

InP Ridge Etching

Oxford PlasmaPro 100 Cobra 300

Ning Cao

2021-09-08

InP Ridge Etch at 60 C , PlasmaPro 100 Cobra

Quarters of 2" InP

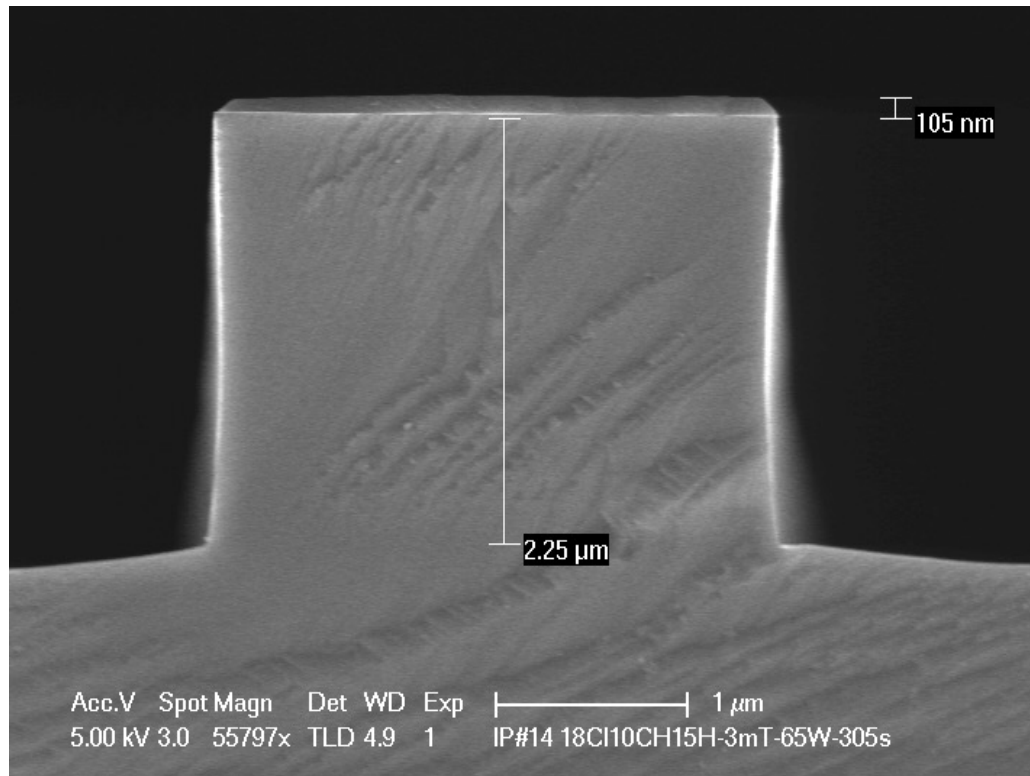
Silicon Carrier wafers, rough side up, no adhesive

SiO2 hardmask, patterned by GCA Stepper #2

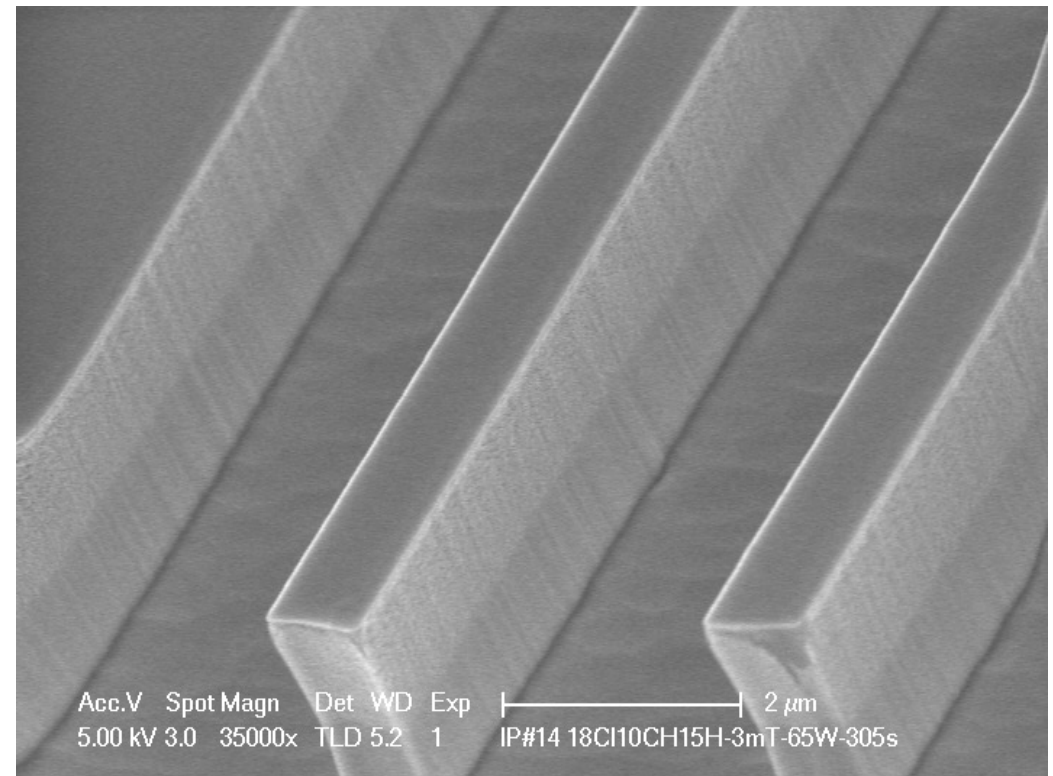
Sample#	Pressure (mT)	Bias Power (W)	ICP Power (W)	Flowing Gas (SCCM)						Etch Time (s)	Note
				H2	CH4	Ar	N2	Cl2	BCL3		
InP#01	3	65	800	15	10	0	0	20	0	305	Si Carrier, 60 C
InP#02	3	65	800	15	10	0	0	20	0	305	TOX Carrier, 60 C
InP#03	3	65	800	15	10	0	0	30	0	305	Si Carrier, 60 C
InP#04	3	40	800	15	10	0	0	20	0	305	Si Carrier, 60 C
InP#05	3	65	800	15	10	0	0	30	0	90	Si Carrier, 60 C
InP#06	3	65	800	25	10	0	0	20	0	305	Si Carrier, 60 C
InP#07	3	40	800	15	10	0	0	25	0	305	Si Carrier, 60 C
InP#08	4	65	800	0	0	80	0	2	0	305	Si Carrier, 200 C
InP#09	3	65	800	25	7.5	0	0	15	0	305	Si Carrier, 60 C
InP#10	3	65	800	25	12.5	0	0	17.5	0	305	Si Carrier, 60 C
InP#11	3	100	800	25	10	0	0	20	0	305	Si Carrier, 60 C
