Some spots remain on cooling.

Start dosing again @ 165C dose for 6m (T↓ 130C)
→ pattern fully covered by poly rings.

Warm back up to 300C in 2.4E-7 O_3.
Anneal here. rings → Spots Anneal for 10 minutes.

Then ramp baratron ↑ 0.2 & T ↑ 970C

500C, Streaks reappear

grow 0.5uc = 4 SrO. Cap layer looks pretty good actually.

150 kΩ
2pt @ RT
when removed.

8/26/19

K 350°C 2.6e13

Grower: Jocienne/ Chris Date: 2019/08/26

Orientation: SIO/STO (001)

Anneal Test Just for fun

Wafer Title: JC190826A

Calibration

None since last sample.

Start Ir w/ EIES = 0.07 & 219 mA.

STO (001)

111

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 107.4

[100] 243 ish.

Base Pressure: 4.5E-8 Torr

Quartz Crystal Life: 91.6 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	Dy	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	450		355							
Flux (10^{13} atoms/(cm^2•s))			5.6 nominal							
Time (s)	~60		11.7 nominal							

Outgas 990 / Grow 970 C Baratron = 0.2 P = 6E-6

Start 0212h

1m 30s SrO then Codep. RHEED looks really good. Saw some chevrons briefly. dropped Ir to 217 & they went away. EIES = 0.06

lets grow 4 unit cells = 32 SrO ~ 32 minutes and cool down. Film looked good by RHEED.

Dose for 12 seconds at 150C (P = 2.7E-7 torr Baratron to Toggle = open)

→ nothing happens.

Try leaving shutter open. Get poly rings @ 1m 30sec

dose for 2m 45sec. (T = 130C)

Anneal @ 300C → surface becomes rough. Will try to heat back up to 500C. in 1E-6 ozone.

→ This basically smoothed the surface again. Cool back down in O_3 1E-6

Grower: Jocienne/Chris Date: 2019/08/26

Orientation: SIO / SKIO / SIO / STO(001)
1uc 7uc 1.5uc

Baratron Control Reduced K from D.

Wafer Title: JC190825F

Calibration

Reduced K to 355 C. 5.6E13 nominal

Start EIES = 0.07
Current = 195 mA

STO (001)

#104

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 110

[100] 245

Base Pressure: 4.7E-8 Torr

Quartz Crystal Life: 92 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr			K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	450			355						
Flux (10^{13} atoms/(cm^2•s))				5.6 nominal						
Time (s)	60?									

Start 1155PM. 1.5mL SrO (1m 60s) then add Ir.
Baratron = 0.23 = 89% → 7.3E-6 w/o K.
SIO buffer for 12 min (1.5uc) looks pretty good.
P = 7.3 ↓ 5.4 E-6 when K opens. Continues to plummet so increased to 0.235 to try and compensate
• 21 min. Continues to drop. Hits 5.2, film getting fuzzy. Increased baratron to 0.24 = 93.8% ∴ This seems to have stabilized things.
• ~30 min pressure starts to recover.... odd... (6.58E-6) pressure still going up. K flux ↓ ?? did we run out?
• 56 min. Pressure almost back to "normal". I wonder if we oxidized the cell or ran out of K. Baratron ↓ 0.235 = 89%
• Grow 68 SrO 1h 8min ∴ shut K. → No changes in pressure. Film quality seems to have improved w/ closed K.
• RHEED @ 450 C. Looks really nice.

45kΩ 2point pulled ∴ stuck in dessicator.

40 min. Film is getting fuzzy and EIES ↓ 0.063
So I_r ↑ 202mA

53 min. Chamber pressure suddenly takes a dive (4.2E-6)
3 film goes rough very fast

Closed k @ 54min 30 sec.

P ↑ 6.5E-6.
Film recovered some but doesn't look great.
→ looks reasonably smooth but Kikuchi lines are weak.

Growth rate of 214 cap.
→ Finish at 1h 3min

Tons of 1/2 order spots

~55kΩ
2pt @ RT
when pulled.
Surface looked good.

Grower: Jodenne/ Chris Date: 2019/08/25

Baratron Control Intermediate K.

Wafer Title: JC190825E

Orientation: SIO / SKIO / SIO / STO(001)
1nc ?? 1.5nc

Calibration
Moved Ir & reduced current.
Got back to 1.82×10^{13}
w/ EIES = 0.07
and 194mA

Shoot for intermediate K between O & B samples

STO (001)
111

Date Loaded: _____

Cleaning Procedure:
☒ Ozone Cleaned 10 min.
☒ Wet Cleaned _____

[110] 113.1
[100] 248

Base Pressure: 3E-8 Torr
Quartz Crystal Life: 91 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	Dy	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	450		365							
Flux (10^{13} atoms/(cm²•s))			9.2 nominal							
Time (s)	60?									

- There are extra spots in RHEED – different STO reconstruction
- Outgas 990 / Grow 970 TC
- Baratron 0.23 → 7E-6 O_2 w/o K & 90.7%.

Start 9:45PM w/ 1.5 SrO (1m 30sec)
Some small metal spots in buffer layer – maybe just transmission.

Open K @ 12min Film starts getty spotty w/in 30s to 1min. Increase Ir a little.

P↓ 5.2E-6 w/ K open.

Film a bit spotty but passable I suppose
P_{O_2} keeps falling so increase baratron to 0.24 / 94%
to try and compensate. (P↑ 5.3E-6)

25 min – parts of film look good. Others clearly have metal.

