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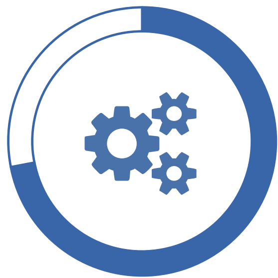
A Plasma-Therm Company

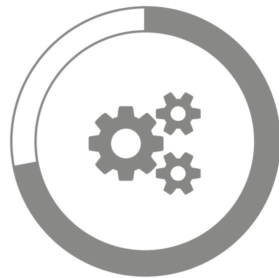
CORIAL 210IL

Get Maximum Flexibility

ICP-RIE equipment for any chemistry



Wide process range for Silicon, Metals, III-V and II-VI compounds



Support ICP, RIE, and DRIE process recipes in the same reactor

Smaller wafer pieces up to full 200 mm wafer

SYSTEM DESCRIPTION
CORIAL 210IL

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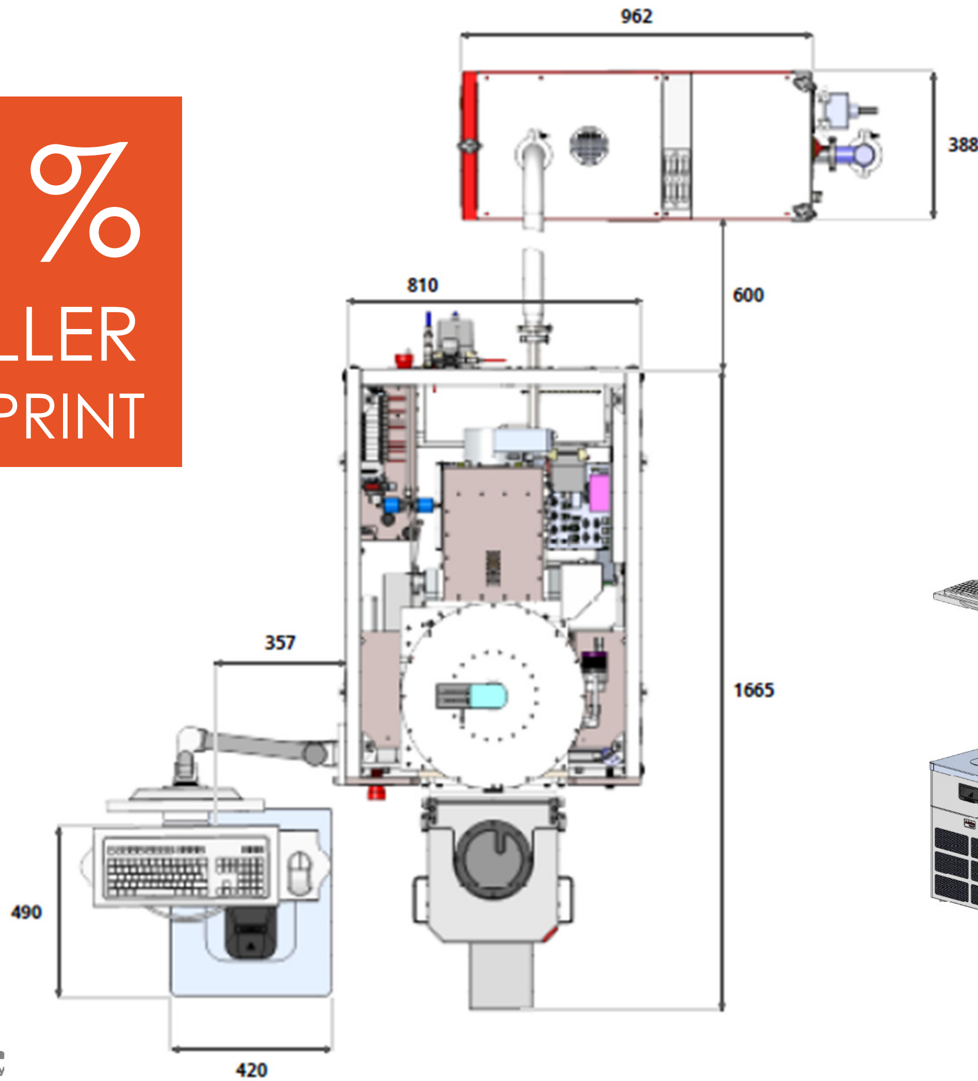
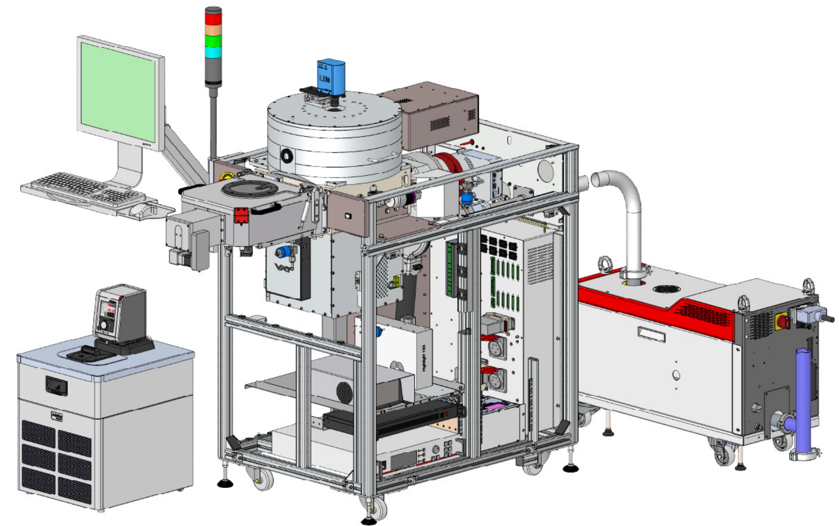
SYSTEM DESCRIPTION

30 %
SMALLER
FOOTPRINT



THE MOST
COMPACT
MACHINE
ON THE MARKET



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SYSTEM DESCRIPTION

EPD with laser

ICP reactor

Load lock

Pumping system
(TMP 500l/s and dry pump 110 m³/h)

Chiller / Heater

HV and LV power supplies

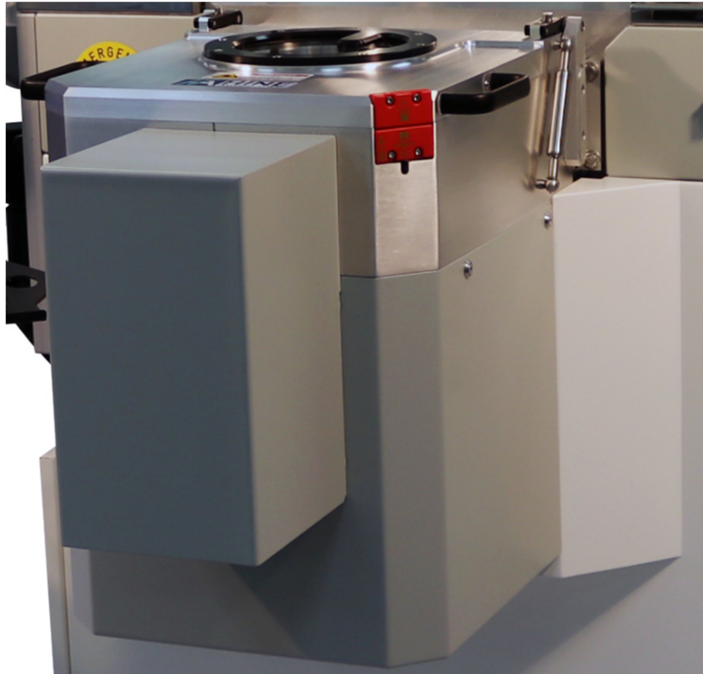
ICP generator
(2 MHz)

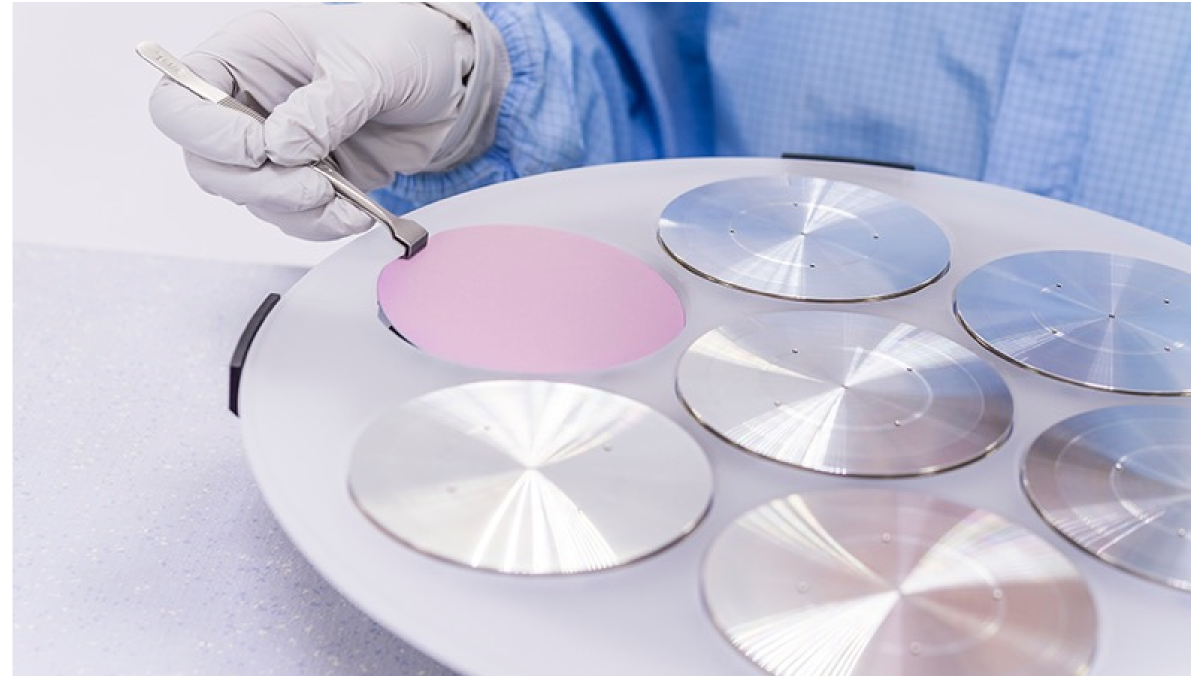
RF generator
(13,56 MHz)