InP#12	3	65	800	35	10	0	0	20	0	300	Si Carrier, 60 C
InP#13	3	40	800	25	10	0	0	20	0	300	Si Carrier, 60 C
InP#14	3	65	800	15	10	0	0	18	0	305	Si Carrier, 60 C; Etch Rtae=0.395 um/min, Selectivity=9.14
InP#15	3	65	800	15	10	0	0	16	0	305	Si Carrier, 60 C; Etch Rtae=0.406 um/min, Selectivity=9.94
InP#16	3	65	1200	15	10	0	0	20	0	305	Si Carrier, 60 C; Etch Rtae=0.489 um/min, Selectivity=9.51
InP#17	3	65	800	15	10	0	0	23	0	305	Si Carrier, 60 C; Etch Rtae=0.36 um/min, Selectivity=8.55
InP#18	3	65	800	15	10	0	0	26	0	305	Si Carrier, 60 C; Etch Rtae=0.417 um/min, Selectivity=9.55
InP#19	3	65	800	15	10	0	0	18	0	305	Si Carrier, 60 C; Etch Rtae=0.364 um/min, Selectivity=9.34
InP#20	3	65	800	15	10	0	0	18	0	305	Si Carrier, 60 C, AR Pre-heat: 10mT, 50sccm, 20-2000W, 60 s; Etch rate=0.425 um/min; Selectivity=9.58
InP#21	3	65	800	15	8	0	0	18	0	305	Si Carrier, 60 C; Etch Rate=0.337 um/min, Selectivity=8.88
InP#22	3	65	800	15	12	0	0	18	0	305	Si Carrier, 60 C; Etch Rate=0.386 um/min, Selectivity=10.5