RGA: 8.7E-10 H_2O 1.03E-6 O_2
-6E-10 CO_2 -2E-10 O_3
1.2E-8 N_2

Grow 68 SrO [1h 8min] then close K.
Final film is a tad ~~spotty but~~ fuzzy but no signs of Ir metal and no spots (looks smooth) ↳ little dots went away.
Grow 1 more UC of 214 as a cap (8s10 = 8 min)
Finish growth @ [1h 16min] Cap looks a little better than film.

Need to remelt Ir. Current is damn high.

QCM Ir after growth:
get [1.78 - 1.84 E+13]

2point
30kΩ
ERT after pull.

1h 8min

Grower: Jocienne/Chris Date: 2019-08-25 Baratron Control

Wafer Title: JC190825D

Orientation: SIO/SKIO/SIO/STO(001)

Calibration

Ir: 0.05 EIES ? 236 mA (Start same as end of last Sample)

K reduced by a factor of 0.61

STO (001) #104

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned

[110] 108.25°

[100] 153.25°

Base Pressure: 3.6E-8 Torr

Quartz Crystal Life: 92 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	Dy	Al	Fe	Lu	K	Ti	Sr	Sc	E-Be
Setpoint (°C)	450					360				
Flux (10^{13} atoms/(cm²•s))						7.2 nominal				
Time (s)	60?									

Baratron → 0.23. 91% output ? gives 7E-6 w/ K shutter closed.
Outgas 990/Grow 970 TC.

1.5ml SrO seed. (1M30 sec) then open Ir.

START 6:25PM

Grow 1.5 uc undoped SIO (12 SrO = 12min) then open K

Buffer layer looks a little fuzzy but not too bad. Ir ↑ 239 mA but don't want to push it too hard. EIES = 0.055

Open K @ 12 min film got a little fuzzy but not rough.

Ir ↑ 240 mA / EIES = 0.055 ? film looks OK.

Pressure ↓ 6.24E-6 w/ K shutter open.

Ir ↑ 243 mA / EIES = 0.06 @ 31min. Still looks good.

50 min → Start to see some sprts ← Ir metal?

Seems coincident w/ increase in H_2O pressure to 2.2E-9 ...

RGA: (K open) 1.3E-9 H_2O 1.73E-8 N_2 -6.4E-11 O_3 2.35E-6 O_2 -5E-10 CO_2

Grower: Jovienne/Chris Date: 2019-08-25 high growth rate T_K=370 Wafer Title

Baratron control test JC190825C

Orientation:

Calibration

Ir 220mA
1.4e13
0.04 A/s EIES

STO(001)
111
~~[illegible]~~

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 2026
[100]

Base Pressure: _____ Torr
Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	~~Ba~~ Sr	Dy	Al	Fe	Lu	~~Mn~~ K	Ti	Sr	Sc	E-Be
Setpoint (°C)	450					370				
Flux (10^{13} atoms/(cm^2•s))						11.7 nominal				
Time (s)	60?									

outgas 980 TC baratron setpoint 0.2 pressure 5.e-6

Start 3:45PM 970TC P_{O_3}=5.4e-6 1:40 SrO

then cooling increase Ir to 227 mA

open K at 12 min

increase baratron to 0.22 at ~13 min

sample is getting rough, developing hatches

close all shutters at 33 min see if it improves

doesn't improve, try to save w/ undoped layer Emily

reopen K at 39 min / increase Ir to 240mA

close K at 1 hr 14 min — RHEED rough smudge

end 1 hr 31 min

Nc

type ozone nozzle batchform output
setpoint

go up to max 600°c
20% K 80% In

Grower: Jovienne/Chris Date: 2019-08-24 $Temp_{k}$ = 270 °C

Wafer Title: JC190825B

Orientation: SKIO / SIO / STO FAIL

Calibration

Ir 1.5e13 227 mA 0.05 RIES

Sr 5.3e12 mA

STO(001) # 104

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110]

[100]

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	Al	Fe	K	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	450				370					
Flux (10^{13} atoms/(cm^2•s))					2.14e14					
Time (s)	6033									

outgas 948 TC

grow 970 TC, 3e-6 start 11:59 AM SrO 1:47s

then open Ir. 24 min then open K

pressure goes to 15e-6 w/ 90% valve open

opening K decreases H_2O, & CO/N_2 ??

increasing target O_3 pressure to 6.5

O_3 is continuously decreasing.

sample getting rough

pressure went down to 4e-7

killed sample — fail

Notes:

- Sr fluctuating at low growth rate, unclear if any samples have K incorporated
- plan is to go back to high growth rate, grow w/ increasing K until sample RHEED changes dramatically.

① QCM Sr at high growth rate ☑

② QCM K at 350°C ☑

③ Melt La & Al_2 ☐

④ QCM La & A_2 ☐

⇒ Temp K = 370°C, growing undoped while it stabilizes
$\boxed{\text{10 min undoped}}$, then open K increase Ir by 2nA after 4min
close shutters 24 min [14min SKIO] RHEED ok, kikuchi lines still there, background intensity high

---

Temp K = 380° C, grow undoped while K stabilizes/sample recovers.
$\boxed{\text{10 min undoped}}$, then open K, Appears that K flux pumps H_2O from RGA
decrease pressure again b/c valve at 100% after open K → 3.2e-6
getting rough & high background. RHEED some hatching
close Sr at 23 min [13 min SKIO]
EIES 0.06 A/S

Temp K = 390°C, growing undoped so sample recovers p: 3.5e-6 O_3
open K after $\boxed{\text{20 min}}$ undoped, increase Ir to 227mA
increase Ir → EIES 0.07 230mA, pretty spotty w/ cross hatches
close K after [16min SKIO]
sample not recovering, probably time to kill it