Process controller

SYSTEM DESCRIPTION

Loading





< 180 s
LOADING TIME

Vacuum robot
FAST AND REPEATABLE LOAD AND UNLOAD

Shuttle
EASY EXCHANGE BETWEEN SUBSTRATE SHAPE AND SIZE

ICP SOURCE
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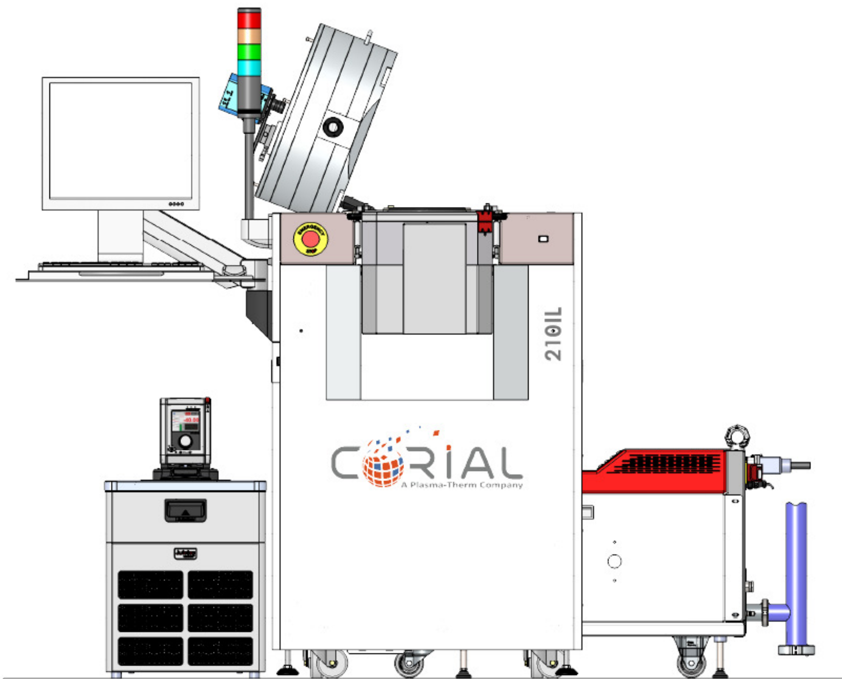
ICP SOURCE

CORIAL's Latest Generation of Reactor

FAST AND UNIFORM ETCHING



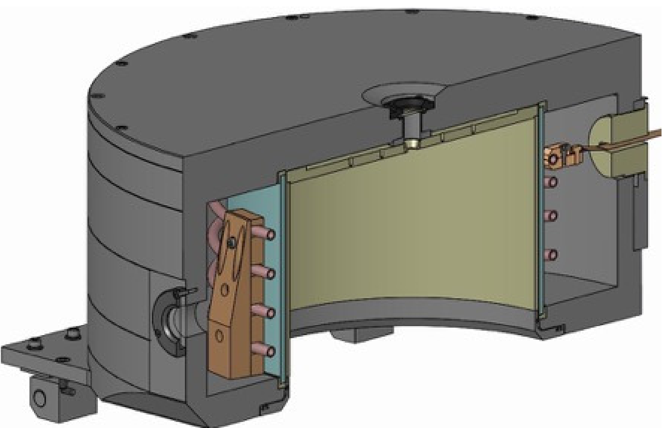
1. Load lock to run fluorinated and chlorinated chemistries in the same process recipe
2. Load lock for stable and repeatable process conditions
3. RF match box with matching range up to 2000 W
4. Uniform temperature control (from -50°C) for best repeatability
5. Hot walls (>250°C) minimize polymer condensation for selective processes
6. Hot walls and retractable liner reduce clean time
7. Retractable liner and shuttle holding to minimize process cross-contamination

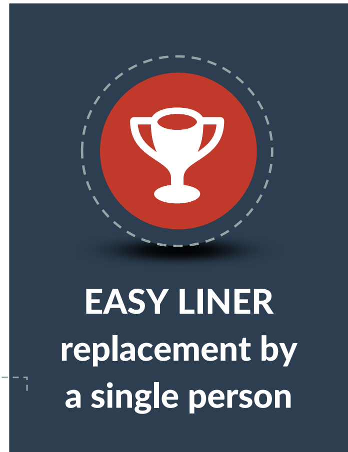
Polymers 800 nm/min
Diamond 500 nm/min
GaN 1200 nm/min
…

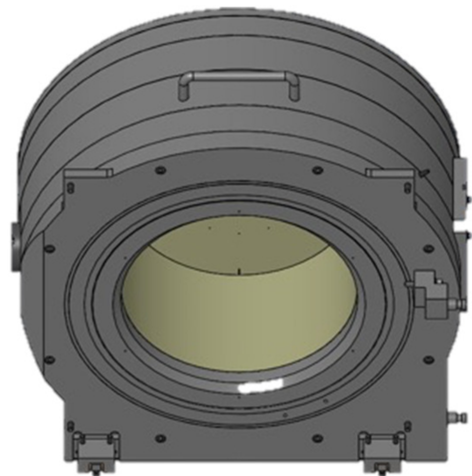
ICP SOURCE

Retractable Quartz Liner

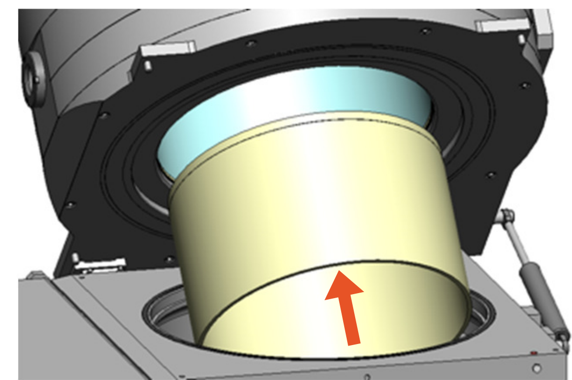
THE LINER FOR HARSH ICP-RIE PROCESSES







ZERO CROSS CONTAMINATION



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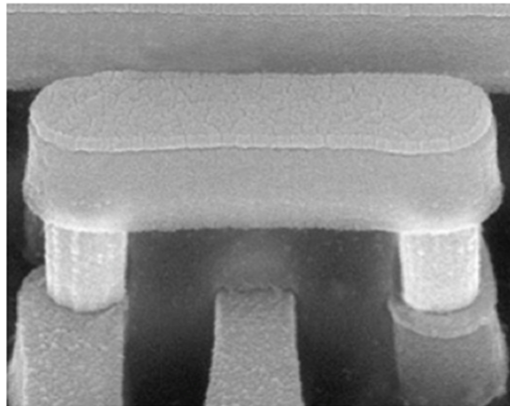
ICP SOURCE

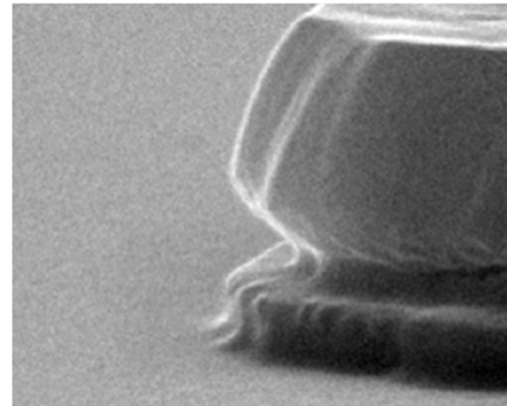
RF Coupling to ICP Source

< 15
volts

Minimum parasitic capacitive coupling giving rise to low plasma potential to enable low damage etching



