New Plasma-assisted Deposition and Etching Capabilities in NUFAB

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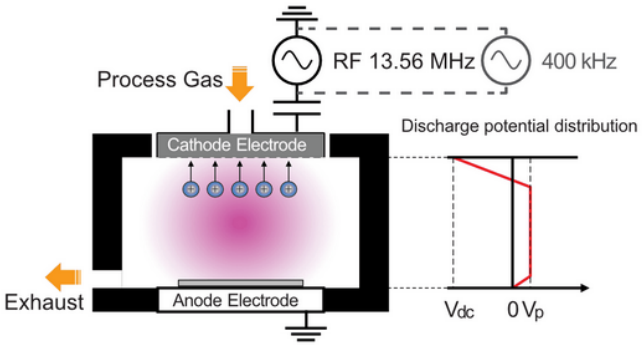
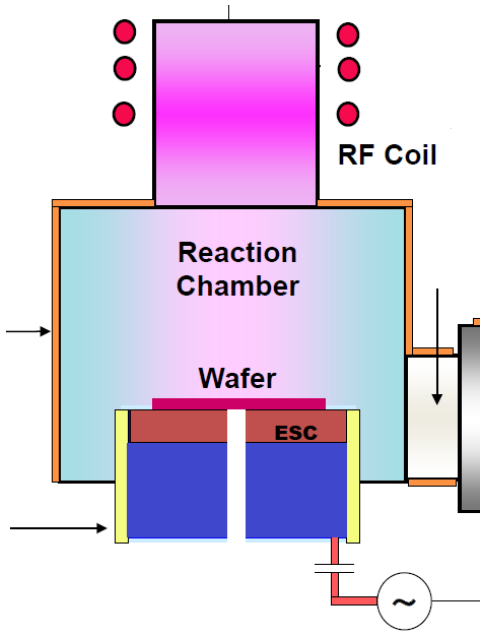
Plasma Equipment in NUFAB

- Thin Film Deposition—PECVD, PVD(Sputter, Ebeam Evaporator, Thermal Evaporator)
  - ***Samco-PECVD***, STS-PECVD for SiO_2 and Si_3N_4
- Dry Etch—DRIE, RIE
  - ***Samco-DRIE***, STS-DRIE for Si/SiO_2 deep etch
  - DRIE—A special ICP etch with Bosch license
  - High energy RF coil power source, KW range
  - Ions accelerated by traveling through the coils
  - Designed for straight sidewall, high aspect ratio Si structures, not intended for wafer thinning and film coating

Plasma Technology



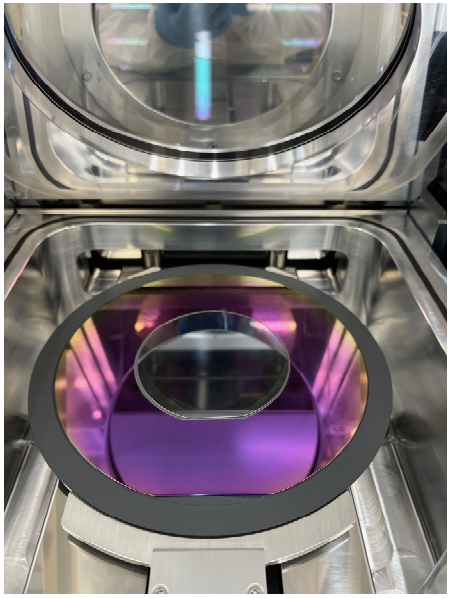
PECVD: SiH_4,NH_3,N_2O→SiO_2, Si3N_4



DRIE: Si, SF_6, O_2→SiF_4

Samco-PECVD

- Film Types
  - SiH_4 based SiO_2 and Si_3N_4
  - TEOS based SiO_2
- Deposition conditions
  - LF, HF, MF
- Operation
  - 4”-8” wafers, chips
  - Friendly for DSP wafers
  - 3 recipes to choose from
  - Staff help to create your own