---

growing $\boxed{\text{undoped cap 20min}}$ 2.3e-6 O_3

QCM Ir after sample: 227 mA 1.5e13

Grower: Jaienne/Chris Date: 2019-08-24 high growth rate vary K test

Orientation: SIO cap/SKIO vary K/SIO buffer/STO(001)

Wafer Title: JCI90825A

Calibration

Re QCM Sr. Clearly oscilating w/ 40 min period. 420C

1.35 - 2.11 E+12 e

Ir: 27 mA

1.3e13

0.045 - 0.05 A/s

STO(001)

111

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] ~~200~~ 203.5

[100] 245

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	Al		Lu	Yb	K	Sr	Sc	E-Be
Setpoint (°C)	450						350			
Flux (10^{13} atoms/(cm²•s))	~5.2e	2 QCM		± 1e	12		3.5e13			
Time (s)			similar parameters before							

Outgas 980 TC 45 min

grow 970 TC, 4.5e-6 O_3

Start 7:08 AM SrO 90s then open Ir

Temp K = 350 °C 3.5e13 flux

open K at [12 min, undoped] looks good by RHEED increase Ir by 5mA

close all shutters at 22 min, take RHEED [10 min SKIO]

Temp K = 360 °C:

growing undoped 214 while K stabilizes start 7:35 AM

- [5 min undoped] 214 then open K
- close all shutters 20 min [15 min SKIO]

decreased ozone to 4e-6 b/c value was above 90%

N_2/CO 4.3e-9

CO_2 - 6e-10

RGA: O_2 8e-7

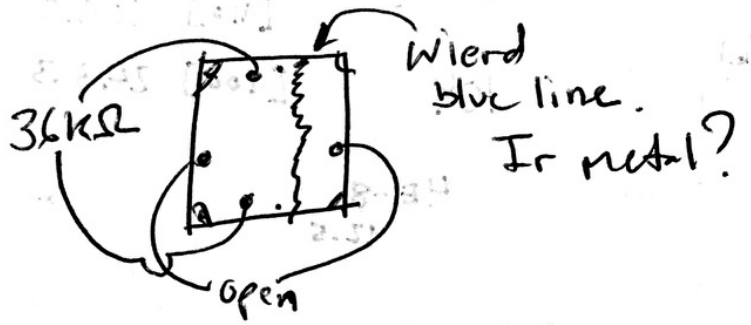
H_2O: 6e-9 to 9e-10 (K open vs closed)

⇒

End @ $\boxed{1h\,3l\,m\,12s}$ (running out of ozone)

→ Started flush @ 5:07PM

Stored in LL & transfered to suitcase



Grower: Jaienne/Chris Date: 2019-08-24 low growth rate $T_K = 305°C$

Wafer Title: JC140824C

Orientation: SIO cap [1 uc] / SKIO [8 uc] / SIO buffer [.5 uc] / STO(001)

Calibration

Last sample Sr/Ir = 4.3/4 ~1.1

So shoot for 4E12 Ir

I_r = 4.3 (ok I think)

EIES = 0.025

Current = 184 mA

STO(001) # 104

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 108.5

[100] 243.3

Base Pressure: 4E-8 Torr

Quartz Crystal Life: 92.5 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	Dy	Al	K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	420			305						
Flux (10^{13} atoms/(cm²•s))	0.43?			0.35 (AL)						
Time (s)	152?									

N_2 1.53E-8

End H_2O = 1.5E-8

H_2O: 1E-8 (start)

O_2: 1.7E-6

O_3: 3E-10

RGA:

1.5ml SrO = 1 min 48sec , ½ uc undoped 214 = 4 SrO = 10 min 8sec

1 uc 214 = 8 SrO = 20 min 16 sec

↓ better

Outgas 990 / Grow 970

Start: 1510 h

- On opening Ir pretty quickly saw chevrons. drop Ir very slightly
- Got worse. Increase Ir to 185 mA. looks a little better but better doesn't look great. Opening K didn't change much.

26 min kikuchi lines ok, but clearly Ir metal. going to very slowly decrease it ? see if we can burn it off.

(185 mA, EIES = 0.03)

1h10min56sec

going to grow 3 uc of doped 214 → Close K at

then put down 1uc of 214 cap. End at

Decreasing Ir didn't help. Went back up (EIES = 0.035) and film looks ok enough I don't want to mess with it.

Took a movie @ 1h6min before closing K shutter

1h31m12sec

Total.

Leave in vented load lock rather then in UFO.

pulled out ~~8/4~~ 502 PM: RPT = 56-75
kΩ eRT

Grower: Jocienne/ Chris Date: 2019-08-24 low growth rate $T_K = 315\,°C$

Wafer Title: JCL1908243

Orientation: SIO cap / SKIO / SIO buffer / STO(001)

Calibration

Ir Cum 3.8e12

198mA 4.0e12

EFFS 0.025 A/s

STO(001) # 111

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 292.8

[100]

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	Al	K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	420			315						
Flux (10^{13} atoms/(cm^2•s))	4.3e12			6.3e12?						
Time (s)	~135-170 152??									

RGA 1e-8 H_2O 1.5 N_2/CO

Outgas 980 TC ~15 min

grow 970 TC

Start 11:18AM 3:15 SrO then codep undopedzr4

spotty, has kikuchi lines

17:73

17:44

20'

Open K at 20min increase Ir by 1mA

intentionally not upping Ir during growth.