SiO_2 Isotropic etching with NO RF biasing



GaN Low damage etching with low RF biasing

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ICP SOURCE

Operation Sequence

1

Shuttle Loading

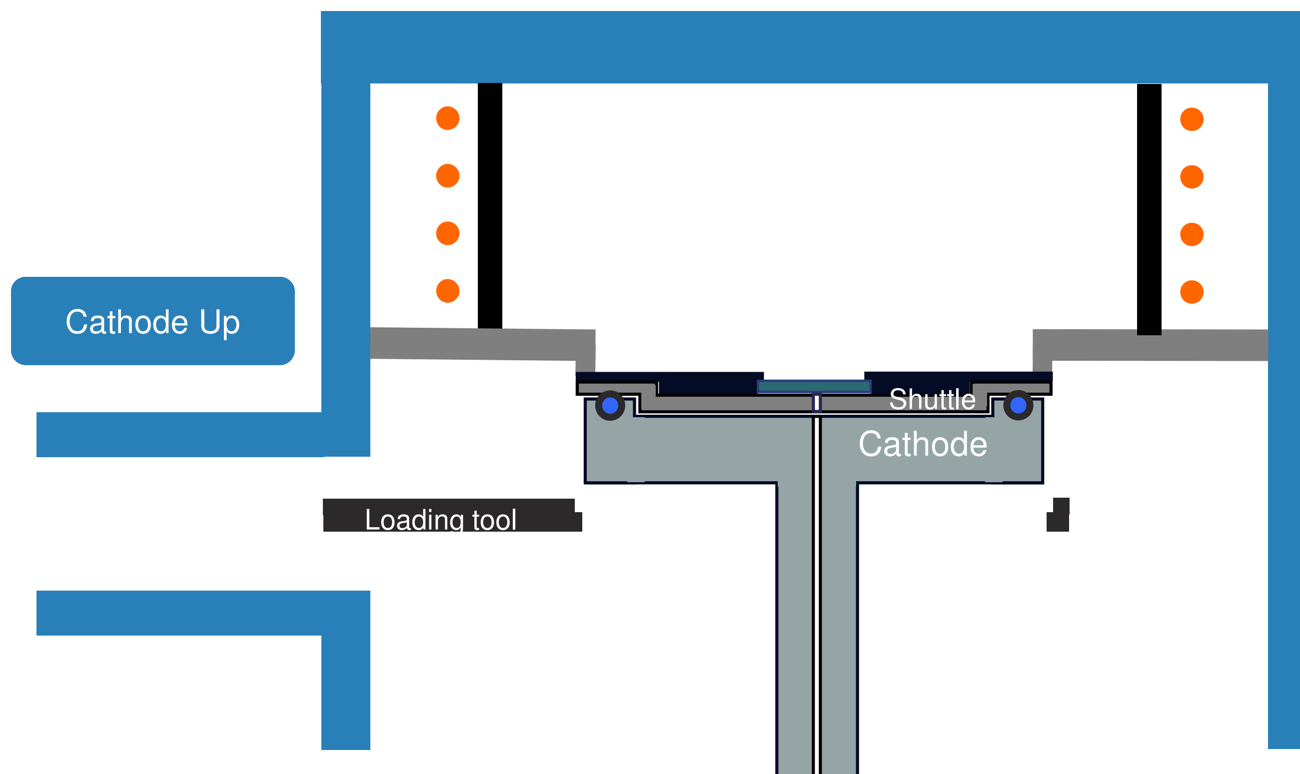
Loading tool

Shuttle

Cathode

ICP SOURCE

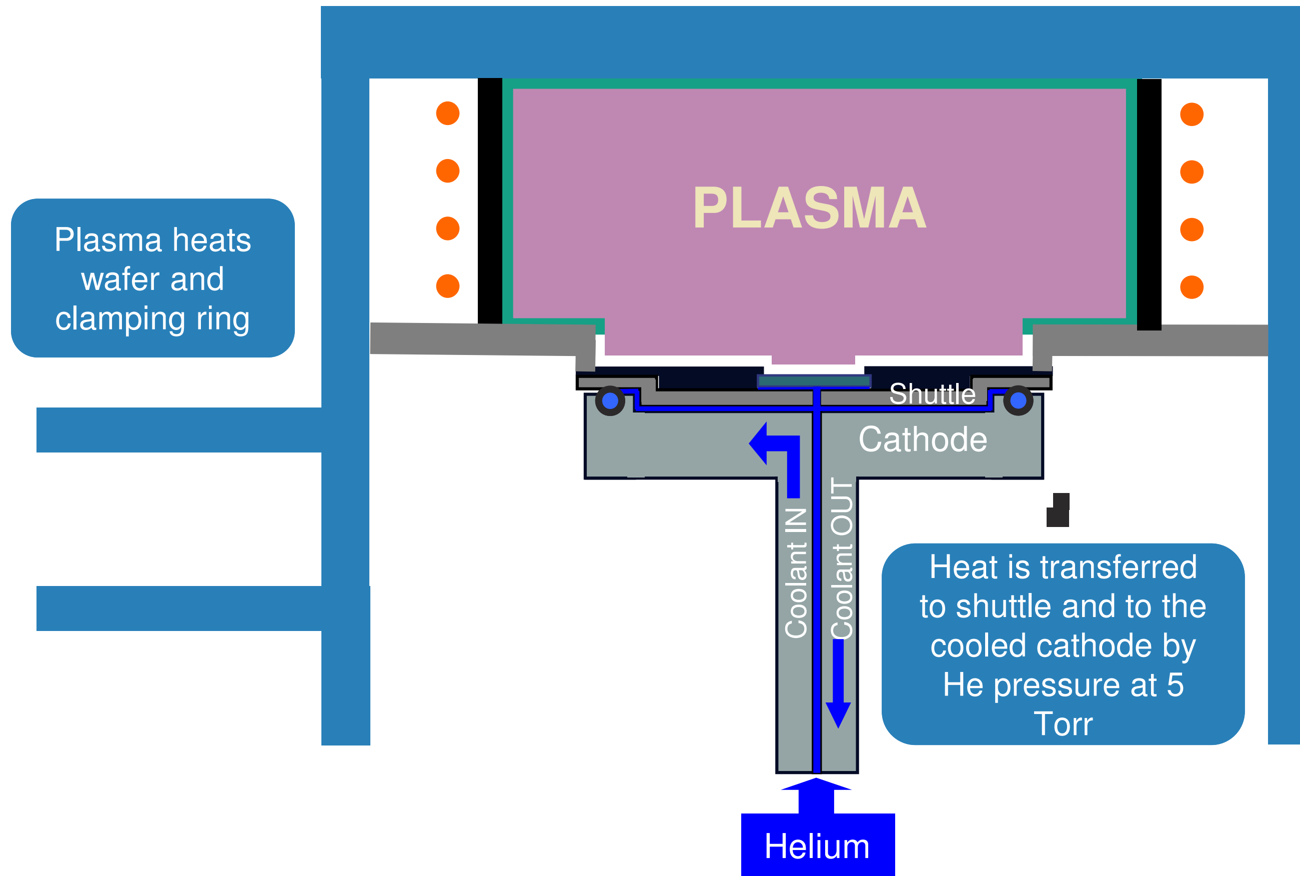
Operation Sequence



2

ICP SOURCE

Operation Sequence



3

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ICP SOURCE

Temperature Control

New cathode design and efficient helium back side cooling of the shuttle and substrate ensure uniform temperature control (from -50°C) during the etch process

Test based on 1 KW configuration for sapphire etching (1 X 2” wafers)

Process	Etch rate	ICP Power	RF Power
Sapphire	300 nm/min	1 KW	280 W

No resist damage when operating at
full ICP and RF power (Novolak type photoresist baked at 110°C)

ICP SOURCE

Reactor Uniformity

Benchmark uniformity test: 500 nm etching of thermal oxide (8” wafers)

Process	Etch depth	Uniformity	ICP Power	RF Power
Thermal SiO_2	500 nm	± 2.2%	800 W	150 W

Remaining 100 nm measured by ellipsometry
Measurement performed with 5 mm edge exclusion

MAXIMUM FLEXIBILITY WITH THE ONLY 200 MM ETCH SYSTEM WITH THE CAPABILITY TO SUPPORT ICP, RIE, AND DRIE PROCESSING IN THE SAME REACTOR

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SHUTTLE HOLDING APPROACH
CORIAL 210IL

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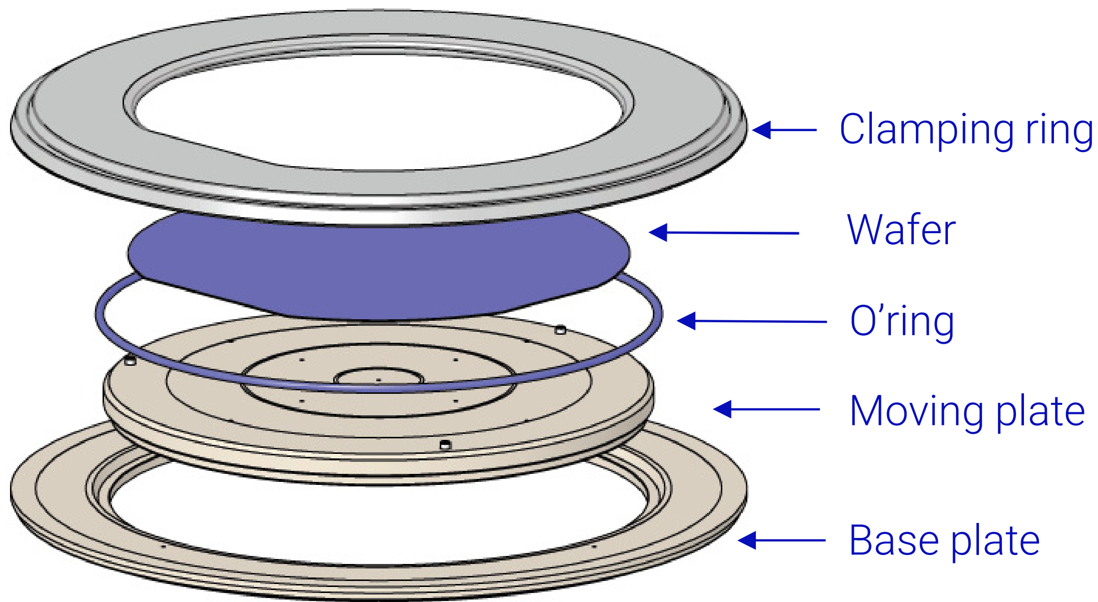
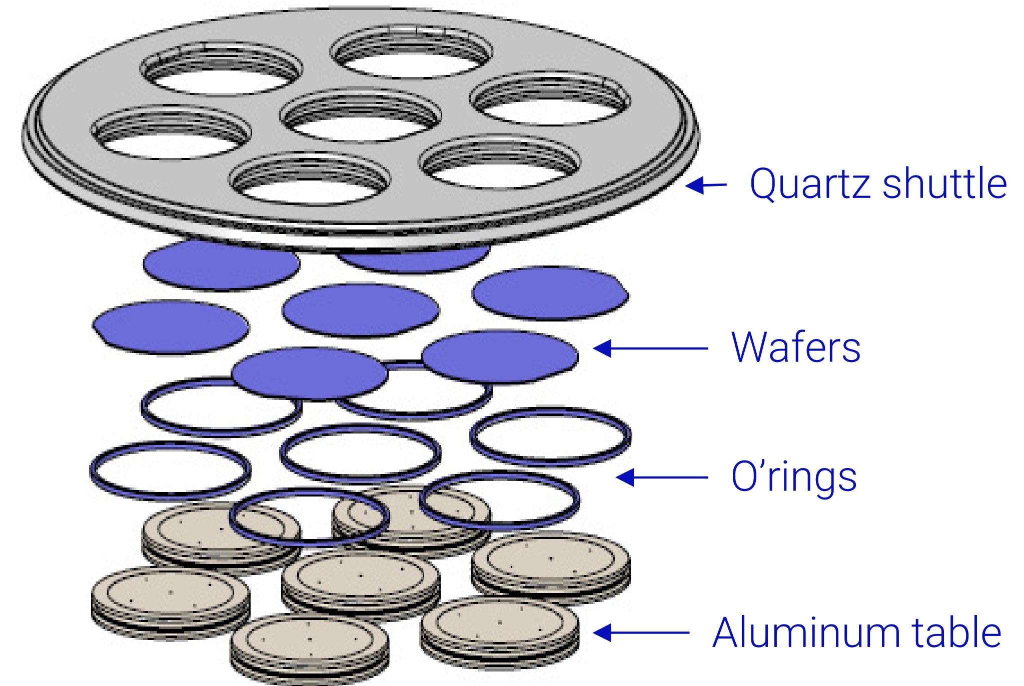
SHUTTLE HOLDING APPROACH