InP#14: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/10/18 sccm,

Etch Rate=0.395 $\mu\text{m}/\text{min}$,
Selectivity=9.14

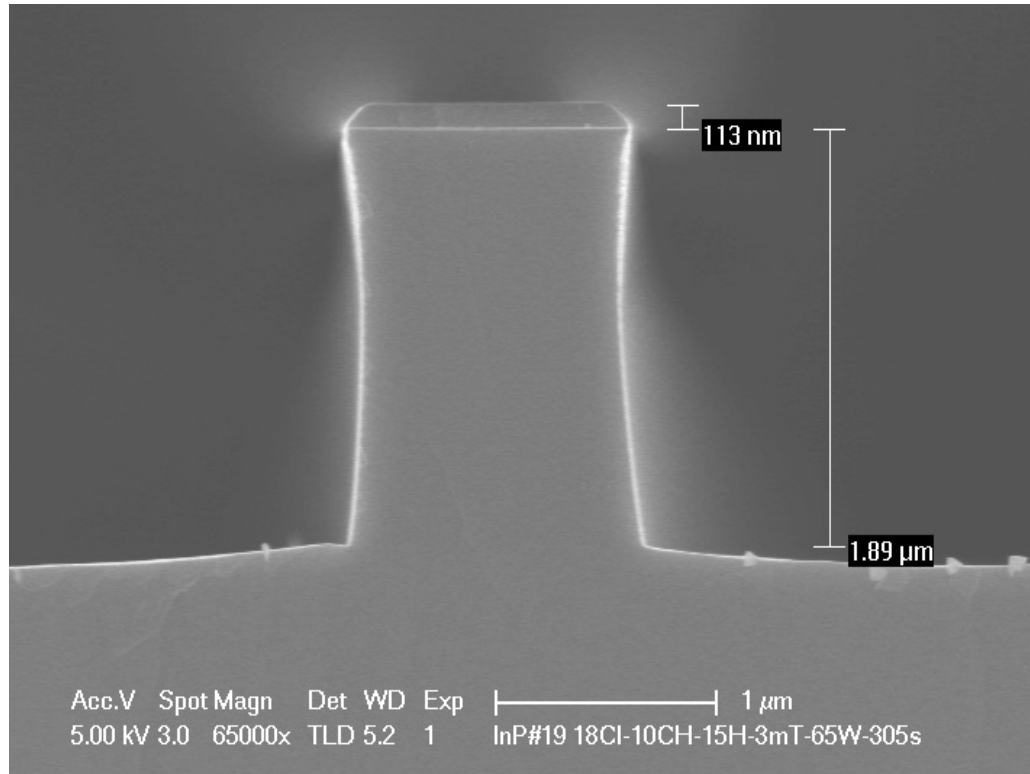


Trench Free in open area,

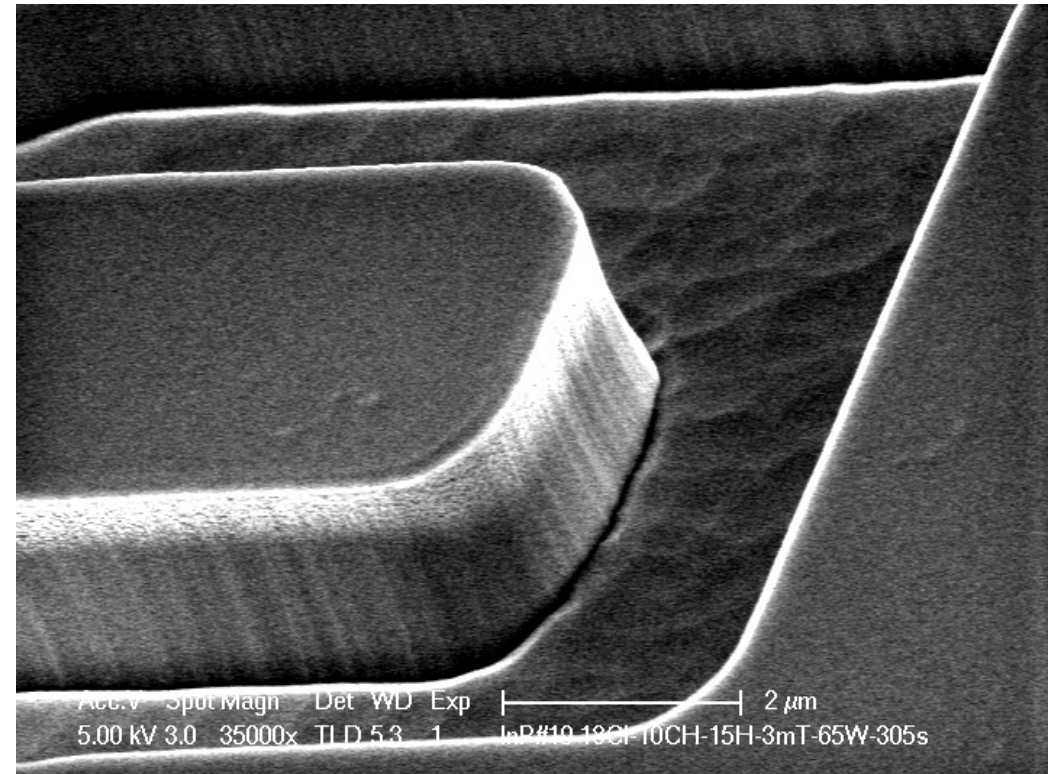


InP#19: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/10/18 sccm,