Sample possibly improving @ 52 min

took RHEED while hot before cap

63 min close K at 1hr23

close K 1 hr 23 min 40s

end 1hr 43 min

Some spots, might be edges??

Grower: Jacienne/Chris Date: 2019-08-24 low growth rate $T_k = 315°C$

Wafer Title: JC1908243

Orientation: SIO cap / SKIO / SIO buffer / STO(001)

Calibration

Ir cum 3.8e12

198mA 4.0e12

EBES 0.025 A/s

STO(001)

111

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 292.8

[100]

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	Al	K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	420			315						
Flux (10^{13} atoms/(cm²•s))	4.3e12			6.3e12?						
Time (s)	~135-170 152??									

RGA 1e-8 H_2O 1.5 N_2/CO

Outgas 980 TC ~15 min

grow 970 TC

Start 11:18AM 3:15 SrO then codep undopd214

spotty, has kikuchi lines

17:73

17:44

20:

Open K at 20min increase Ir by 1mA

intentionally not upping Ir during growth.

63min close K at 1hr23

sample possibly improving @ 52 min

took RHEED while hot before cap

close K 1hr 23 min 40s

end 1hr 43 min some spots, might be edges??

Grower: Cheienne/ Chris Date: 2019-08-24

cal low growth rate

Wafer Title: CK190824A

Orientation: $SrIrO_3$ / STO (001)

Calibration

Ir	auto	3.8e12
185	mA	5e12
	EIES	0.02-0.025 A/s

STO(001) # 104

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 290°

[100] 335°

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	Al	Fe	Lu	K	Ti	Sr	Sc	E-Be
Setpoint (°C)	420					315				
Flux (10^{13} atoms/(cm^2•s))	1.3e12 3e12 actual??	-2.2e12 @cm				7.6e12 -5.8e12 @cm actual???				
Time (s)	212									

3:32

outgas 750 TL grow 650 TL 4.5e-6 O_3

SrO 3:14 s then codep, 170 s layer time

~~increased to 135??~~

~~open K at 16:34~~ (956 of the oscillations)

increasing Ir (0.03-0.035 A/s)

3.8e12-4.8e12 Sr flux

close K 48 min

end 58 min

RHEED looks good

2.7 KΩ 2pt

QCM Sr after sample:

took awhile to stabilize

3.9 e12 to 4.7 e12

K 315 7.6e12 to 5.8 e12

Grower: Chris Dienne, Date: 2019-08-23

Wafer Title: JC190823E

Orientation: STO cap / 5 K IO / 5 IO buffer / STO(001)

Calibration

Ir: 196 mA

1.4 e13

EIES 0.05 A/S - 0.045

STO(001)

111

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 291°

[100] 336°

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	Dy	[illegible]	K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445			340						
Flux (10^{13} atoms/(cm²•s))	1.13			2.56e13	← QCM likely actual flux / sticking amount is lower					
Time (s)	57									

raise K to 340 °C, use QCM to determine when it is stable

stabilize at 2.46 e13 (probably different from last cal b/c ebeam is hot)

Outgas 970-980 TC for ~15 min, RGA CO partial pressure stabilized

grow 970 TC, 4.5e-6 O_3

Start 1:45 AM SrO 97 s then codep (0.05 A/s EIES) 201 mA

immediate chevrons, going to let it grow to see if it recovers, spotty at some rotations.

$\boxed{\text{Open K at 12:30}}$ before opening K, looks good at some rotations, broad & spotty at others

Increase Ir by 2 mA at 17 min → EIES ~0.0525 A/S

↑ 2 mA 32 min

$\boxed{\text{close K at 1 hr 10 min}}$ 8 min undoped Sr_2IrO_4

$\boxed{\text{end 1 hr 18 min}}$

Potassium Re-QCM:

Temp	Flux ($\times 10^{13}$)
345	3.31
340	2.56
335	1.89
330	1.47
325	1.16
320	0.82

Grower: Chris (Jociennc,) Date: 2019-08-23

Wafer Title: JC190823D

Orientation: SIO cap / SKIO / SIO buffer / STO(001)

Calibration

Cool Ir 3 QCM
K at high temp.

Shoot for
Sr/Ir = 1.13/1.3
as in 23B

Ir = 1.3 @ EIES
= 0.05
I = 178mA

STO (001) #104

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 116.1

[100] 161

Base Pressure: 3.7E-8 Torr

Quartz Crystal Life: 92.8 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr		K							
Setpoint (°C)	445		335							
Flux (10^{13} atoms/(cm^2•s))	1.13		1.95							
Time (s)	57									

Shoot to grow a high flux sample at same conditions as previous: Outgas 990, grow 970, 4.5E-6 torr O_3

• STO substrate looks really, really nice.

1.5ml SrO → 1m26sec. Saw some chevrons when opening Iridium shutter. 8min → Sample seems to be going rough.

Start 1049PM

12 SrO (1.5 Sr_2IrO_4) = 11min 24sec

then opened K shutter. Film sorta is starting to recover. Increasing Ir seems to help. Some parts look better. Some parts spotty, Some parts chevrons.

going to grow 68 SrO layers → ~~[illegible]~~ 1hr 4min 36seconds ← Close K

then a 1.5nc (8 SrO) Cap. → 1hr 12min 12sec ← Finish

Still some chevrons at certain spots but some directions seem to have recovered reasonably well.