Portfolio

WF type



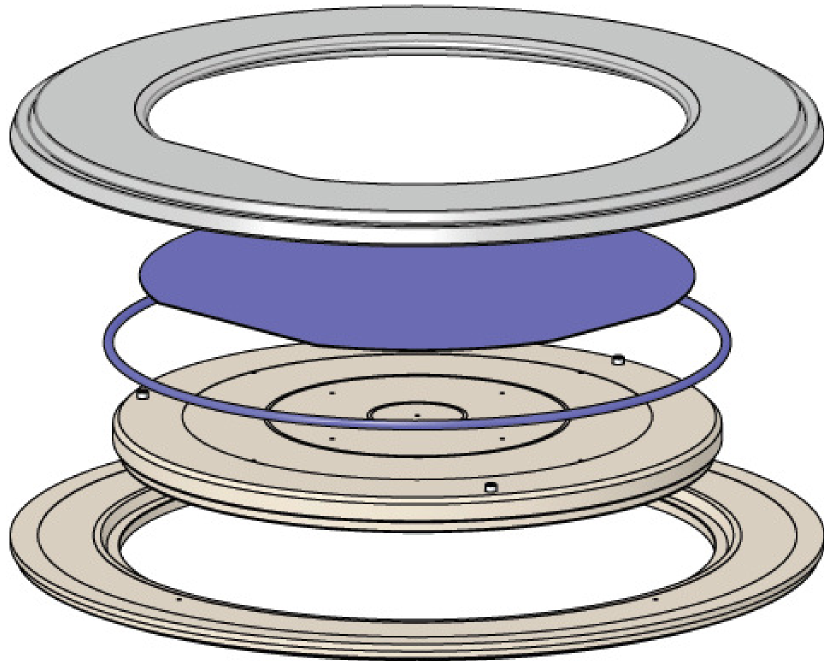
SW type



Guaranteed no wafer damage due to SOFT wafer clamping

SHUTTLE HOLDING APPROACH

Benefits



1. Quick adaptation to sample shape and size
2. Optimum process conditions with NO modification of process chamber
3. Limited cross contamination between processes by using dedicated shuttles
4. Shuttles for single wafer treatment: 1 x 2”, 1 x 3”, 1 x 4”, 1 x 6”, 1 x 8”
5. Shuttles for batch processing : 7 x 2”, 3 x 3”
6. Customized shuttles are available (4” x 4”, 5” x 5”, etc)

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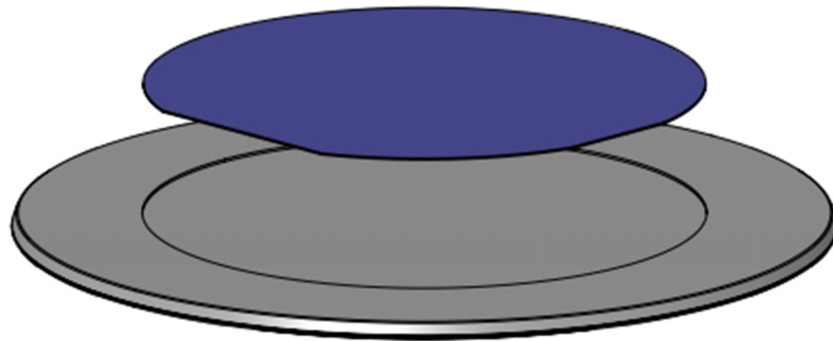
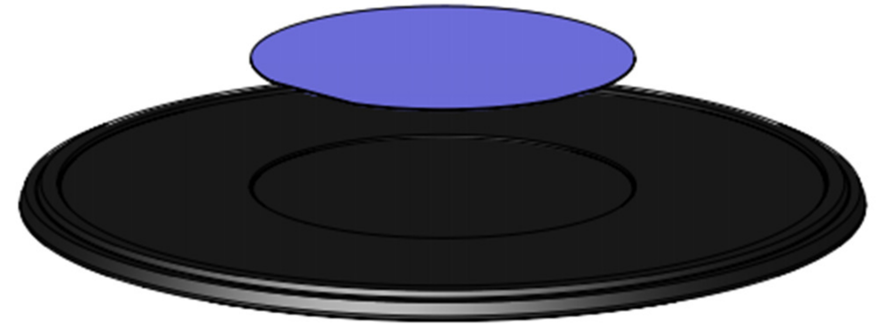
SHUTTLE HOLDING APPROACH : UNCLAMPED

Exemples



NQ150
unclamped 150mm wafer Quartz shuttle



NG20-100
unclamped 100mm wafer Graphite shuttle

PERFORMANCES ICP-RIE PROCESSES
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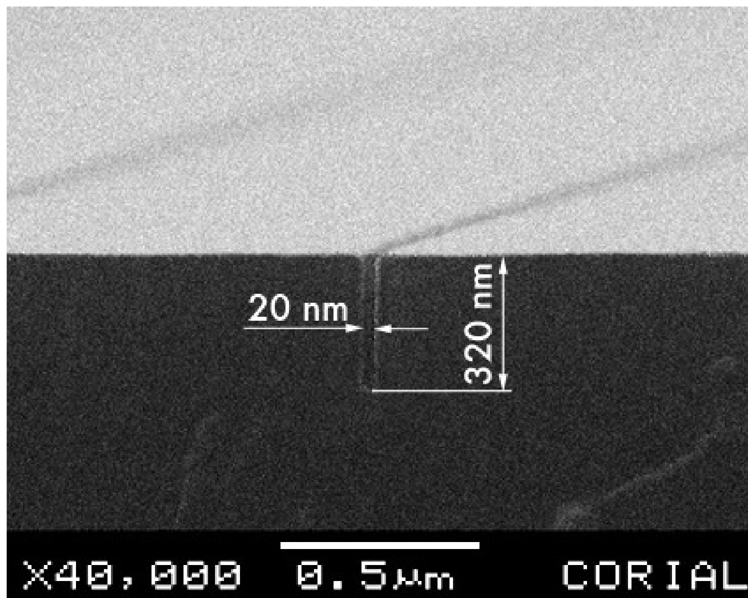
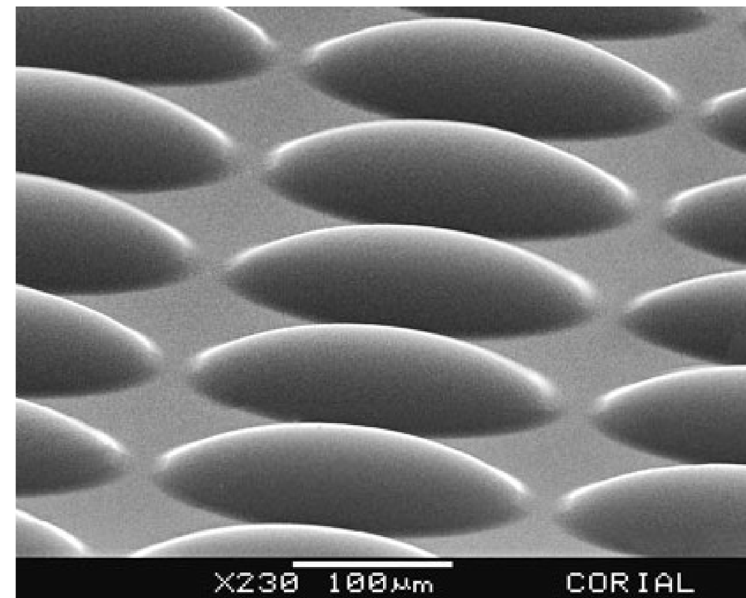
ICP-RIE OF SI