Etch Rate=0.364 $\mu\text{m}/\text{min}$,
Selectivity=9.34

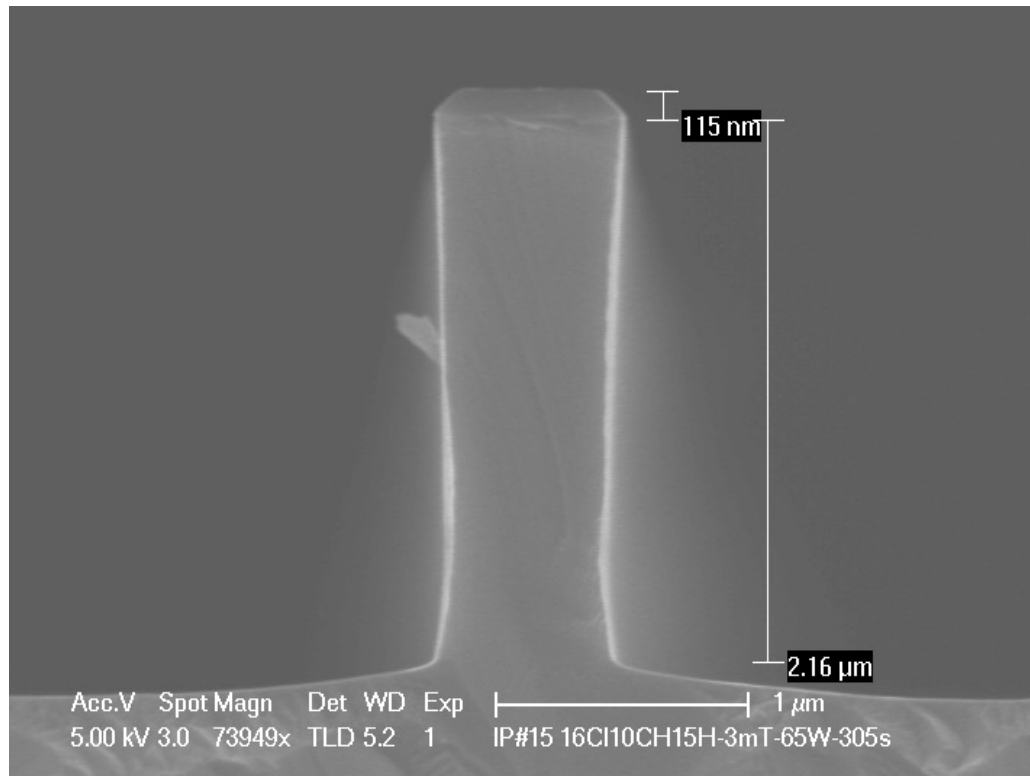


Repeat InP#14

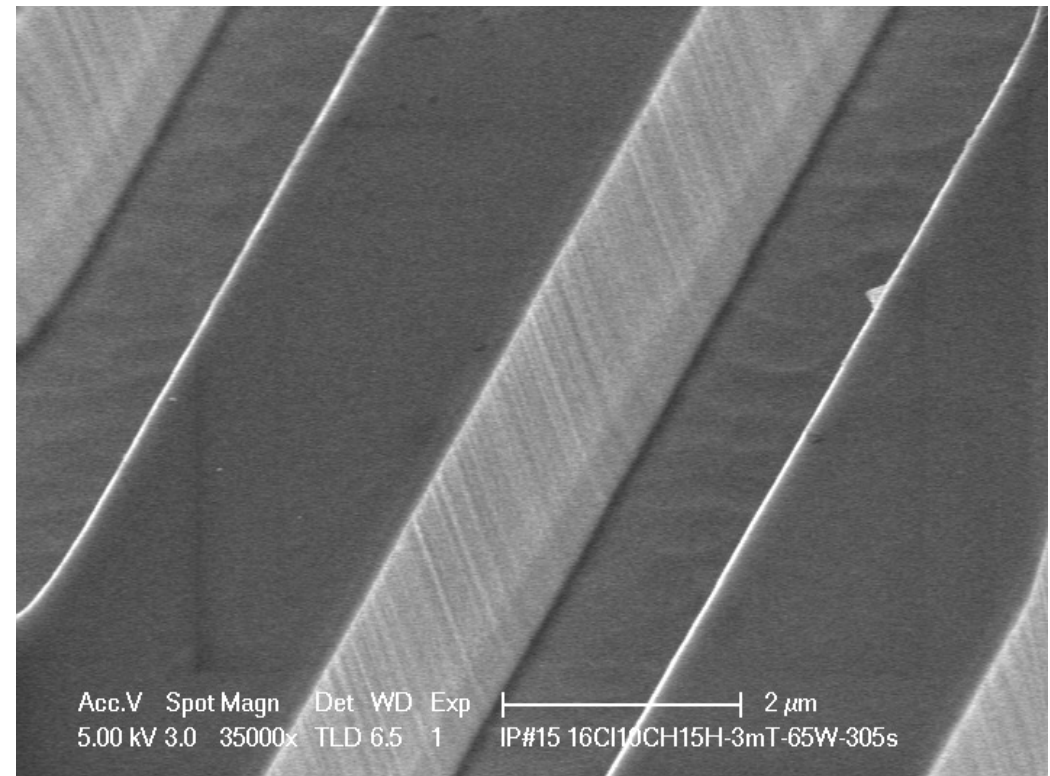


InP#15: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/10/16 sccm,

Etch Rate=0.406 $\mu\text{m}/\text{min}$,
Selectivity=9.94

