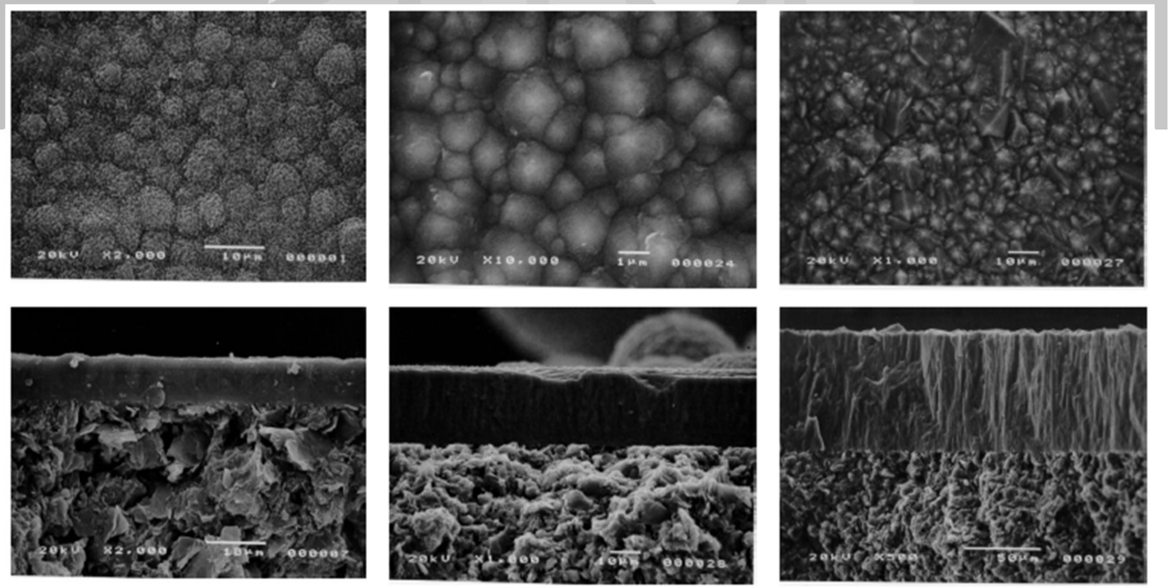
PRODUCT INTRODUCTION

Ceramics CVD Reactor

Dynamic ThermVac

in pursuit of

the Best Vacuum Furnace



www.thermvac.co.kr

[Features of Ceramics CVD]

- Hot zone appropriate for thermal CVD of high temperature up to 2400℃
- Horizontal or vertical gas flow all available depending on loading conditions
- Muffle, nozzle and piping structures of easy maintenance
- Turn key supply of the entire line from gas delivery to the exhaust scrubber
- Longer life of each component

[Application of Ceramics CVD]