Fluorinated chemistry



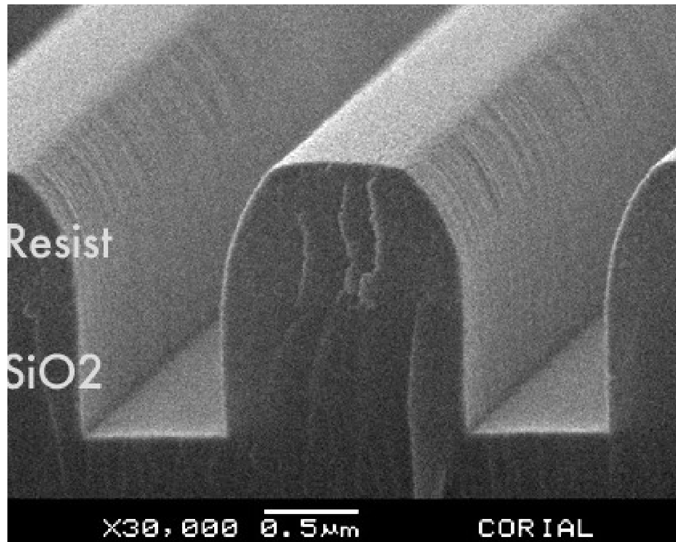
High Resolution ICP-RIE of Si



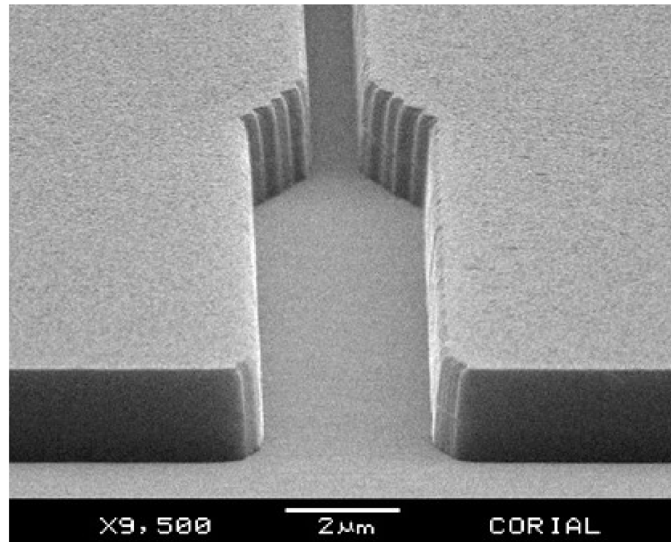
ICP-RIE of Si microlenses 40 µm high

ICP-RIE OF OXIDES AND NITRIDES

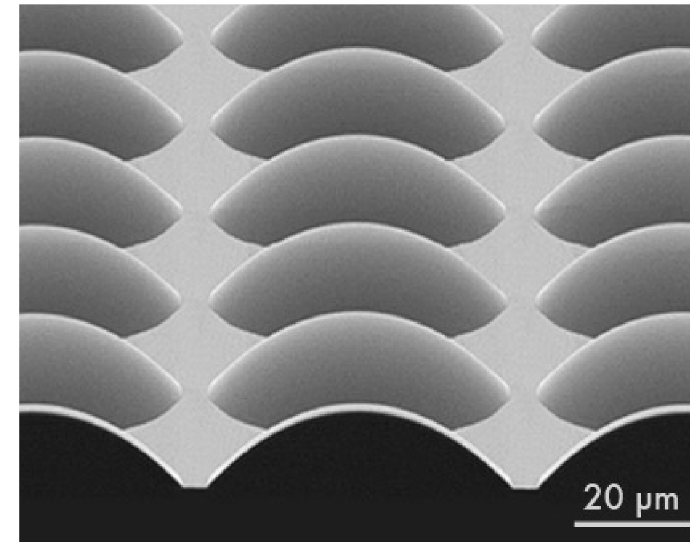
Fluorinated chemistry



ICP-RIE of SiO_2



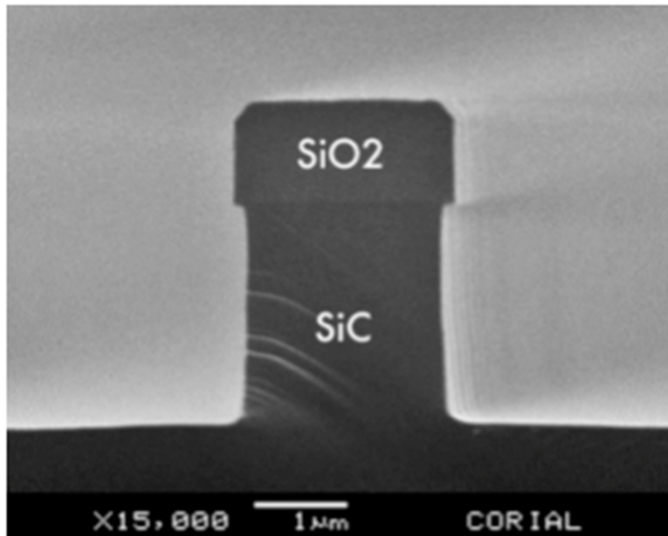
ICP-RIE of Si_3N_4



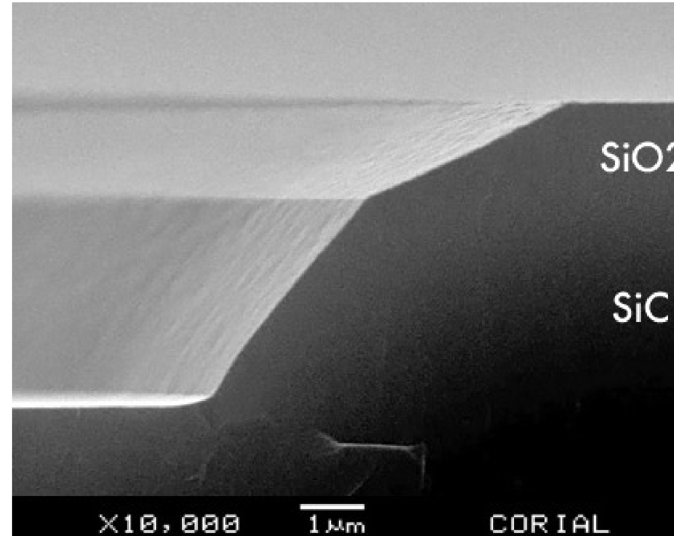
ICP-RIE of SiO_2 Microlenses

ICP-RIE OF HARD MATERIALS

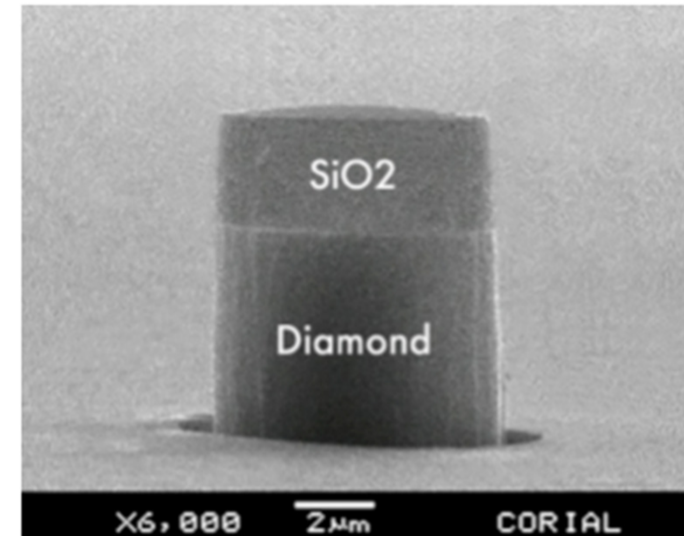
Fluorinated chemistry



ICP-RIE of SiC
With no trenching