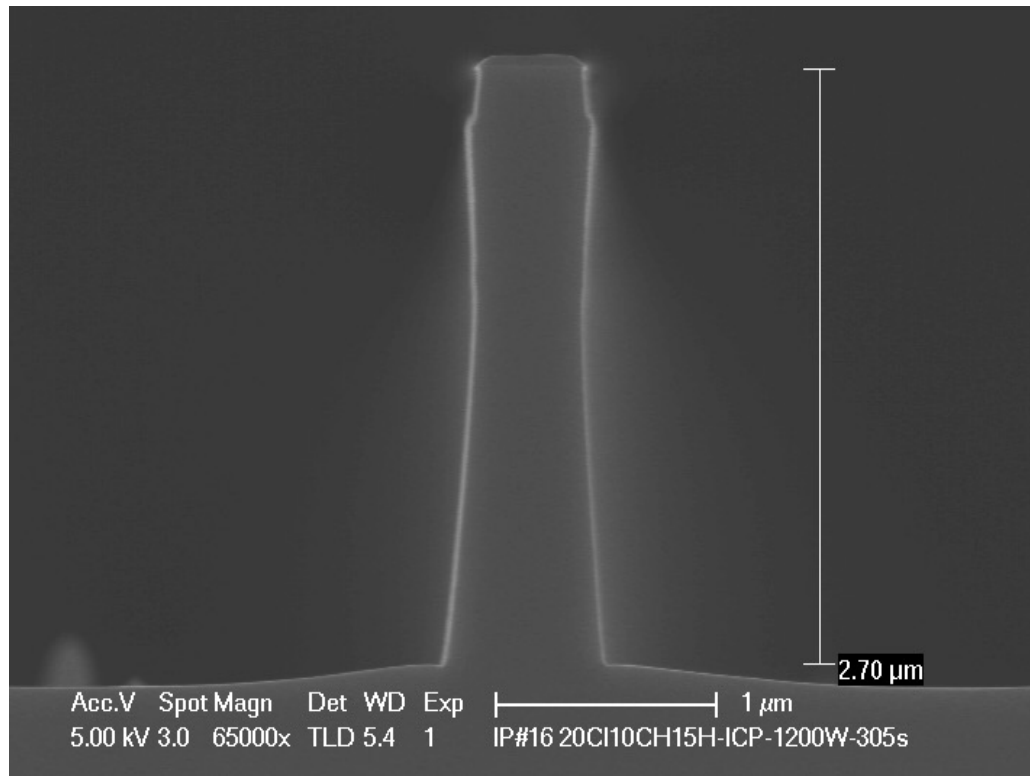


Etch Profile: Undercut

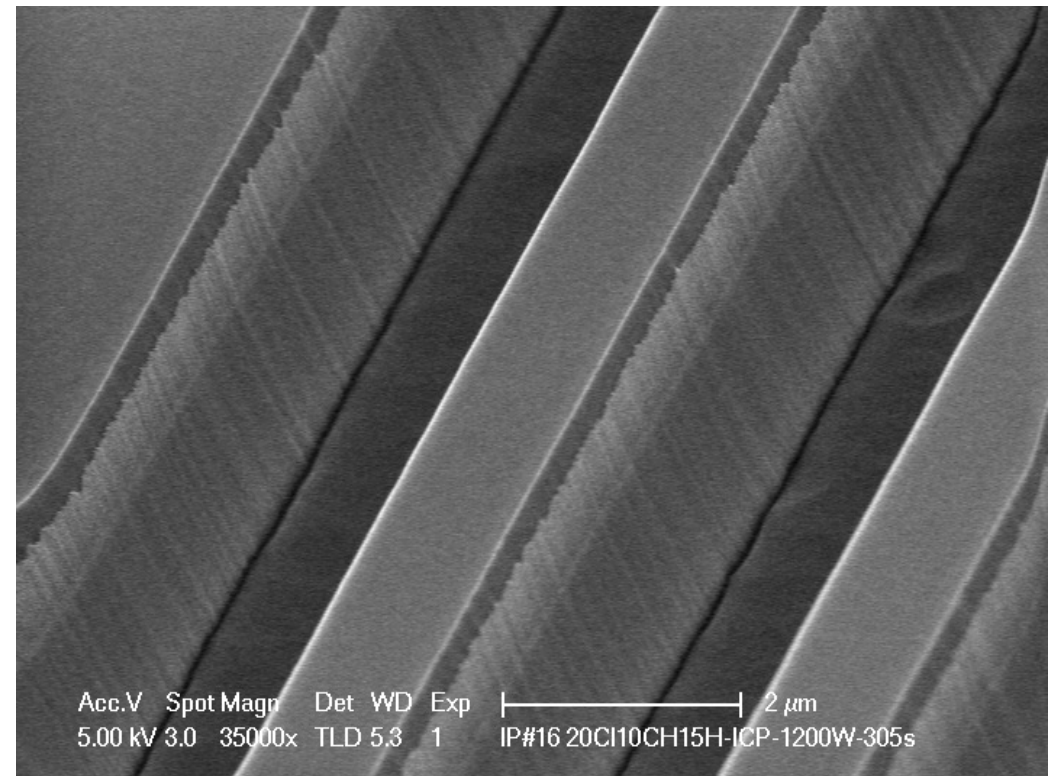


InP#16: 3mT, 65W-1200W,
H₂/CH₄/Cl₂=15/10/20 sccm,

Etch Rate=0.489 $\mu\text{m}/\text{min}$,
Selectivity=9.51

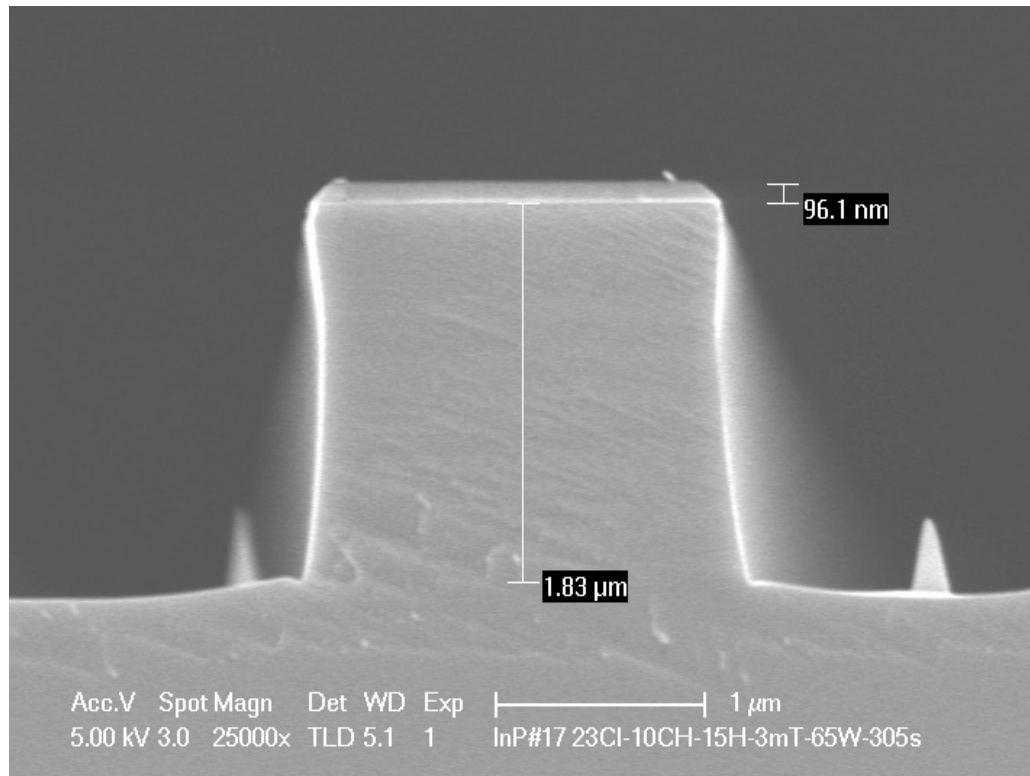


Profile: undercut (Strange shape at the top)