RGA: H_2O: 1.2E-9, N_2: 1.5E-8, O_3: 3E-10, O_2: 1.65E-6

- 48 min. Kikuchi lines are not very strong.
- Start ramping to 325 at $\boxed{1\text{ hour}}$
  1h13m → RHEED images & inc ↑ Ir a little to 218
- Start ramping to 330 @ $\boxed{1\text{h}15\text{min}}$
  RHEED still very streaky but kikuchi lines are weak.
  improves a little but still not super sharp.
- Ramp to 335C, $\boxed{1\text{h}25\text{min}}$
  More RHEED images at 1h30min – a bit fozzier still so Ir ↑ 219mA / 0.065 EIES.
- Ramp to 340C, $\boxed{1\text{h}35\text{min}}$
  RHEED is getting pretty fuzzy, even though EIES = 0.065–0.07
  Took images
- Ramp to 345C, $\boxed{1\text{h}50\text{min}}$
  @ 341 I think the growth might be getting 3D.
  EIES dropped slightly so Ir ↑ 223 (EIES ↑ 0.07)
  @ 344 Some clear roughening. kikuchi lines basically gone took images @ 2h
  Film is getting rough. took movie too.

$\boxed{2\text{h}}$ Close K & grow cap of undoped material.

Close shutters & cool at $\boxed{2\text{h } 10\text{min}}$

Need to remelt Ir and want to QCM the potassium at this temp.

Kikuchi lines sort of reappeared but film still rough.

2pt after pull = 50–60 kΩ

PARADIM GM1

Grower: Chris/Jacienne Date: 2019-08-23 K solubility limit test

Wafer Title: CTP190823C

Orientation: Sr_2IrO_4 / $(Sr,K)_2IrO_4$ / Sr_2IrO_4 / STO(001)

Calibration: None since last sample.

STO (001) #111

Date Loaded:

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned

[110] 109.5 (?)

[100] 154.5

Base Pressure: 5E-8 Torr

Quartz Crystal Life: 97.8 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr		K			Eu	La	Al	Ebeam
Setpoint (°C)	445		300						
Flux (10^{13} atoms/(cm²•s))	1.13		0.026 0.038						
Time (s)	57								

Outgas 990 / grow 970

1.5 mL SrO then Codep 214 undoped

(92 sec) end (11 m 40 sec) end

Start 3:52 PM Iridium: Start 0.055 EIES / 211 mA

Starts out a little fuzzy but no chevron

Ir ↑ 212 mA. looks pretty darn good.

got fuzzy again so Ir ↑ 215 mA. going to be more convavitive w/ Ir on this film. EIES ~ 0.06

Open K @ 300 C 4:04 PM. Will slowly ramp up.

- Start ramping to 310 C = T_K at 15 min (1 C/min) let settle for 10 m then increase again. No noticible change in RHEED.
- Start ramping to 315 C = T_K @ 35 min & let settle for 5 min. RHEED looks a little fuzzy so Ir ↑ 217 mA. no noticible change in EIES.
- Start ramping to 320 C @ 45 min

H_2O @ END = 1.66E-8

1.68E-10 O_3

1.6E-7 O_2

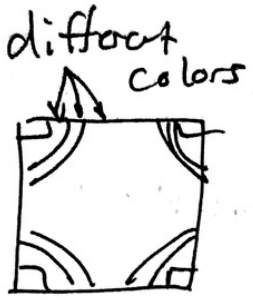
3.2E-9 H_2O

2.5E-8 N_2

RGA:

This puck is ready cleaner:

Surface



when removed

XRR looks bad (2 isl peaks)

XRD didn't look right → alignment must have gone wrong....

→ Store in He for later.

PARADIM GM1

Grower: Jocienne/Chris Date: 2019/08/23 T_K = 300°C

Orientation: Sr_2IrO_4 cap / $Sr_{2-x}K_xIrO_4$ / 214/STO T_{sub} = 1020°C

Wafer Title: JC190823B

Calibration

Ir: 206mA
1.3e13
EIES: 0.055 A/s

STO(001)
# 104

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.
☒ Wet Cleaned _____

[100] 248.6
[110] 243.6

Base Pressure: 4.6E-8 Torr
Quartz Crystal Life: 92.8 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	Mn	K	Sr	Y	Eu	La	Al	Ebeam
Setpoint (°C)	445		300						
Flux (10^{13} atoms/(cm²•s))	1.13		0.26-0.38e12 from sample 23A						
Time (s)	57								

H_2O ↑ 5.0E-8 during growth

$-2.7e-10$ O_3

RGA: 8e-9 H_2O, 2e-8 N_2/CO, 1.6e-6 O_2

outgas at growth temp 1020°C 4.5e-6 O_3

Start 1:15 PM 92s SrO then open Ir (209mA)

Chevrons so decrease Ir to 207mA

Opened K at 12 min

45 min. RHEED both fuzzy & w/ "lines" ? } segments of poly rings?

- Up Ir slightly to 211mA from 209. EIES shows no change
- some areas of film appear spotty, others smooth. Uneven thermal distribution? Took RHEED images. Ir ↓ 209mA.

Close K at 1hr 6min (68 SrO nominal) & grow 1nc = 8 SrO undoped cap.

End @ 1430h – 1h 13m 45s growth time

Store in LL until ready for transport.