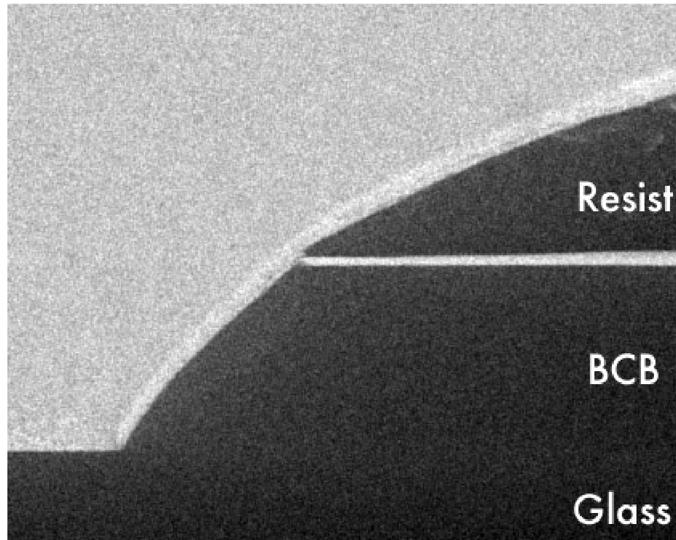
Tapered ICP-RIE of SiC



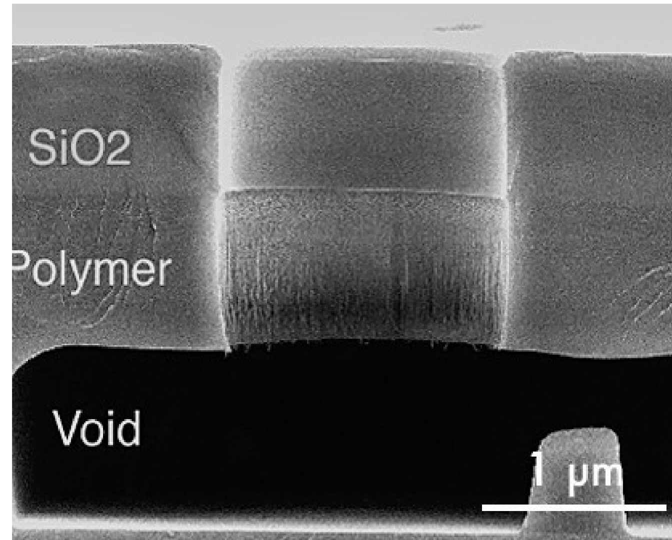
ICP-RIE of Diamond

ICP-RIE OF POLYMERS

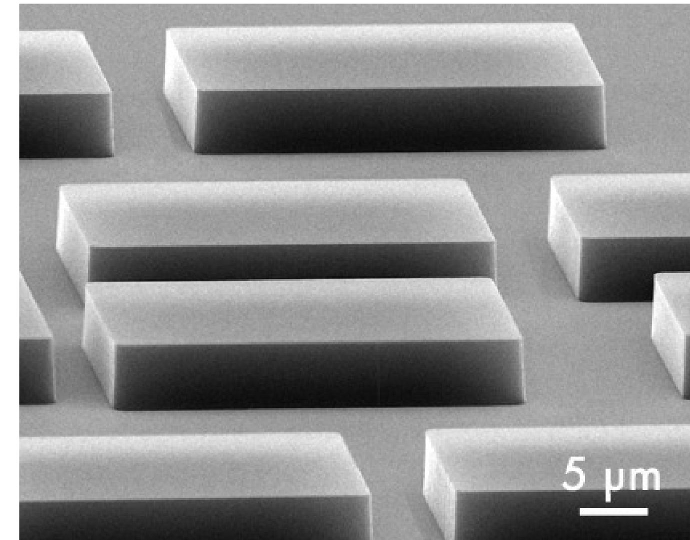
Fluorinated chemistry



BCB etching with PR mask



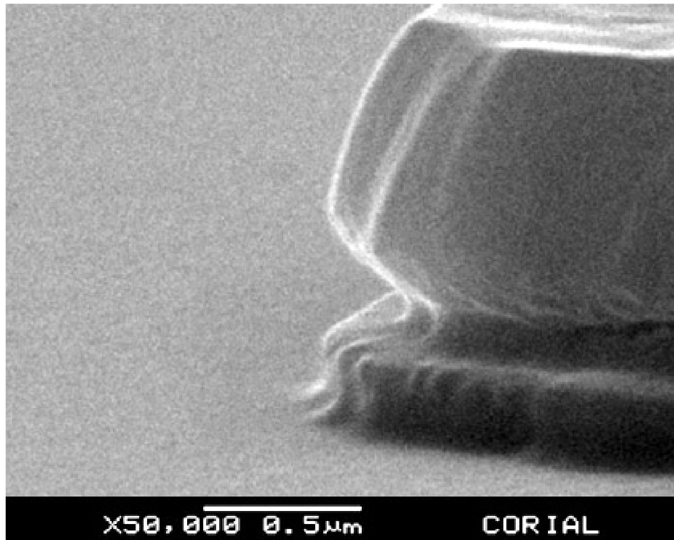
ICP-RIE of Polyimide



Anisotropic etching of Polyimide with SiO2 mask

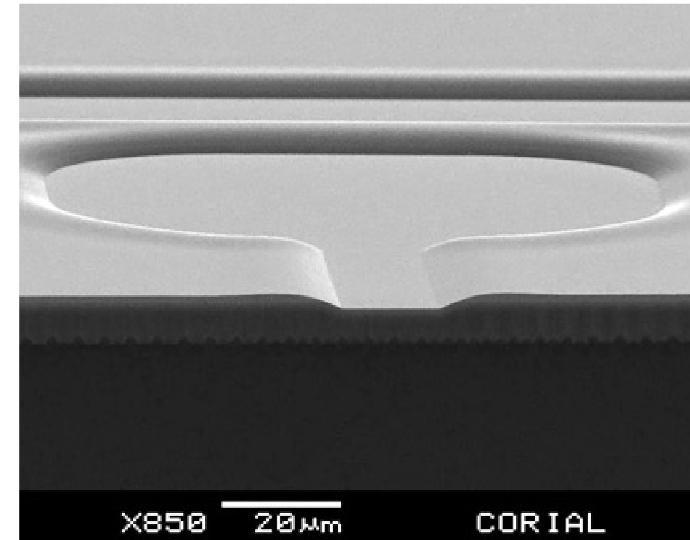
ICP-RIE OF III-V COMPOUNDS

Chlorinated chemistry



Low damage ICP-RIE of GaN

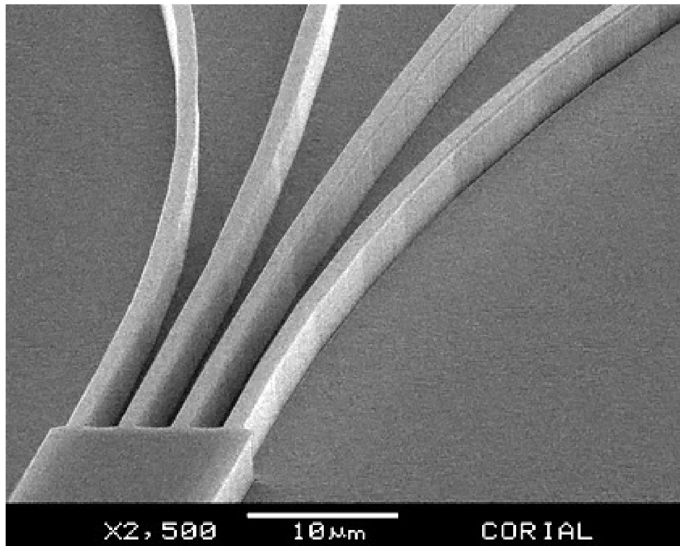
VCSEL



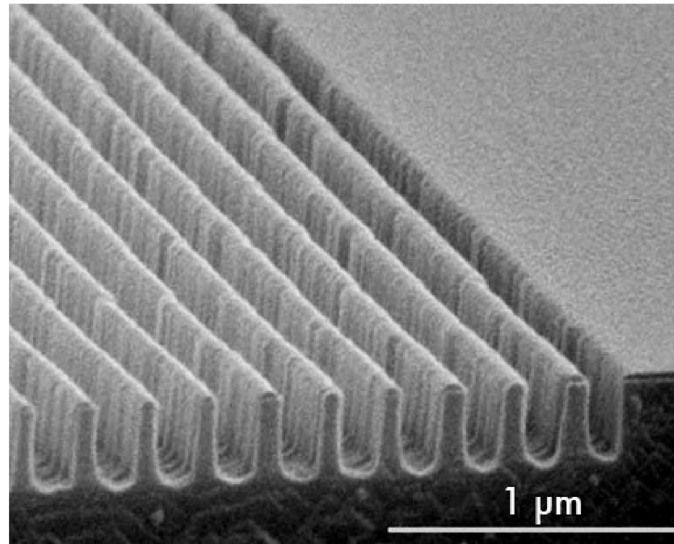
ICP-RIE of GaN (Mesa)