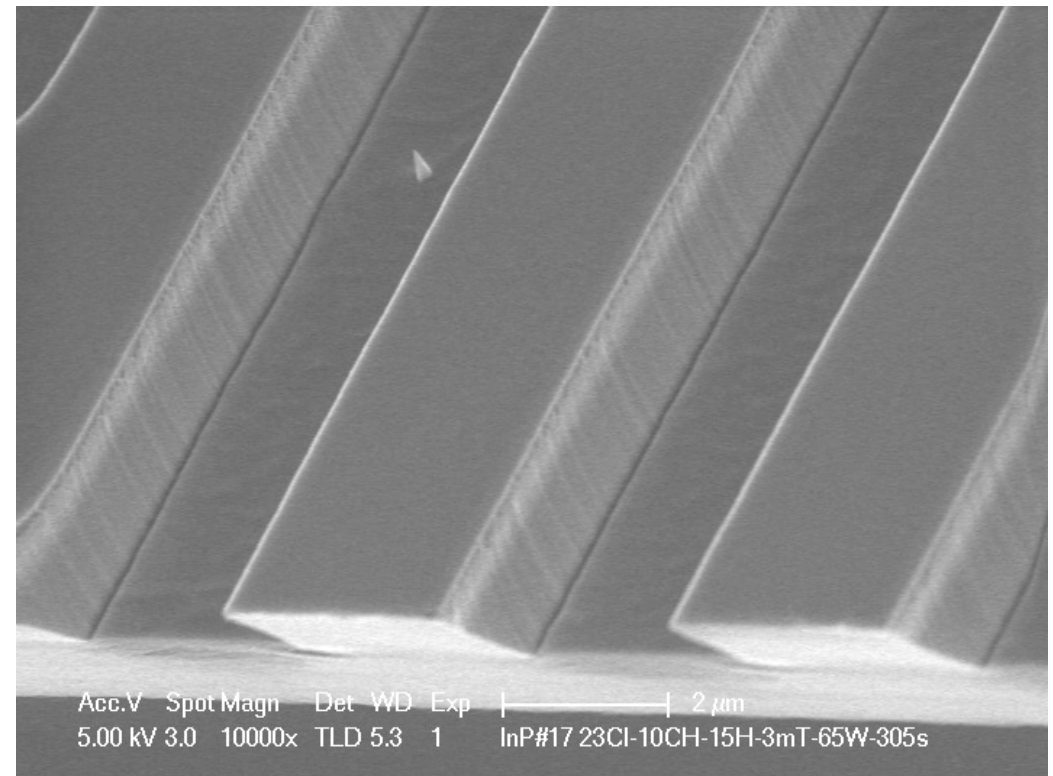


InP#17: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/10/23 sccm,

Etch Rate=0.36 $\mu\text{m}/\text{min}$,
Selectivity=8.55

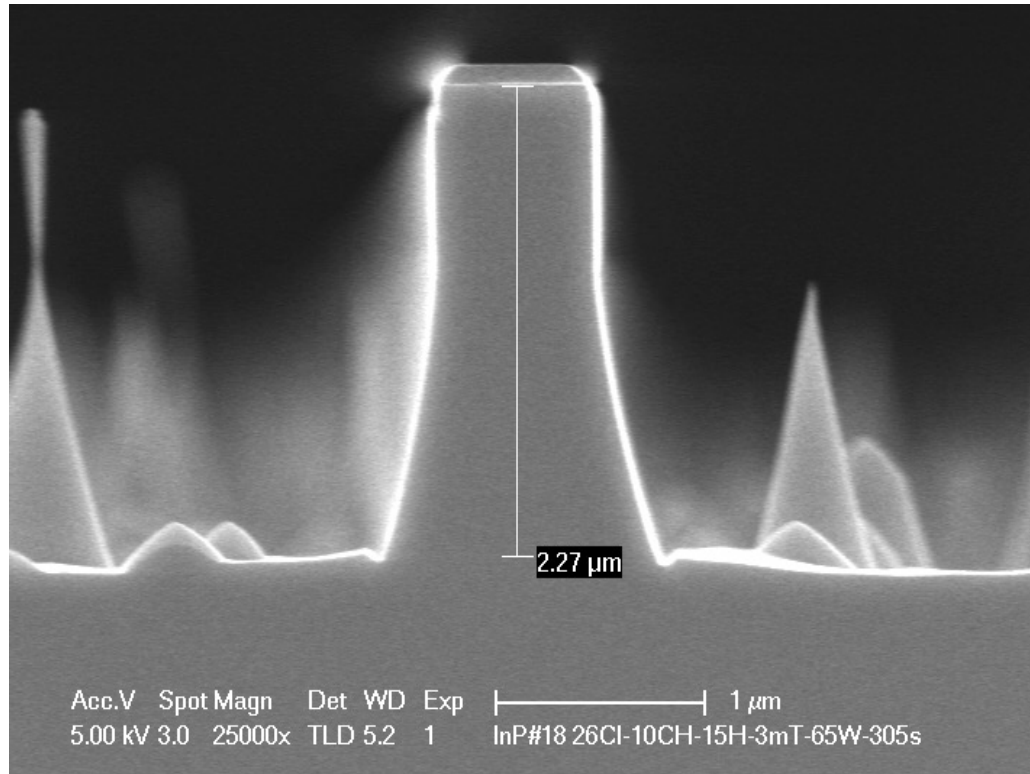


Profile: undercut, and micro-trench
developed

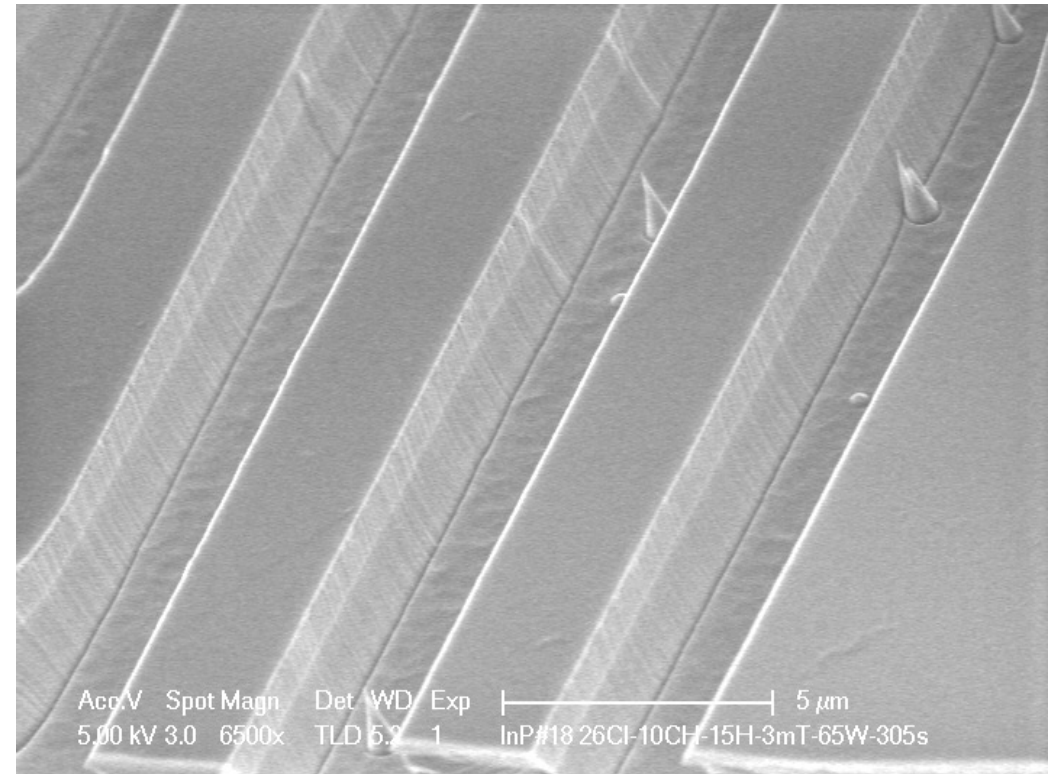