Deposit Materials

① SiC, TaC, HfC, BN

② Carbon

Temperature & Pressure

① 950 ~ 2,400℃

② 133 Pa ~ 100 KPa

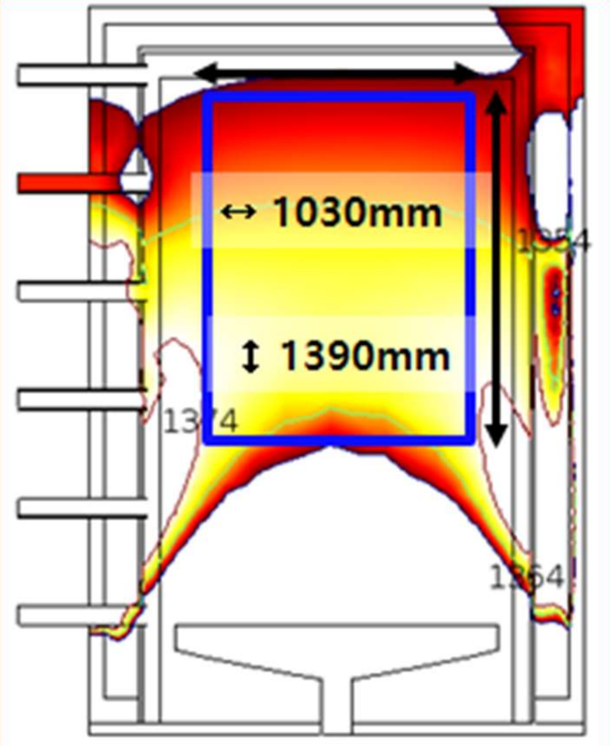
Process

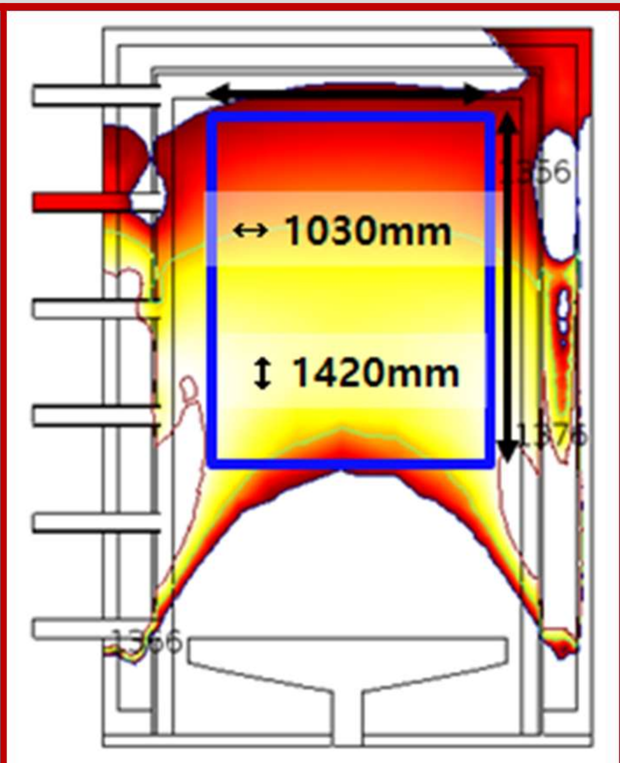
① CVD

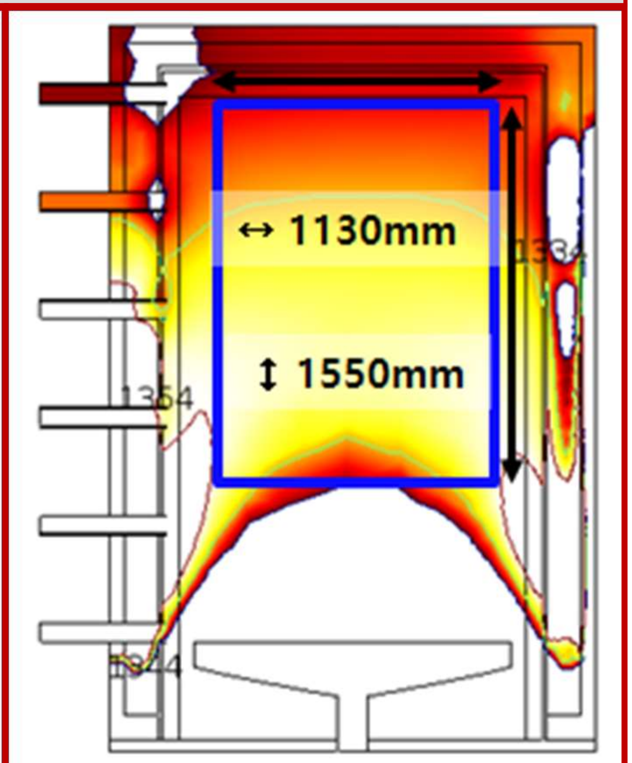
② CVI (TG, ISO, Pulsed)

[CVD Simulation _ Work Zone Expansion]