ICP-RIE OF III-V COMPOUNDS

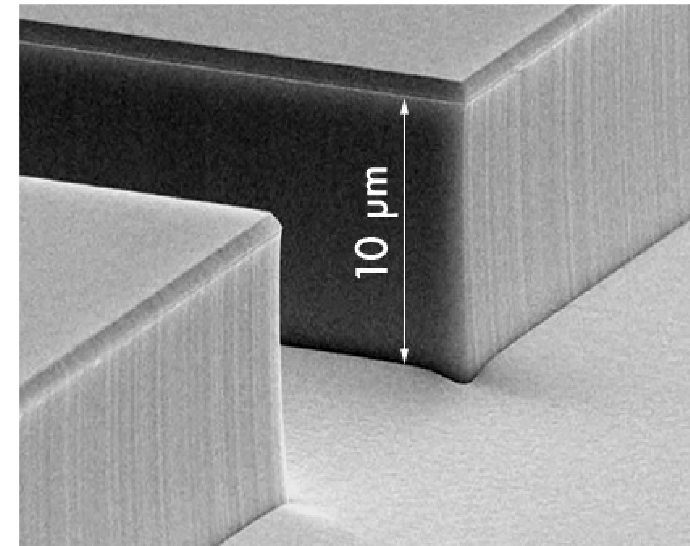
Chlorinated and hydrocarbon chemistry



ICP-RIE of InP

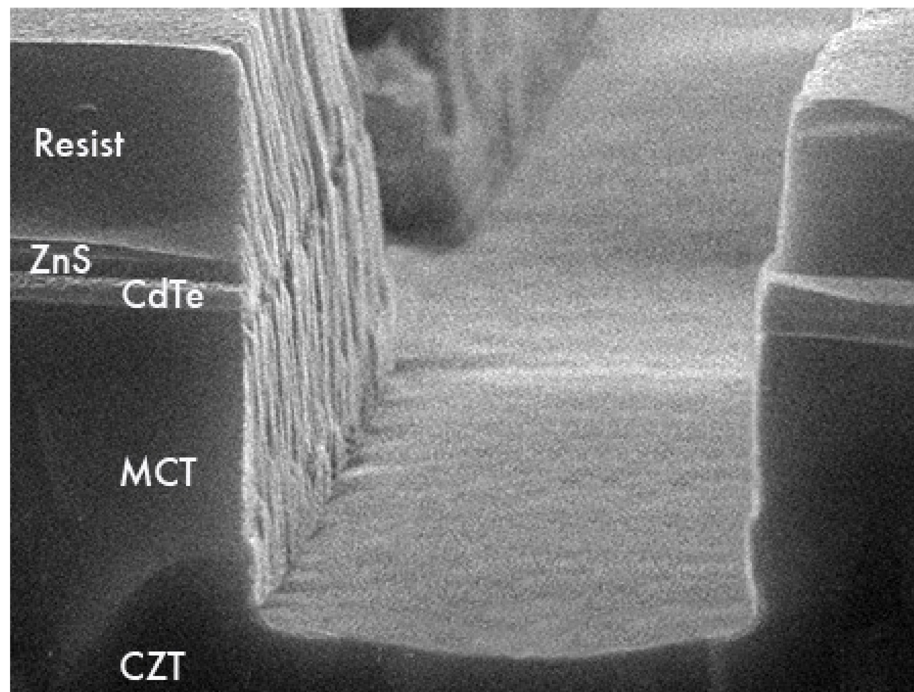


RIE of InP 0.1 μm lines and spaces

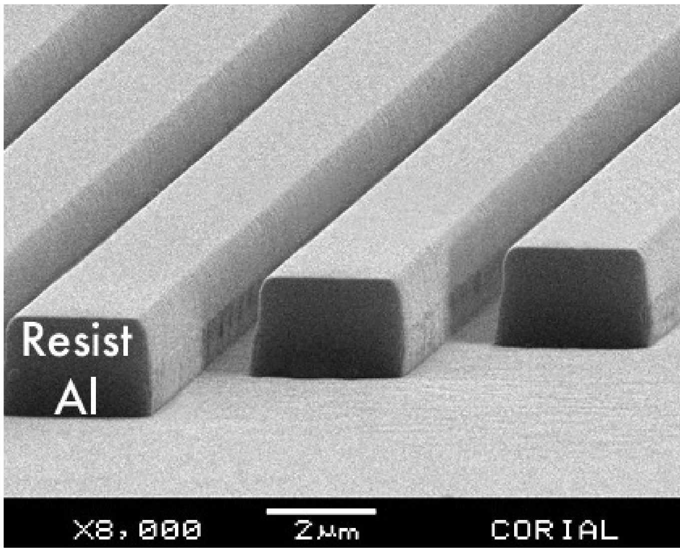


Deep RIE etching of InP

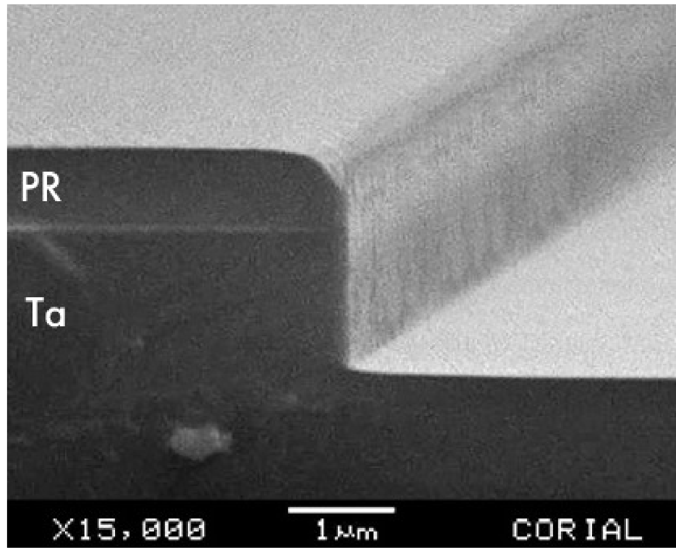
ICP-RIE OF II-VI COMPOUNDS



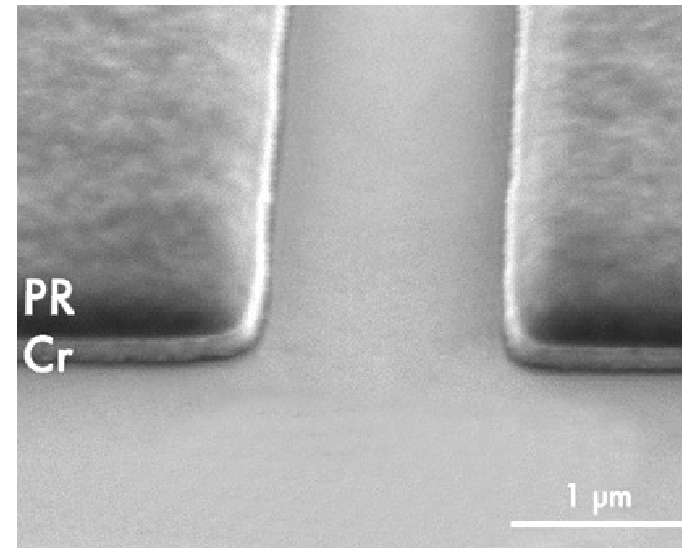
ICP-RIE OF METALS



ICP-RIE of Al



ICP-RIE of Ta



ICP-RIE of Cr

PROCESS PERFORMANCES

Examples of High Etch Rates & Excellent Uniformity

Process	Mask	Etch rate (nm/min)	Selectivity (vs mask)	Uniformity (across wafer)
Polymers	PR	800	1	±5%
SiO_2	PR	400	> 3	±3%
Si_3N_4	PR	350	> 4	±3%
Diamond	SiO2	500	> 25	±3%
Cr	PR	60	0.8	±3%
InP	SiO2	1200	> 25	±3%
InSb	SiO2	250	> 6	±3%
GaN (Mesa)	PR	600	1	±3%
GaN (Iso)	PR	1200	> 1	±3%
ZnS	PR	100	> 1	±3%
CdTe	PR	300	> 2	±3%
MCT	PR	500	> 4	±3%

PERFORMANCES SPUTTER-ETCH PROCESSES

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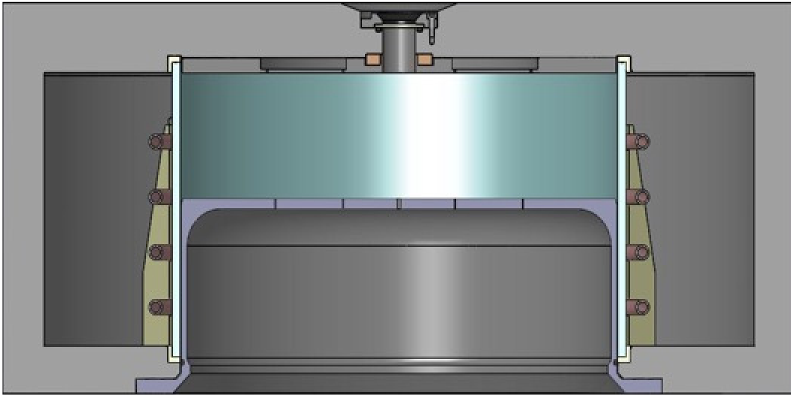
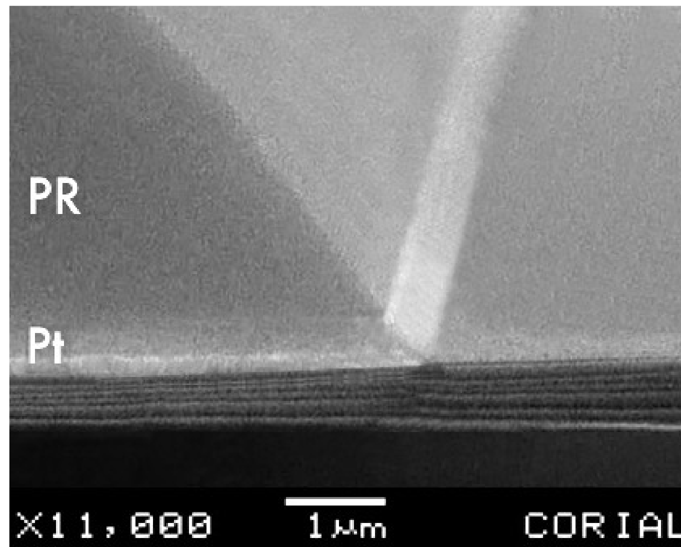
SPUTTER-ETCH

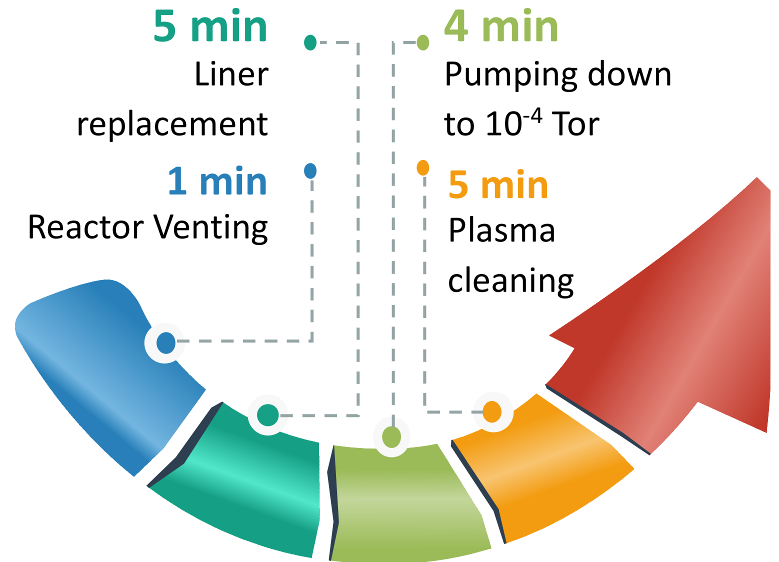
Retractable Liner



Ni COATED LINER TO COLLECT SPUTTERED MATERIALS IN METAL RIE SPUTTER-ETCH MODE

Pt SPUTTERING WITH PR MASK





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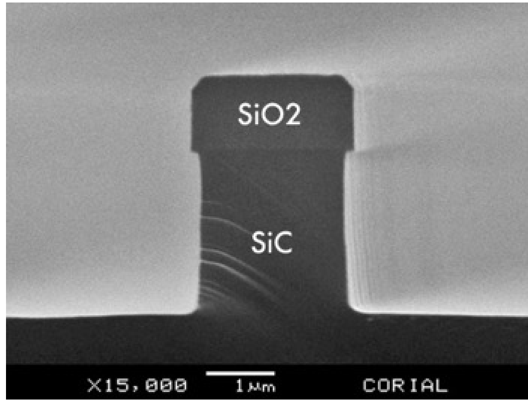
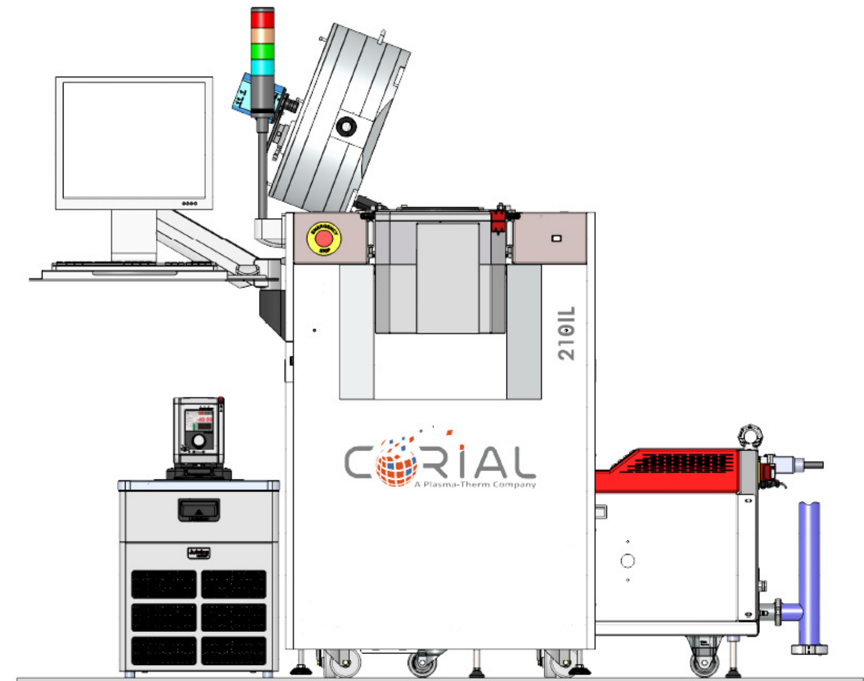
REACTOR CLEANING