InP#18: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/10/26 sccm,

Etch Rate=0.417 $\mu\text{m}/\text{min}$,
Selectivity=9.55

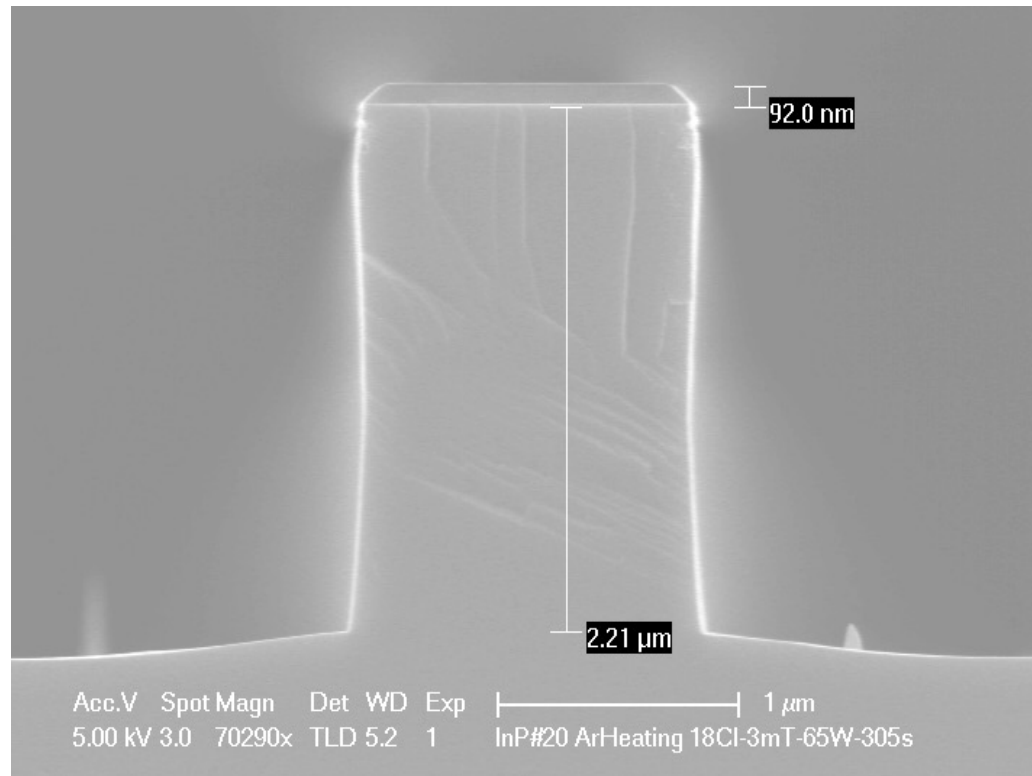


Tapered profile, roughness on the
etched surface

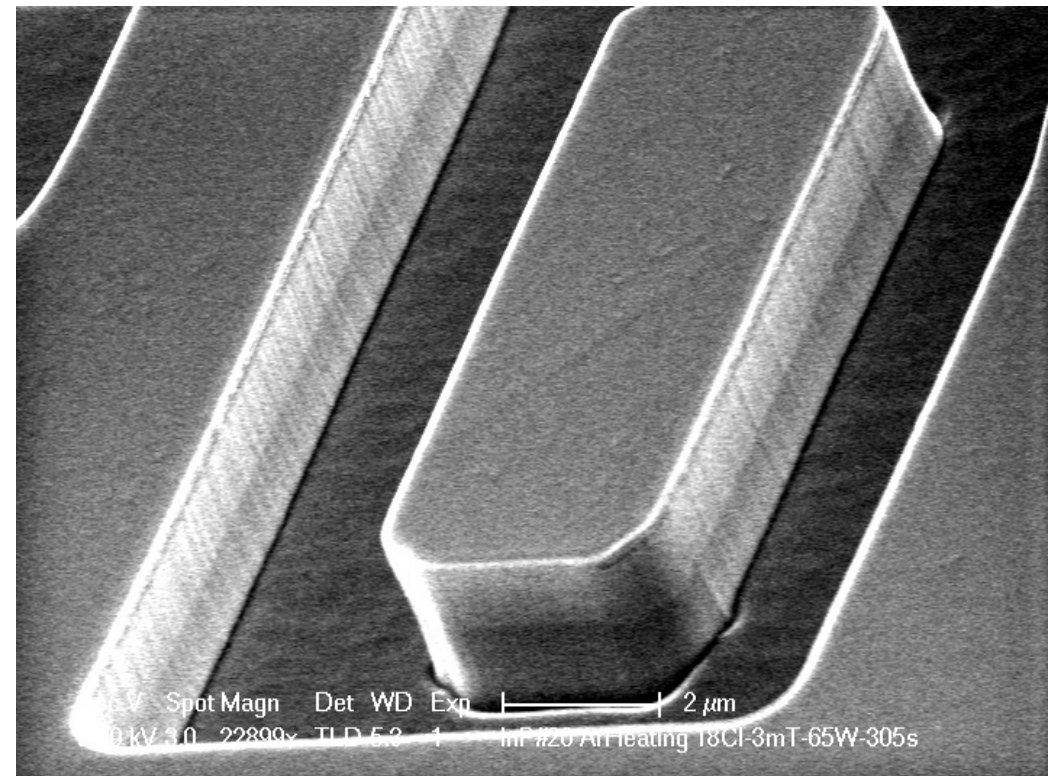


InP#20: 3mT, 65W-800W, H₂/CH₄/Cl₂=15/10/18 sccm, (Ar Plasma Pre-heat for 60 sec)