Modification of hot zone structure to expand effective work zone







Uniformity 1350℃±10℃

Top heater : 1370℃
Middle heater : 1500℃
Bottom heater : 1800℃

Thickness of bottom felt
80T→120T ㎜

Work zone expanded
H 1390→1420 ㎜

Length/distance of heater
distance 73 ㎜→35 ㎜

Work zone expanded
ф 1030→1130 ㎜

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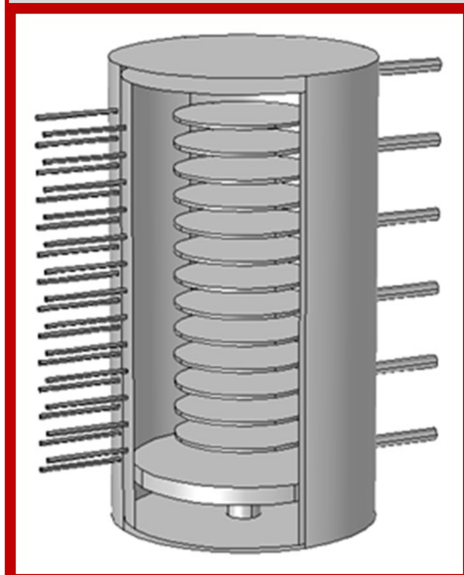
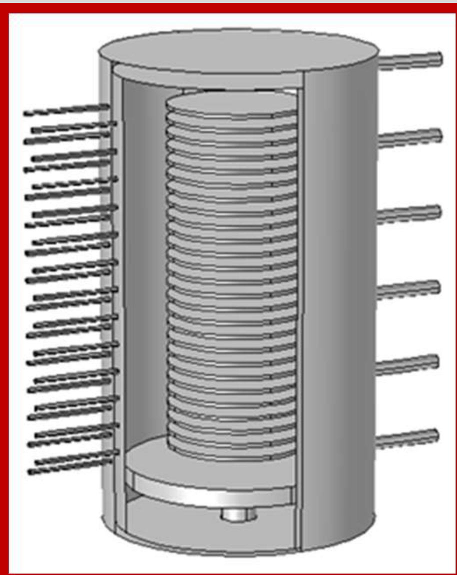
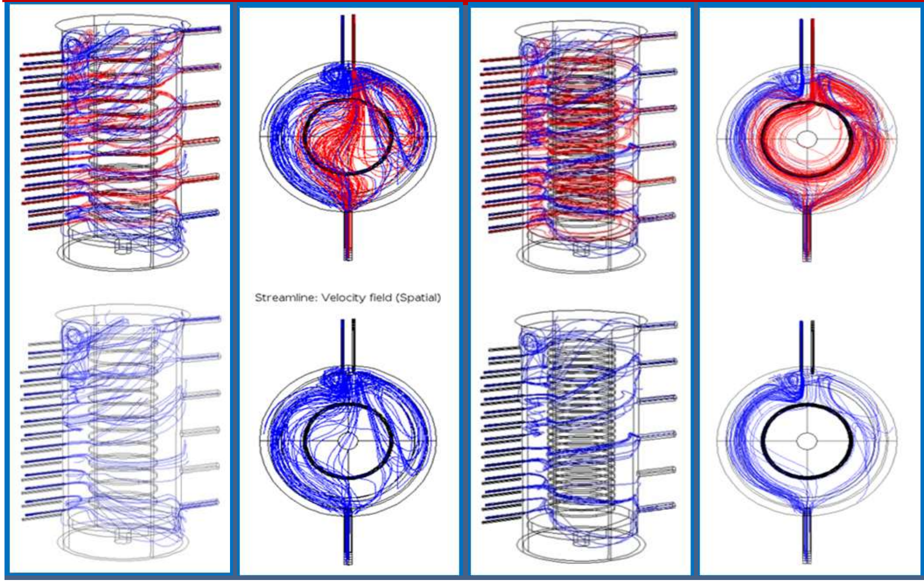
[CVD Simulation _ Thermal Gas Flow]

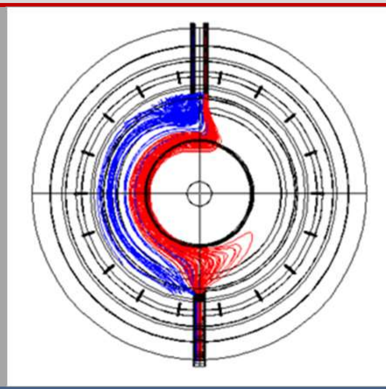
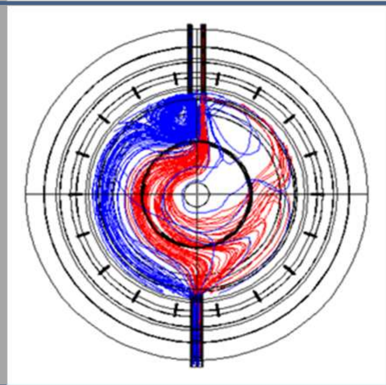
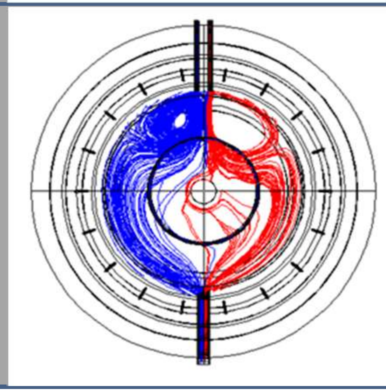
Flow analysis by loading capacity