2pt = 200kΩ CRT on taking out

Grower: Jacienne/Chris Date: 2019-08-23 $T_K = 300°C$ $T_{sub} = 970°C$

Wafer Title: JC190823A

Orientation: Sr_2IrO_4 cap / $(Sr,K)_2IrO_4$ / Sr_2IrO_4 buffer / STO(001)

Calibration

Ir: 206 mA

1.4e13

0.05 EIES

STO(001)

111

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 291.5

[100] ~~29~~

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445		300							
Flux (10^{13} atoms/(cm^2•s))	1.13		0.26-	0.38	vacuum					
Time (s)	57									

outgas 980 TC, 4.5e-6 O_3

grow 970 TC start 9:38AM

90 s SrO then codep, good rikuchi lines but tonged

open K at 11:40 increasing Ir

11:24

64:06

7:36

increase to 216 mA at 24 min

Closed K at 1 hr 6 min 0s (normally 68 SrO)

7:36 min undoped 214

end 1 hr 13 min 42 s

70 KΩ 2pt

Changed at 3PM 8/22/19
Flushed ozone at ~11 PM 8/22/19 ⇒ 32 hrs

Started charging 4AM (has ready sometime between 3AM & 4AM b/c Irma in check)

7AM

1PM ~~[illegible]~~ flush

Grower: Jocieme/ Chris Date: 2019-08-22 $Temp_K = 325°C$

Wafer Title: JC190822E

Orientation: 1uc Sr_2IrO_4 / $Sr_{2-x}K_xIrO_4$ / 1.5uc Sr_2IrO_4 / STO (001)

Calibration

Cool/Warm Ir for K QCM. K↑ to 325 C.

Ir = 1.23 E+13

Sr/Ir ~ 0.93 to start.

EIES ~ 0.045

Current = 195

STO (001)

#140

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

113.95 [100]

158.8 [110]

Base Pressure: 4E-8 Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Beam
Setpoint (°C)	445		325							
Flux (10^{13} atoms/(cm²•s))	1.15		.96							
Time (s) based on previous xtal →	57.1		???							

Outgas / grow 970c

Same start as previous: 1.5ml SrO (1m25sec) + 1.5uc Sr_2IrO_4 (12ml = 11m25sec)

Start: 9:52 PM.

RHEED looks pretty good some spots but I think they are from below the pins

Close K at ~~1.06~~ 1hr 6min

grow 1uc of undoped 214 cap:

1hr 14min 8 second

cooling in O_3, RHEED images 300°C look good!

2pt 75 kΩ nightafter

RGA: 1.65E-6 O_2, 1.72E-8 N_2, 4.45E-9 H_2O

6-7-19

1w13:45

56.7

XRR → 24.2 nm. in 71.43 min

= 75.06 SrO layers

=> 0.951 min/SrO ≈ 57.09 sec ML time

After XRAY → 2pt ~27 kΩ

(Why lower?)

Grower: Jodienne/ Chris Date: 2019-08-22

Wafer Title: JC190822O

Orientation: $(Sr,K)_2IrO_4 / Sr_2IrO_4 / STO(001)$

Calibration

No recalibration of Sr or Ir from last growth.

Start current = 209mA

EIES = 0.065

STO (001)

#137

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[110] 106.45°

[100] 151.5°

Base Pressure: 5.4E-8 Torr

Quartz Crystal Life: 93 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445		315							
Flux (10^{13} atoms/(cm²•s))	1.13		0.51							
Time (s)	58.25									

Outgas / grow @ 970 C

Same as previous: 1.5mL SrO + 1.5uc Sr_2IrO_4

Start: 5:41PM (1m27s) (11m39s)

→ Some chevrons on opening Ir. going to say they are alright.

→ Source is becoming a bit unstable. EIES ↑ 0.075 all of a sudden. Chevron's seem to have subsided (16m 22s) and film looks really good.

44min in (1826h) RHEED a little streaky so current up to 211mA & EIES ↑ 0.075 (had slowly dropped down)

Going to put an undoped layer on very top (1uc)

Close K shutter at 1h3m40sec 64 SrO

and grow 1uc = 8 SrO = 7min 46sec

total growth time = 1h 11min 26sec

RGA: H_2O 1.29E-8, O_2 1.64E-8, N_2 1.56E-8

Final RHEED Images @ 300 C → look great

Ramp down Ebeam & Re-Qcm potassium

2pt = 36kΩ @ RT after vent

55 - 65 kΩ / RT after unload.

Grower: Facienne/ Chris Date: 2019-08-22

Wafer Title: JC190822C

Orientation: $(Sr,K)_2IrO_4 / Sr_2IrO_4 / STO(001)$

Calibration

Qcm after last sample → 1.4E13 = 0.065 EIES

Remelt to try to get current down.

Remelt: Ir = 1.35E13
EIES = 0.065

Sr/Ir = 0.837

STO (001)

#126

#~~120~~

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

[illegible] [110] 108.55

[illegible] [100] 153.75

Base Pressure: 4.65E-8 Torr

Quartz Crystal Life: 93 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	La	K	[illegible]	[illegible]	Yb	Ti	Sr	Sc	E-Bea
Setpoint (°C)	445		~~290~~	Increase to	300					
Flux (10^{13} atoms/(cm²•s))	1.13		~~0.19~~ 0.32							
Time (s)	58.25									

During heat up something burped a ton of $H_2O/CO_2/N_2$. does not appear to be e-beam – STO surface looked bad after this.

→ That something was the main shutter. :(

Substrate ruined → swap.

Grow 970 C. 1.5 mL of SrO [1m27sec] then a SIO-214 buffer layer.

Start 1531h – see some chevrons on open but streaks otherwise look good.

Reducing Ir very slightly gets rid of them but RHEED gets fuzzy.

[11 min 39 sec] (12 SrO → 1.5 nc of 214) open K shutter

Leaving Ir @ EIES = 0.06 seems ok.

