Micro-Trenches Etch

Module recipe name: ***CNS5_Trenches***
Sequence recipe name: ***s_CNS5_Trenches***

Module Recipe

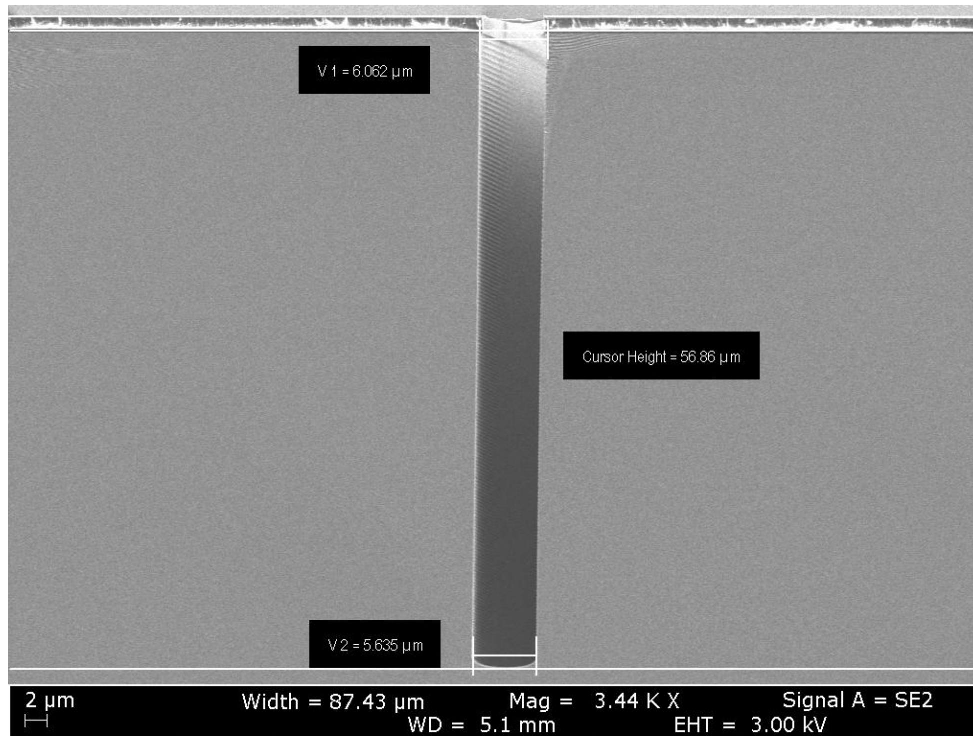
		3	4	5
Step Name		Dep 1	Etch 1_1	Etch 2_1
Process Time	Secs	1.4	1.5 1.5	1.9
Process Pressure	mTorr	45.0 ± 40 %	25.0 25.0 ± 30 %	40.0 ± 30 %
APC Setpoint Position	%	100.0	100.0	100.0
APC Mode		Automatic	Automatic	Automatic
Source power	Watts	2500.0 ± 50 %	2500.0 2500.0 ± 50 %	2500.0 ± 50 %
Source MU tune capacitor		4	4	4
Source MU load capacitor		1	1	1
Source RF Control Mode		Load	Load	Load
Source 2 power	Watts	1000.0 ± 50 %	1000.0 1000.0 ± 50 %	1000.0 ± 50 %
Source 2 MU tune capacitor		4	4	4
Source 2 MU load capacitor		1	1	1
Source 2 RF Control Mode		Load	Load	Load
Platen HF Power	Watts	0.0 ± 0 %	60.0 90.0 ± 30 %	25.0 ± 40 %
Platen HF Capacitor Adjust		Automatic	Automatic	Automatic
Platen HF Tune Capacitor	%	50.0 ± 5 %	50.0 ± 5 %	50.0 ± 5 %
Platen HF Load Capacitor	%	50.0 ± 5 %	50.0 ± 5 %	50.0 ± 5 %
Platen HF Padding Capacitor		2	2	2
Platen HF Control Mode		Load	Load	Load
Platen HF Modulation Enabled		Enable	Enable	Enable
Platen HF Modulation Frequency	Hz	150	150	150
Platen HF Modulation Duty Cycle	%	20	20	20
Helium pressure	Torr	15.0 ± 20 %	15.0 15.0 ± 20 %	15.0 ± 20 %
Helium Flow Warning Level	sccm	10.0	10.0	10.0
Helium Flow Fault Level	sccm	20.0	20.0	20.0
Coil current	Amps	10.0 ± 20 %	10.0 ± 20 %	10.0 ± 20 %
Loop destination		0	0	3
Number of loops		0	0	167
Loop Variation Parameter		0.0	1.0	0.0
Gas Line Config		Flow	Flow	Flow
P1 Argon 500	sccm	0.0 ± 5 %	0.0 0.0 ± 5 %	0.0 ± 5 %
P2 Oxygen 1K	sccm	0.0 ± 5 %	0.0 0.0 ± 5 %	0.0 ± 5 %
P3 N2 100	sccm	0.0 ± 5 %	0.0 0.0 ± 5 %	0.0 ± 5 %
P4 C4F8 500	sccm	360.0 ± 20 %	1.0 1.0 ± 0 %	1.0 ± 0 %
P5 SF6 720	sccm	1.0 ± 0 %	300.0 300.0 ± 20 %	400.0 ± 20 %
S1 Oxygen 300	sccm	0.0 ± 5 %	0.0 0.0 ± 5 %	0.0 ± 5 %
S2 C4F8 500	sccm	95.0 ± 20 %	1.0 1.0 ± 0 %	1.0 ± 0 %
S3 SF6 720	sccm	0.0 ± 5 %	0.0 0.0 ± 5 %	0.0 ± 5 %