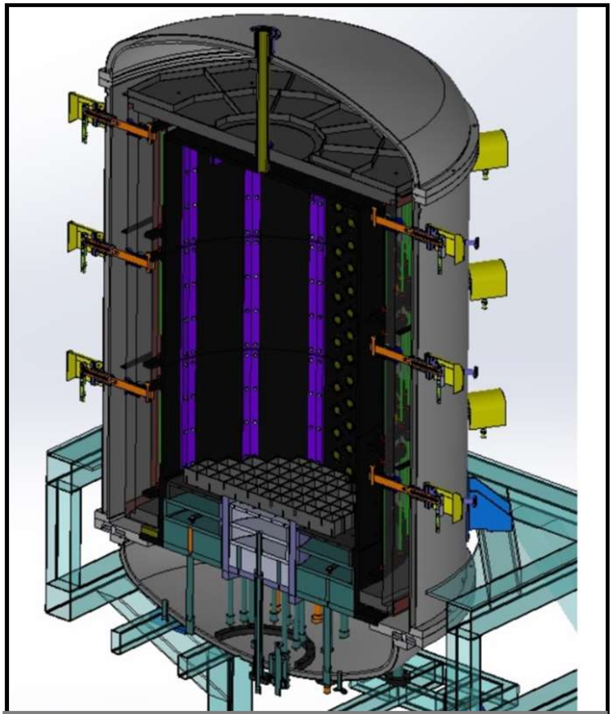


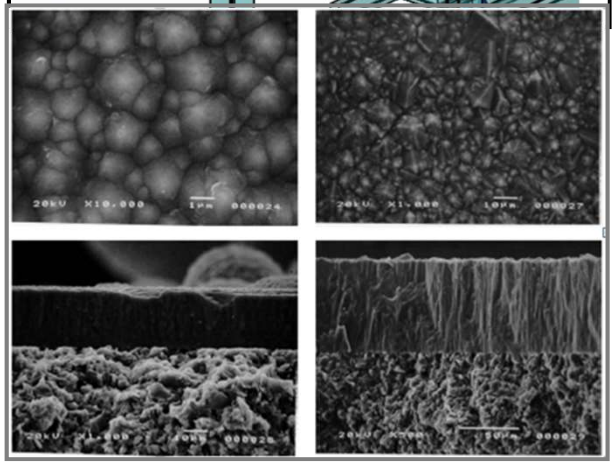


Flow analysis by rotation speed

RPM 1	
RPM 0.5	
RPM 0.1	

[Standard Specifications of Ceramics CVD]





Item	Specification
Furnace type	Vertical reactor furnace for high temperature CVD
Application	Ceramic coating(CVD) or densification(CVI)
Film materials	SiC, TaC, HfC, BN, (Pyrolitic) Carbon
Loading volume	254L ~ 3532L
Temperature	HT type : Max. 1600℃, UT type : Max. 2400℃
Uniformity	±6~12℃ [1000℃, no load, Vacuum]
Heat-up rate	2 ~ 10℃/min
Temperature control	Multi zone PID control by T/C and SCR
Hot zone materials	Graphite
Retort muffle	Polygonal cylinder assembly
Process gas	[MTS, CH_4, $TaCl_4$, $HfCl_4$, BCl_3-NH_3,], H2, N2, Ar
Process pressure	Partial 5KPa ~ 50KPa
Evacuation	Mechanical booster pump & Dry pump
Loading	Bottom door loading & rotating turn-table
Door lock	Hydraulic clamps
Exhaust treatment	Vapor trap, Particle filter & Scrubber
System control	PLC control, Touch or PC interface
Electricity	AC 3ph or DC

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[Standard Dimension of Ceramics CVD]

