mechanical System)



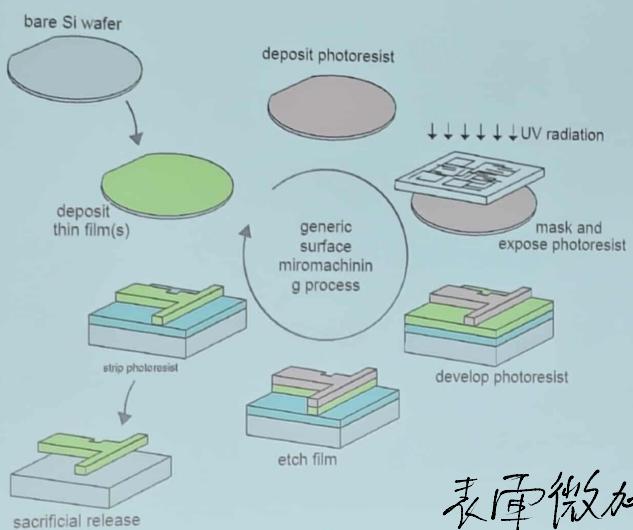
Fabrication (Fab)

*用半導體設備在無塵室進行

* 曝光 → 顯影 → 蝕刻

deposit 薄膜

Surface Micromachining:
deposition, lithography, etching + sacrificial release



表庫微加工

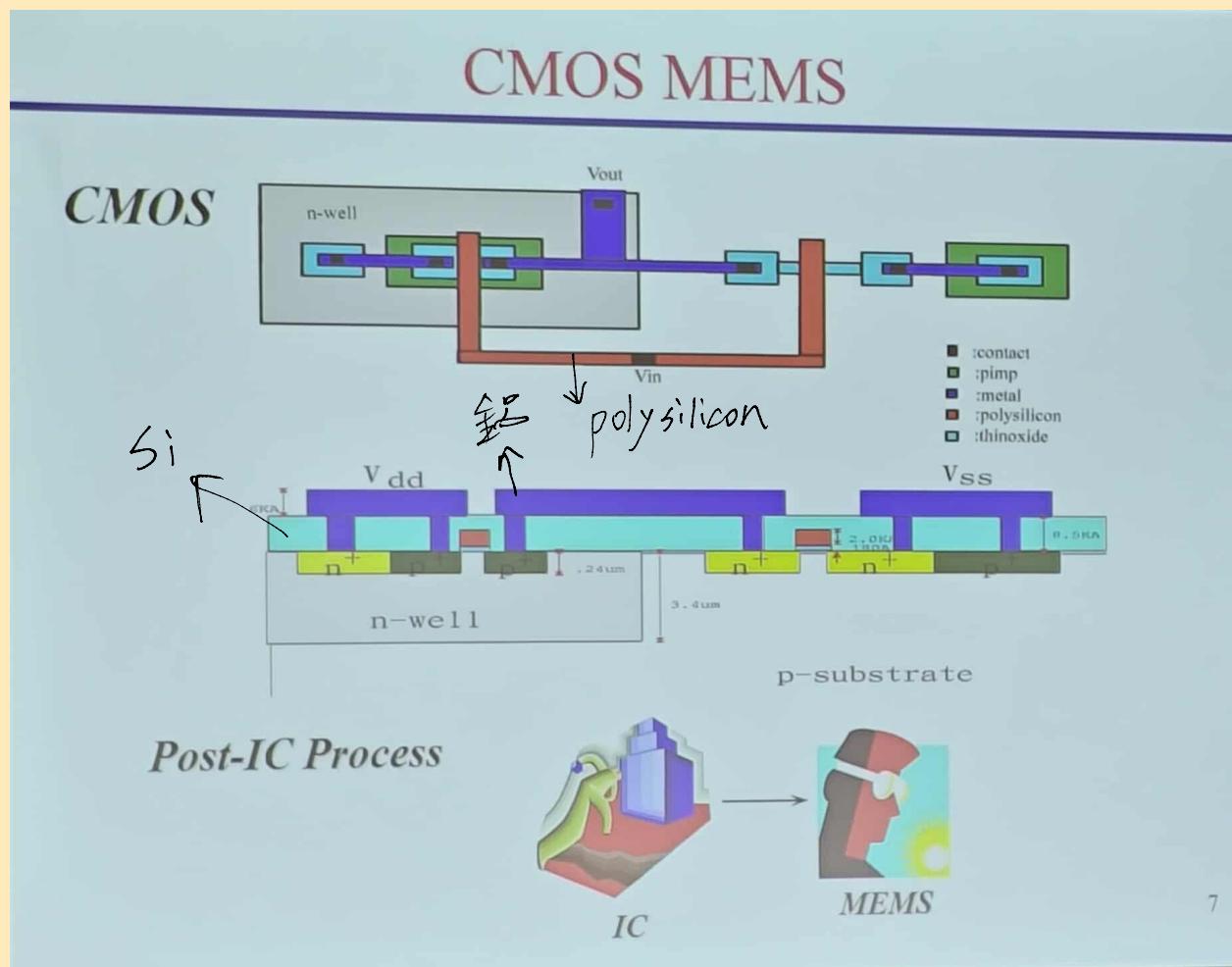
sacrificial release
(比VLSI多這部分)
(懸浮站立)

Bulk Micromachining 餓刻



* CMOS MEMS $PMOS + NMOS \rightarrow CMOS$

自己餓刻 \rightarrow 懸浮 \rightarrow MEMS Device



Accelerometer 加速度器
(電容)

懸浮站立

TSMC 8吋廠

Accelerator meter

電容，有彈簧位移

$$F = ma$$

又是蝕刻

Microstage

+ CMOS-region 都一樣

Gyroscope 陀螺儀感測器

1. 蝕刻 SiO_2

2. 蝕刻 Si

Probe-based data storage

1. 蝕刻 SiO_2

2. 蝕刻 Si

在 Si 中建構磁碟的 pick-up layer

Hall magnetic

又蝕刻 Si

↓ substrate loss

Mirror with comb drives \rightarrow scanner

蝕刻 (製程) \rightarrow 形狀

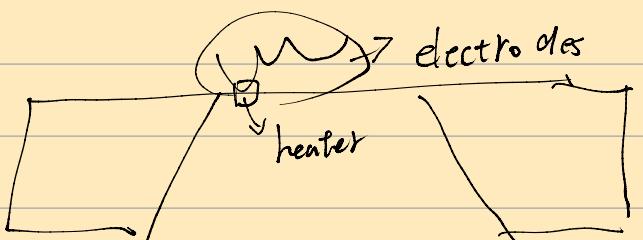
Micro mirror array

Intermolecular force detection

探針 \rightarrow 測量波

Micro hotplate 氣體感測器

工作溫度: 300°C + heater 加熱器



Micromechanical RF switch

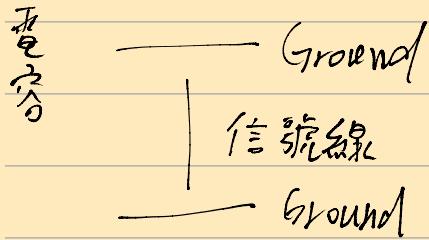
Micro tunable resonator 可調共振器

RF switch

手機通訊

MEMS Poor switching speed
at

Switch [Metal contacting (壽命不太長、金屬接觸面氧化)
電容



Why CMOS MEMS

1. 製程成熟

2. 大量生產

3. 一起整合電容