Slowly inc. Ir flux during growth to keep sharp (EIES ↑ 0.07 current ↑ 201 mA

Grow 64 SrO layers (8 uc 214) → [1h 3m 40sec]

Final EIES = 0.07
Current = 202 mA } final RHEED @ 600C

25.797 = C
8 SrO layers

RGA

H_2O 2.75 × 10^{-8}
N_2 1.55 × 10^{-8}
O_2 1.61 × 10^{-6}

~~XRR → Trash (illegible)~~ Ignore
~~Basically nothing in XRay... odd~~

XRR - 21.2 nm = 8.22 unit cells @ 8 SrO per cell

= 65.744 SrO layers

in 63 m 38 sec ⇒ 1.03 SrO per min

58.25 s/me

95 kΩ 2 point

Grower: Jacienne/Chris Date: 2019-08-22

Wafer Title: JC190822B

Orientation: $(Sr,K)_2IrO_4$ / Sr_2IrO_4 / STO(001)

Calibration

No re-QCM. Assume same as previous

STO (001) #137

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 10 min.

☒ Wet Cleaned _____

108.73 (100)

153.73 (100)

Base Pressure: _____ Torr

Quartz Crystal Life: 93 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445		290							
Flux (10^{13} atoms/(cm^2•s))	1.1		0.19 – 0.32							
Time (s)	59.65									

End: 5.52E-8, 1.67E-8, 1.62E-6

Start: 3E-8 H_2O, 1.7E-8 N_2, 1.6E-6 O_2

RGA:

Grow 1.5 layers SrO (1m 30s) (grow @ 970 C) then start Sr_2IrO_4 w/o K.

Start 1143h

I_r = 182 mA → immediate chevrons/dots. Dropping to 175 mA didn't help. (0.38 EIES)

Increasing I_r seems to clean it up. 0.06 EIES / 196 mA

22 min in open K shutter (1205 PM)

↳ 22 functional units undoped (

After opening K film looks a bit fuzzy

} develops w/ open K shutter.

Film doesn't look great → but better than A at least. (not rough)

Final I_r: 201 mA / 0.065 EIES

63m 38sec total time

Final RHEED @ 380 C → looks decent.

grow for $\boxed{50m45s}$ - Same as last

ebeam is 0.042 or so by EIES

Film never fully flattened out ? there are still Chevrons @ end. Will try to grow buffer w/o K next time first.

Took RHEED end ~~ex~~ imager @ 350C

→ 2pt is above scale on DMM .....

XRR trash → 17 nm??

Basically nothing in XRAY

-70 base → flush.

JC190822A

Grower: Jorienne/Chris Date: 8/21/19 Temp$_K$=290°C

Orientation: $Sr_{2-x}K_xIrO_4$/STO x=?

Wafer Title: ~~JC190822~~

Calibration

Ir 1.3e13 185 mA

~~Ir 1.35e13 (200 mA)~~

0.05-0.06 A/s

~~0.05 A/s~~

K 280 7.6e11 to 1.6e12

K 290 1.8e12 - 3.2e12

STO(001) #126

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned _____ min.

☒ Wet Cleaned _____

104.1 (110)

149.1 (100)

Base Pressure: 4E-8 Torr

Quartz Crystal Life: 93 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445		290	0.19 to						
Flux (10^{13} atoms/(cm^2•s))	1.1e13			0.32						
Time (s)										

RGA: H_2O 1.4E-8, O_2 1.85E-6, N_2 1.8E-8 → 1.5E-6 ozone

Sr → 0.16 A/s → 59.65 ml time STO

grow/outgas @ 970 TC/511 pyro (window coated)

Start 9:58AM. 1ml SrO to start

then open K & Ir

Immediate strong chevron pattern. drop Ir from 185 ↓ 183mA

got fuzzy fast so inc. Ir back

By 100Sh looks very 3D.

Film is still growing rough. will grow out to see. Ir ↑ 188mA.

increased Ir defs made it worse. Tons of chevrons

(took RHEED images)

1025h. Still a lot of Ir metal but film seems to be getting flatter.

Drop Ir very slightly (0.45 EIES / 182mA)

Grower: Jocienne/Chuz Date: 8/21/19 Temp$_K$ = 280 °C

Wafer Title: JC190821D

Orientation: $Sr_{2-x}K_xIrO_4$ /STO x = ?

Calibration

1.4e13 (198 mA)
used for sample C
0.06 A/SEIES

STO(001)
# 126

Date Loaded: _____

Cleaning Procedure:

☐ Ozone Cleaned _____ min.

☐ Wet Cleaned _____

[110] 291
[100] 335

Base Pressure: _____ Torr
Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	La	Al	K	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445			280						
Flux (10^{13} atoms/(cm^2•s))	5.2e12 1.1e13	QCM actual		1.57e12±		1e11				
Time (s)				↑ QCM right before growth						

Sr flux + K flux = (1.1 + 0.157) e13 = 1.257e13

→ Ir aim 1.1e13

Ontyus 970 TC / 518 pyro grow 4.5e-6 O_3
Sigma

Start 5:34AM SrO 1:55 then codep Sr, K, Ir
then RHEED looks good

grow for same time as last sample use diff of fringes to figure out flux of K.

increase TO 200 mA at 35 min

$\boxed{50:45}$ end

70-80 kΩ ← larger than undoped sample C

pp H_2O = 5.6e-8
pp CO_2 = -8e-11
pp N_2/CO = 1.75e-8
pp O_2 = 1.56e-6

QCM after is 200 mA, 1.38 e13 for Ir

XRR 18 nm, did K stick??