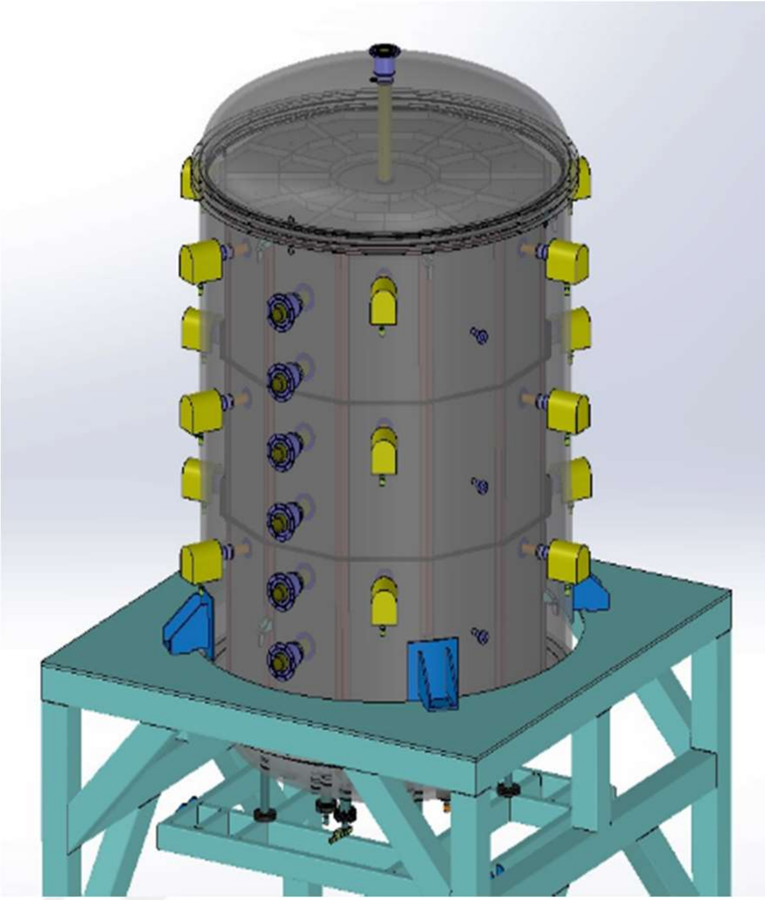
HT Model _ Max. 1,600℃

Model code	TVCVD-HT0609	TVCVD-HT1015	TVCVD-HT1218	TVCVD-HT1520
Work zone(㎜)	Φ600*900H	Φ1000*1500H	Φ1200*1800H	Φ1500*2000H
Capacity(㎏)	200~300Kg	550~700Kg	750~1000Kg	1000~1300Kg
Uniformity	±6℃	±8℃	±10℃	±12℃
Electricity(kVA)	360KVA	600KVA	750KVA	1000KVA

UT Model _ Max. 2,400℃

Model code	TVCVD-UT0609	TVCVD-UT1015	TVCVD-UT1218	TVCVD-UT1520
Work zone(㎜)	Φ600*900H	Φ1000*1500H	Φ1200*1800H	Φ1500*2000H
Capacity(㎏)	200~300Kg	550~700Kg	750~1000Kg	1000~1300Kg
Uniformity	±6℃	±8℃	±10℃	±12℃
Electricity(kVA)	540KVA	940KVA	1140KVA	1440KVA

[Details _ Vacuum Chamber]



Boundary Conditions

STEP1

- Max Temp. of inner surface : 300~600℃
- Internal pressure : Vacuum
- External pressure : Atmospheric
- Water pressure of cooling jacket : 3Kgf/㎠

Fabrication

STEP2

- Type : Bottom loading vertical cylinder
- Double wall water cooled jacket
- Materials : STS316L(inner wall)
  STS304(outer wall･flange)
- Inside surface : Buffing #300

[Details _ Hot Zone]

Insulation

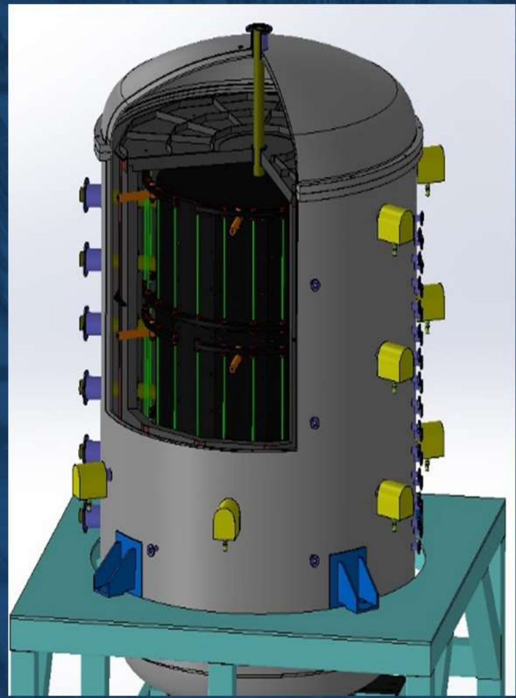
- Graphite rigid felt layers
- Thickness : HT 80T ㎜, UT 150T ㎜
- Inside treatment of foil coating

Heaters

- Materials : Graphite CIP block
- 2 ~ 4 zone control
- Side : Connector & rod assembly
- Bottom : Disc plate