Compare with STS-PECVD

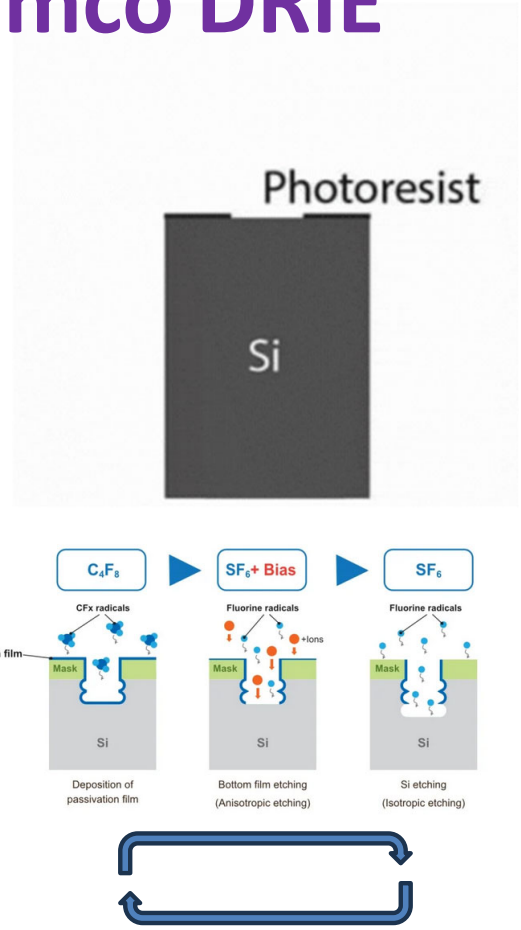
	Samco	STS
Platen temperature	350C (SiH_4-SiO_2, Si_3N_4)	300C (SiH_4-SiO_2, Si_3N_4)
	250C (TEOS-SiO_2)	
Deposition rate	SiO_2 ~75, 117nm/min Si_3N_4 ~80nm/min	SiO_2 ~60nm/min Si_3N_4 ~15nm/min
Min. film thickness	> 20-50nm	> 10nm
Sample material restriction	Most strict -No metal -No any polymer -No any high vapor pressure materials and even its compound, like Na, Zn, Mg, Li, S…	Special approval -No metal -NO photoresist -Some approved polymer and compound -No other high vapor pressure materials, like Na, Zn, Mg, Li, S… -No metal
Power type	HF, LF, or mixed	HF, LF, or Mixed

Which one to choose

What you want	PECVD
Non-standard material	STS and ask
Medium deposition temperature	Samco TEOS STS
Stress balanced films	Both
Faster	Samco
Oxynitride and a-Si trials	STS
Double side polished Si/SiO_2 /Sapphire Thin <300um thick wafers	Samco
Small samples	Both (with carrier wafer)

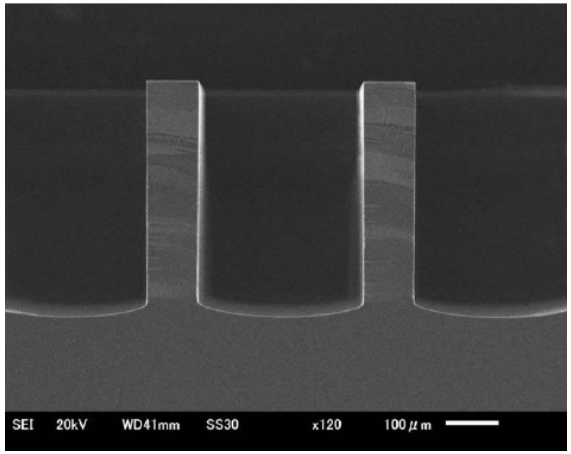
Samco DRIE

- Touchscreen, loadlock
- High rate anisotropic etch of Si and SiO_2
- Bosch process
- Platen He backside cooled
- Electrostatic wafer clamping