Jocienne / XRR — omega th 5r0001

Grower: Jocienne/Chris Date: 8/21/19

Wafer Title: JC190821C

Orientation: Sr_2IrO_4 / STO(001)

Calibration

Ir: aim 9.3e12

190 mA 1.1e13

EIES 0.04-0.06 A/s

STO(001) # 137

Date Loaded: _____

Cleaning Procedure:

☑ Ozone Cleaned 10 min.

☑ Wet Cleaned 30s

[100] 335

[110] 291

Base Pressure: _____ Torr

Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	La	Al	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	445									
Flux (10^{13} atoms/(cm²•s))	1.1e13									
Time (s)										

Outgas 970 TC ~20min, grow 970

4.5 e-6 O_3 (~87% output increase) Ebeam to 195 mA before start

start 3:09 AM, 90 s SrO then codep

at 9 min increase to 197 mA (0.05-0.07 A/s EIES)

some spots/streaks but strong Kikuchi lines

(substrate had some spots also though)

end 50:35

partial pressures

H_2O = 1e-7

CO_2 = 1.9e-11

N_2/CO = 2e-8

O_2 = 1.5e-6

QCM after: 1.67 e13

XRD: low angle XRR 19 nm

looks like pure phase 214

2pt R 50-60 kΩ

Grower: Jacienne/Chris Date: 8/21/19

Orientation: $SrIrO_3$(001)/STO(001) calibration

Wafer Title: JC190821B

Calibration

Ir: aim 1.2e13
188 mA
1e13

STO(001)
# 126

Date Loaded: _____

Cleaning Procedure:

☑ Ozone Cleaned 10 min.

☑ Wet Cleaned 30s

oscillations ~~335° [110]~~ ?
[110] 291° [100] 335°

Base Pressure: _____ Torr
Quartz Crystal Life: _____ %

Chamber Setup

Turbo:	☐ Open	☐ Closed
Ion:	☐ Open	☐ Closed
Cryo:	☐ Open	☐ Closed
Liq. N_2:	☐ Open	☐ Closed

	Sr	La	Al	Fe	Lu	Yb	Ti	~~Sr~~ Ir	Sc	E-Be
Setpoint (°C)	445									
Flux (10^{13} atoms/(cm^2•s))	5.2e12 QCM approx 9.6e12 from tooling factor									
Time (s)										

outgas 750 TC, grow 650 TC (pyro reads 400)
4.5e-6 O_3

Start 1:05 AM 82 s SrO then codep, increase ebeam to 203 mA

RHEED looks great!

RHEED minima from oscillations: 196, 263, 322, 380
67, 59, 58 ~61 s/layer

~~ebeam~~

end 38:38

QCM after: 2.2e13

surface looks visually weird maybe too much Ir

partial pressures

pp H_2O = 2.2e-6
CO_2 = -2.34e-10
N_2/CO = 3.25e-9
O_2 = 1.66e-6

XRD: 17 nm → 42 layers → 55 ~~layers/s~~ s/layer

K temp	flux (e beam off)
300 °C	7 - 8.5 e12
290 °C	3.3 E+12
285 °C	1 - 4 e12
275 °C	0.9 - 2.4 E+12

note: K flux as measured by QCM is very sensitive to ebeam emission current.

Started to go crazy. → Oscillations...

50 uc → 53 min ; 20.1 nm

RHEED taken @ 340 C.

XRD — 34 nm? (using epitaxy program to calculate) from XRR

→ 87 layers → 36.5 s/layer

⇒ 1.821 e13 ⇒ $\frac{QCM}{actual} = \frac{9.9e12}{1.82e13} = 0.54$

reasonable for sleeve

→ set Sr to 445 °C

3.905

JC190821A

Wafer Title

Grower: Chris/Science Date: 8/21/2019

Orientation: $SrIrO_3$ (001) / STO(001)

Calibration

Sr → 1E+13 (9.9E+12)

Ir → 8.2E+12 (Want)

QCM 1 = 8.3E+12

I = 166 mA

EIES(Pt) = 0.05 Å/s

STO (001)

#126

Date Loaded: _____

Cleaning Procedure:

☒ Ozone Cleaned 6 min.

☒ Wet Cleaned _____

(110) 108.7

(100)

Base Pressure: 6.9E-8 Torr (4.47E-8 Ebeam off)

Quartz Crystal Life: 93 %

Chamber Setup

Turbo:	☒ Open	☐ Closed
Ion:	☐ Open	☒ Closed
Cryo:	☐ Open	☒ Closed
Liq. N_2:	☐ Open	☒ Closed

	Sr	La	K	Fe	Lu	Yb	Ti	Sr	Sc	E-Be
Setpoint (°C)	460		280							
Flux (10^{13} atoms/(cm²•s))	9.9e12		0.16	±0.06						
Time (s)										

H_2O w/ Ebeam 8.5E-9

9:03 PM got to 5.5E-6 w/ 93% on Valve

→ Puck is outgassing H_2O like crazy. → 700c (almost 1E-7).

↳ Manipulator not yet outgassed.

C_{SrIrO_3} = 4.02 Å

drop to 650c for growth

STO monolyr time 63.63 sec.

9:12 PM Start. 0.5 layers Sr

A bit fuzzy → inc↑ Ir. 178 mA

Still fuzzy, growth looks a little 3D. Increase Ir to 186mA

A little better. Inc. to 188 (9:32PM)

~~30 uc → 31min 40sec → 12nm~~ ← grow longer. Film appears to improve (P_{H_2O} ↓) (Ir ↑)

↳ 0.8 Å/s by EIES(Pt)