Muffle

- Materials : Graphite CIP plate
- Polygonal cylinder assembly
- Fixed by carbon composite screw
- Inside wall : Graphite foil lining



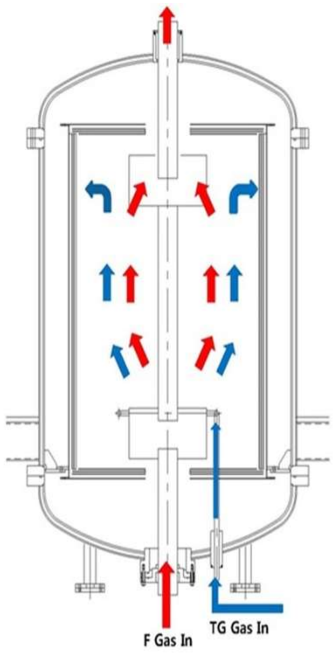
Hot Zone

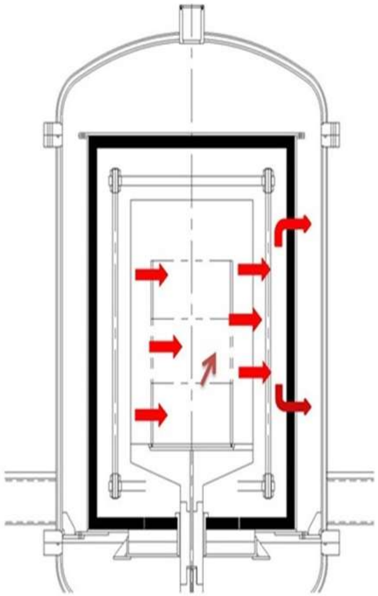
[Details _ Gas Flow & Precursor]

Gas Flow Orientation

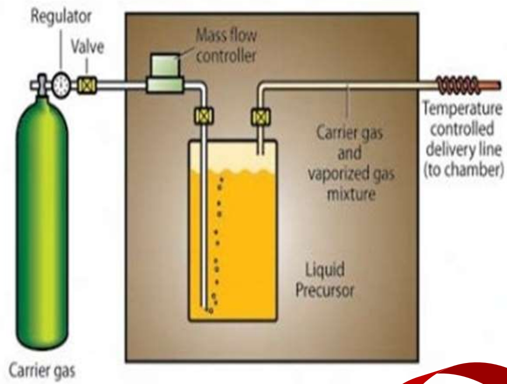
Vertical Flow
(TG CVI, SiC/PC CVD)

Horizontal Flow
(SiC/TaC CVD)