Sequence Recipe

	Modules	Commands	Module Recipes	Wafer
1	RAP	READY	EQP_IDLE19	STANDARD
2	Transport	PUMP		STANDARD
3	RAP	PROCESS	IPC_PreLot_19C	STANDARD
4	Transport	LOAD		STANDARD
5	RAP	PROCESS	CNS5-Trenches	STANDARD
6	Transport	UNLOAD		STANDARD
7	Transport	VENT		STANDARD
8	RAP	PROCESS	IPC_19C	STANDARD
9	RAP	PROCESS	EQP_IDLE19	STANDARD

Micro-Trenches Etch Results

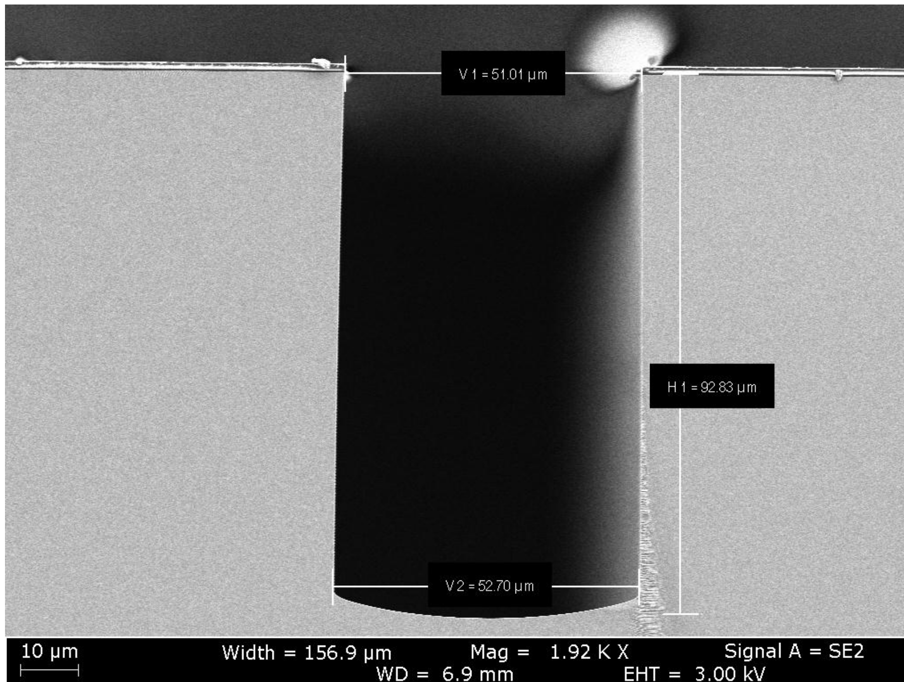
5.0µm thick resist etch mask



Characteristic	Achieved
Etch Profile	89.8
Scallop Depth	< 70 nm
CD Loss (nm)	500 nm
Mask Undercut (nm)	250 nm
Selectivity to resist	40:1
Etch Rate	~4.0 um/min
Uniformity	~2 %
Etch Depth (µm)	57

Micro-Trenches Etch Results

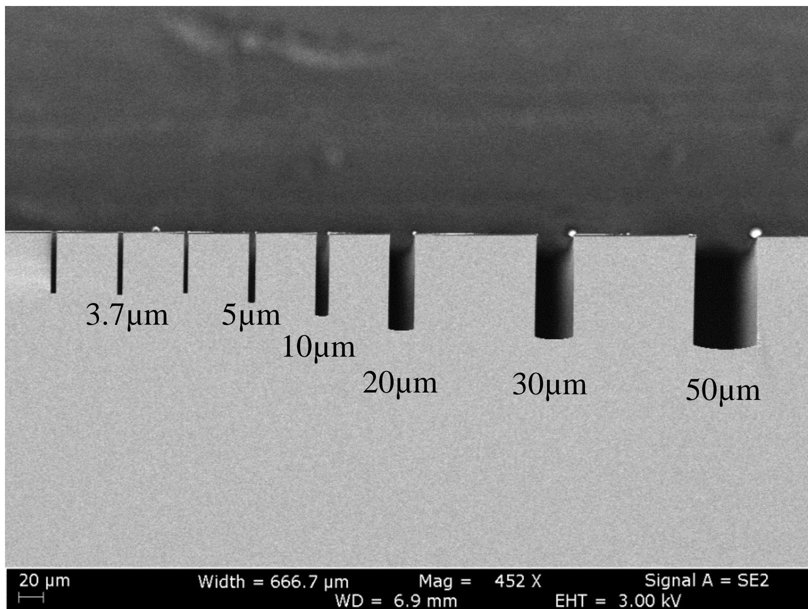
5.0μm thick resist etch mask



Characteristic	Achieved
Etch Profile	90.5°
Scallop Depth	< 100 nm
CD Loss (nm)	500 nm
Mask Undercut (nm)	250 nm
Selectivity to resist	64:1
Etch Rate	~ 7.0 um/min
Uniformity	~2 %
Etch Depth (μm)	92

Micro-Trenches Etch Results

Aspect Ratio Dependent Etch (ARDE)



Characteristics

- Etch rate depends on lateral dimensions;
- Worst for Chemical reaction limited etching;
- Least for
  - Ion bombardment limited etching
  - Higher pumping speed decreases ARDE;
- Oxide often shows reversed ARDE.