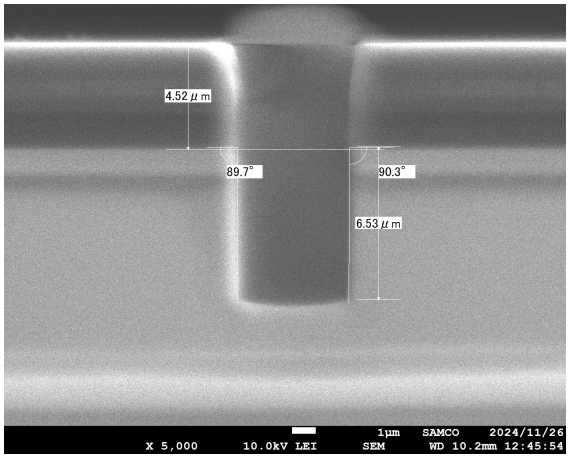


Wide trench and Fine pattern

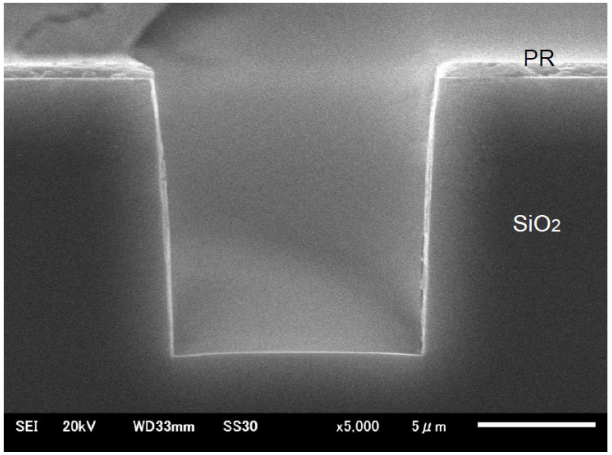
Wide Si trench etch



Fine Si pattern etch



Fine SiO_2 pattern etch

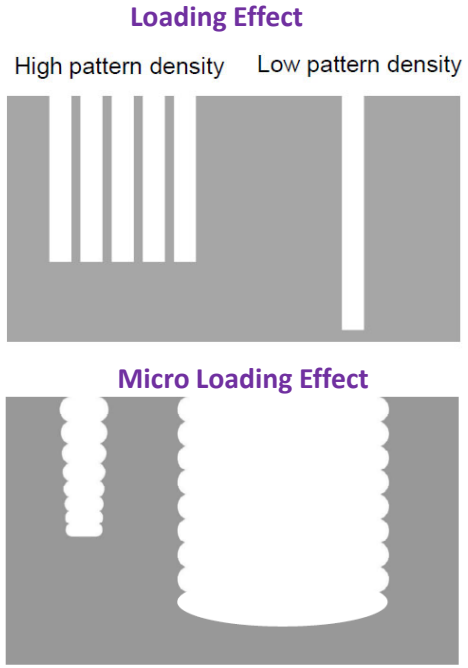


Compare with STS-DRIE

	Samco	STS
Platen temperature	20 C	15C
Chamber	80C	120C
Si recipe types and etch rate	Fine Pattern <10um wide (2-5um/min)	SpecA (>2um/min)
	Wide Trench >50um wide (>8-14um/min)	SpecB and SpecC (>3-15um/min)
SiO_2 etch rate	~100-500nm/min	NA
Sample material restriction	4” wafer only Single side polished only No Metals No polymers (except approved PR)	
Power type	RF and LF bias	
Sample preparation	Same request	

Which one to choose—DRIE

- Etch principle—same
- SiO_2 etch—Samco
- Deep trench—Both
- Operation—similar through loadlock
- Full wafer thinning—None
- Non-stick coating—None



Depth uniformity: ±1.5%

Summary

- New Samco PECVD and DRIE with comparable performance to our existing STS products
- New features as functional expansion
- Some flexibility in existing STS, and cleaner process in Samco
- Forecast—more to cover tech details and selection between
  - PECVD, Sputter, ALD, LPCVD, evaporators, Parylene
  - DRIE, RIE, wet etch

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