**Etch Rate=0.425 $\mu\text{m}/\text{min}$,
Selectivity=9.58**

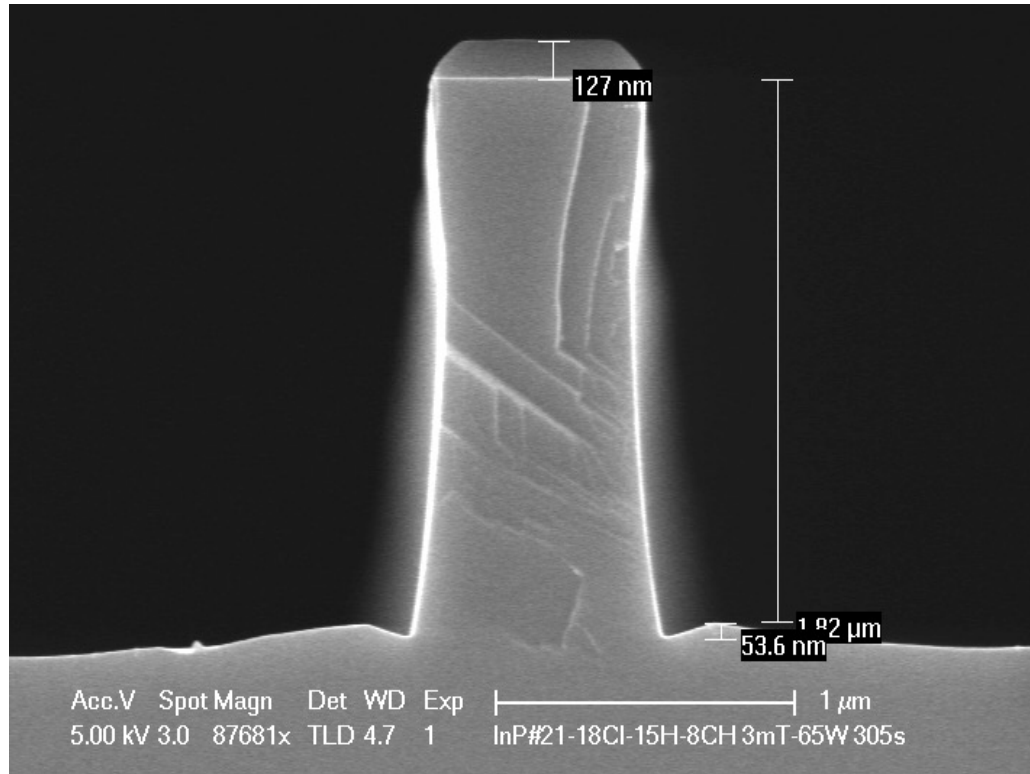


Profile not much changed

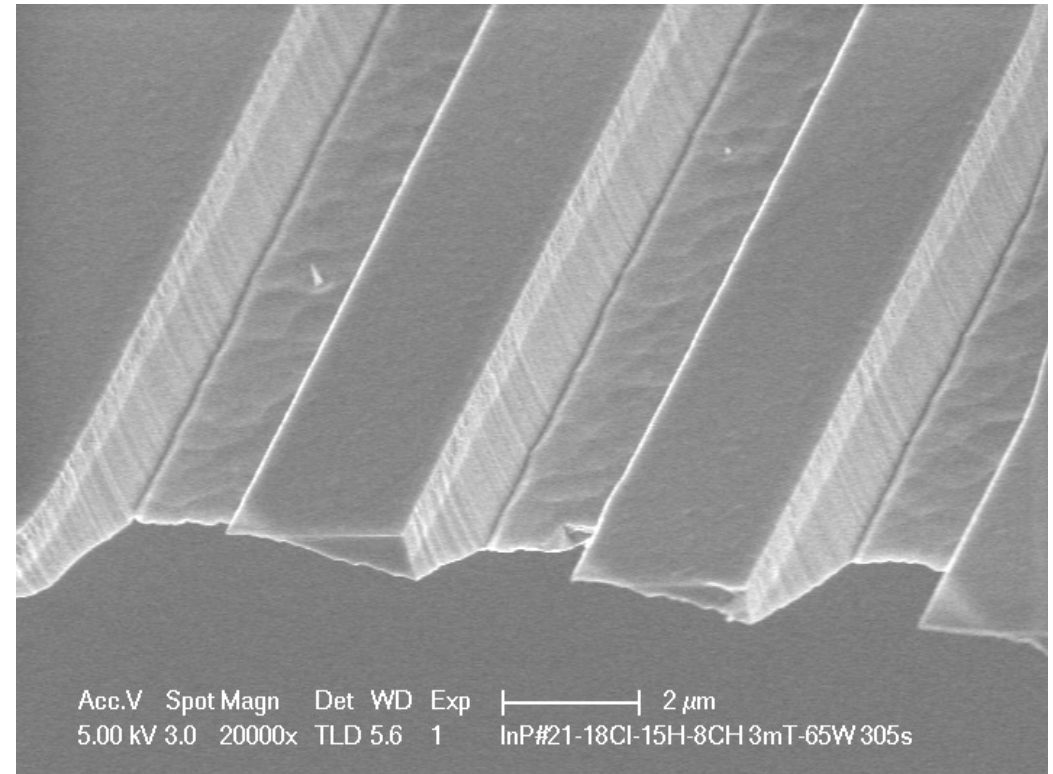


InP#21: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/8/18 sccm,

Etch rate=0.337 $\mu\text{m}/\text{min}$,
Selectivity=8.88



Profile: undercut, and micro-trench developed



InP#22: 3mT, 65W-800W,
H₂/CH₄/Cl₂=15/12/18 sccm,

Etch rate=0.386 $\mu\text{m}/\text{min}$,
Selectivity=10.5

Profile: undercut