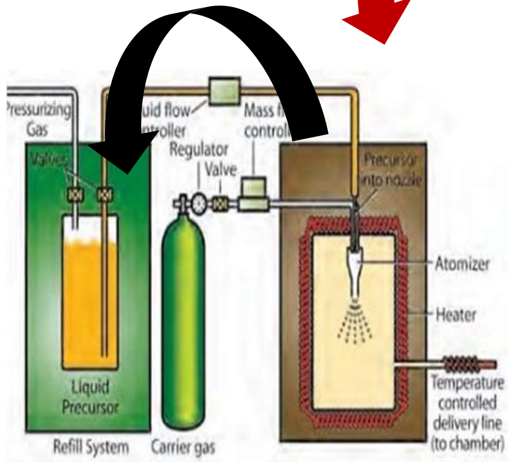




Bubbler System



Vaporization System



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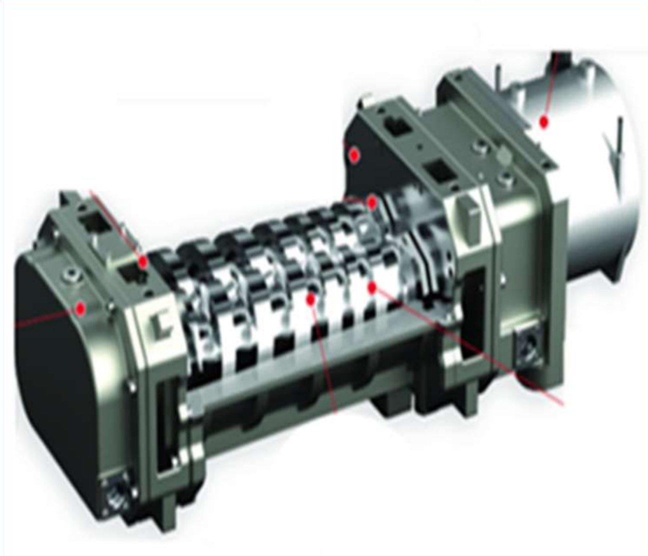
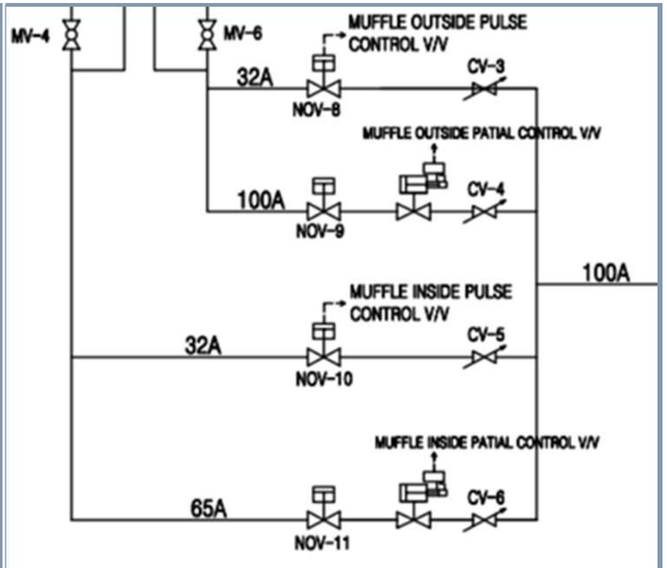
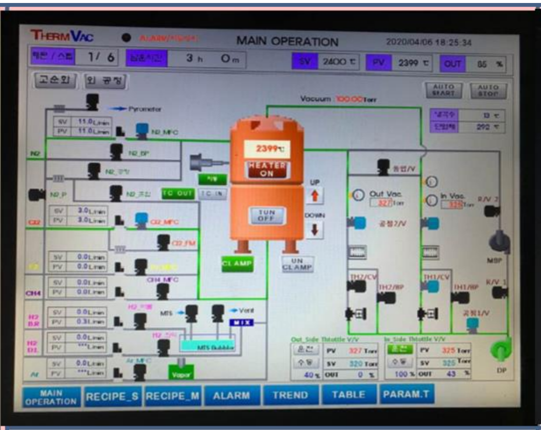
[Details _ Evacuation System]





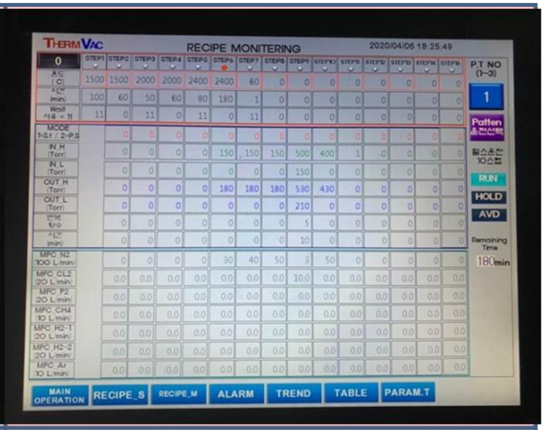
Vacuum Pumps	Vacuum Gauges	Suction Line Control
► Roots type mechanical Booster pump ► Screw type dry pump ► Maker : Edwards or Busch or Ulvac	► Type : Diaphragm Manometer ► Maker : MKS or Inficon ► Muffle inside & outside, pumping line	► Slow pumping vs. normal pumping ► Pumping of muffle inside vs. outside ► Atmospheric vs. partial pressure

[Details _ Control Panel]