High Uptime



OVER
95 %
UPTIME

LESS THAN
30 MIN
REACTOR
CLEANING



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USABILITY
CORIAL 210IL

CORIAL
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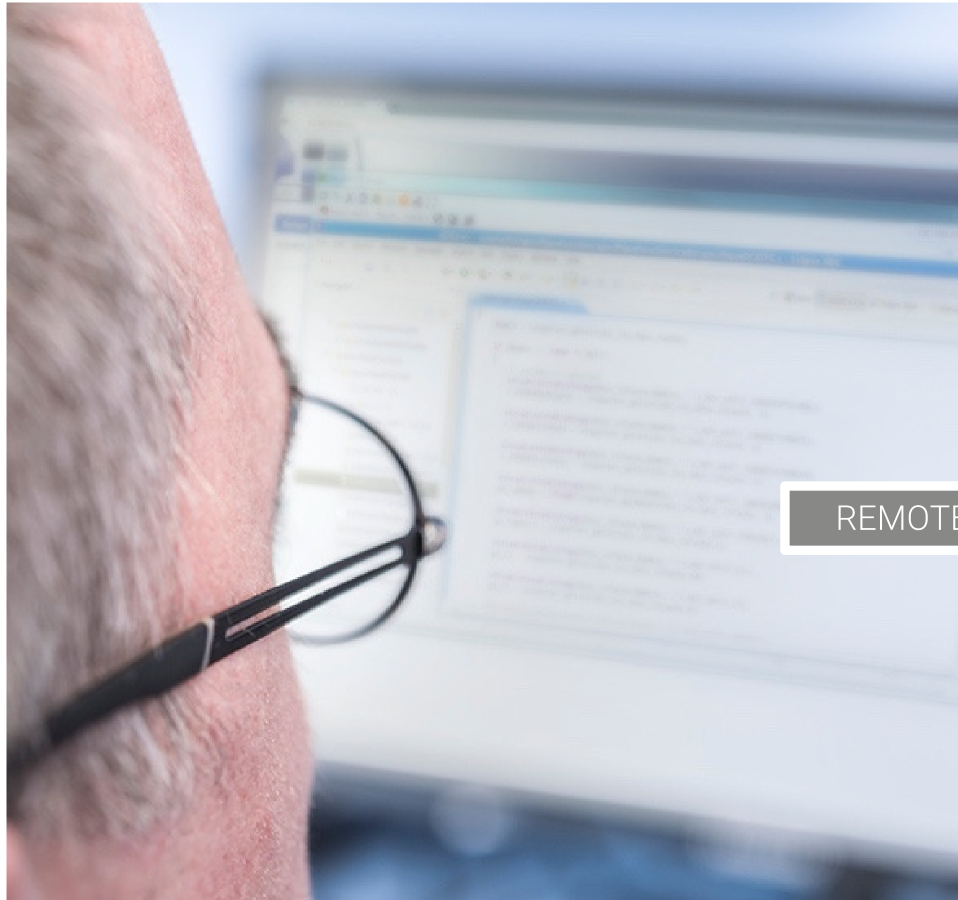
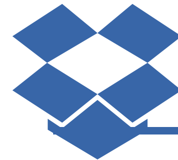
PROCESS CONTROL SOFTWARE

Cortex®





Cortex®

The simplest, most efficient software to develop processes, operate, and maintain CORIAL systems

REMOTE CONTROL

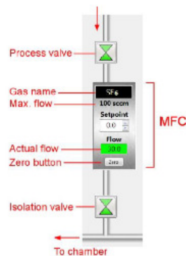
DESKTOP APPLICATION

Process Editing I Process Adjustment I Process Operation I Process Traceability I System Maintenance

CORTEX SOFTWARE

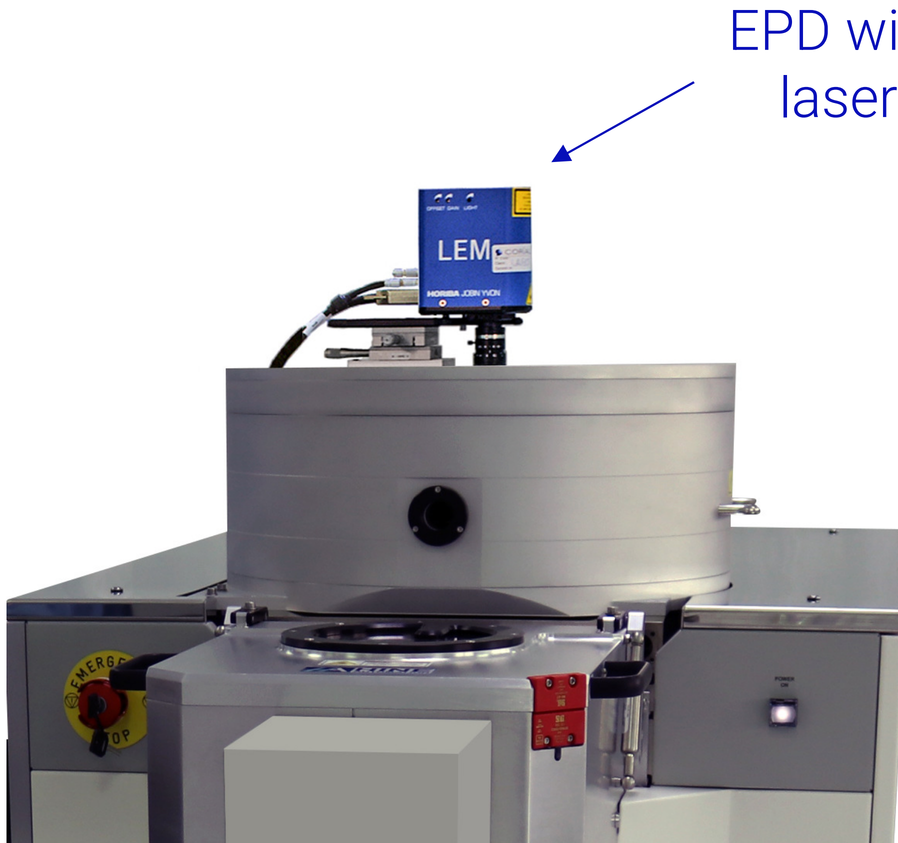
Plasma-Therm proven controls

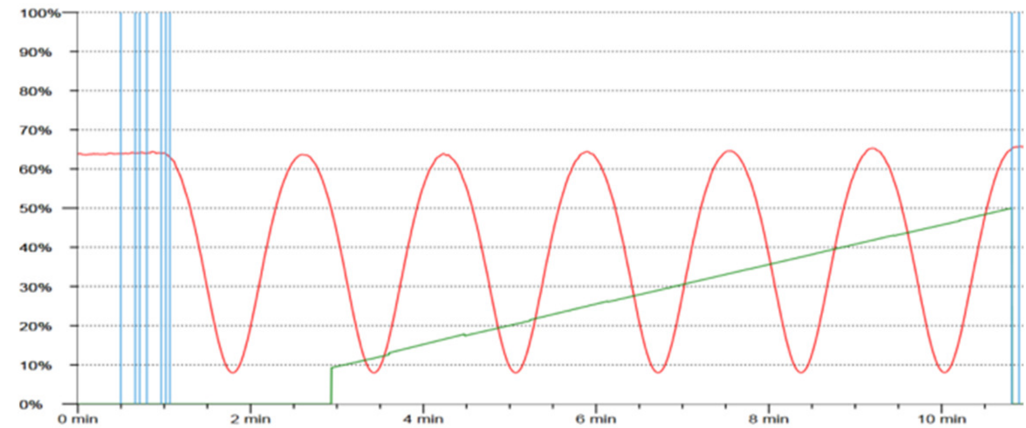
- Graphical User Interface
- Recipe Automation (incl'd proprietary endpoint controls)
- Material handling
- Data Display, Charting, Logging
- Maintenance & Service



END POINT DETECTION

EPD with laser





A CCD camera and laser diode, in the same measuring head, enables simultaneous visualization of the wafer surface and the laser beam impact on it. A 20 µm diameter laser spot facilitates the record of interference signals.

Real-Time etch rate measurement
Real-Time etched depth measurement

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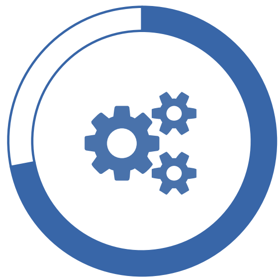
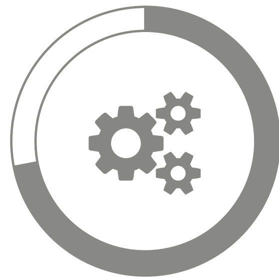
Get Maximum Flexibility

ICP-RIE equipment for any chemistry



Wide process range for Silicon, Metals, III-V and II-VI compounds



Support ICP, RIE, ALE and DRIE process recipes in the same reactor

Smaller wafer pieces up to full 200 mm wafer