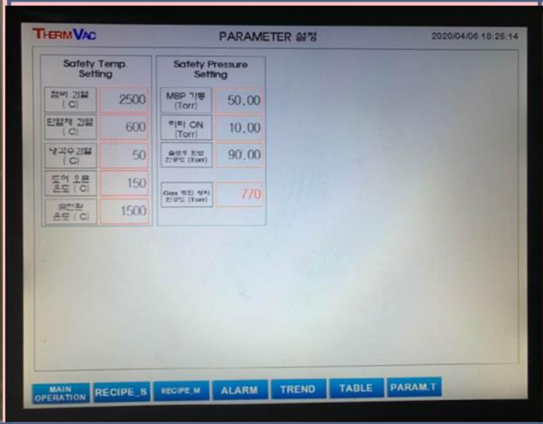
Main screen

Trend screen

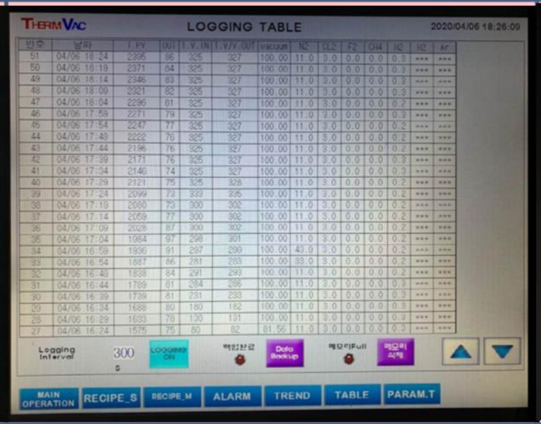


Recipe monitor

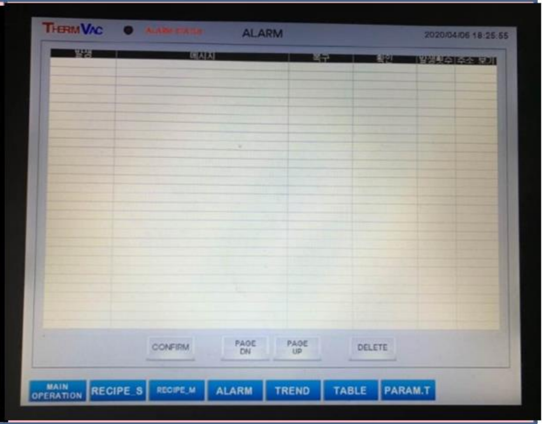
Control panel of Test Furnace



Parameter setting



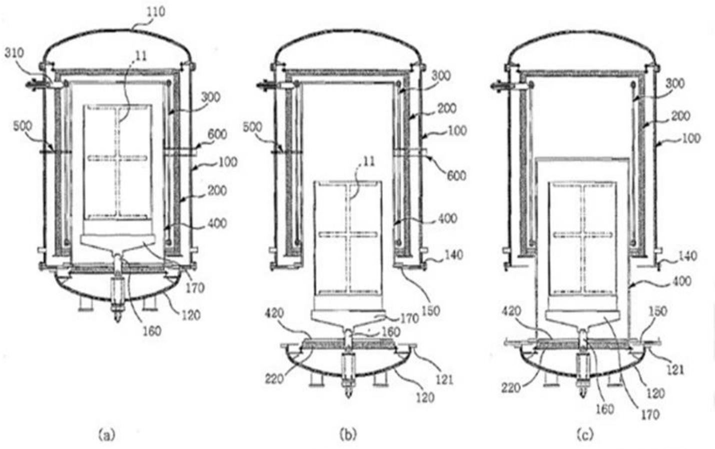
Data Logging



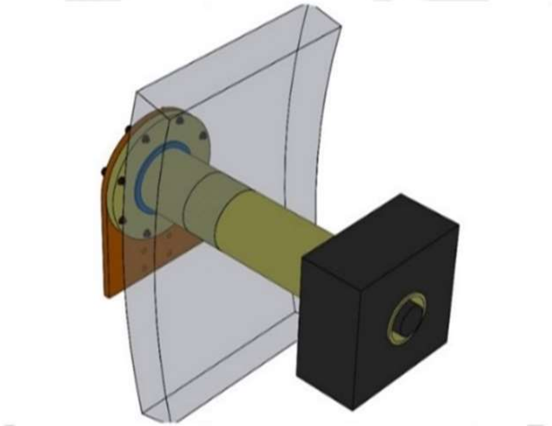
Alarm history

[Details _ Accessories]

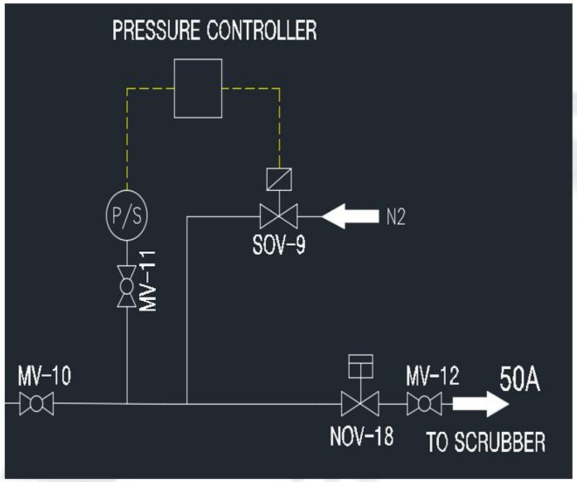
Separation of muffle from hot zone



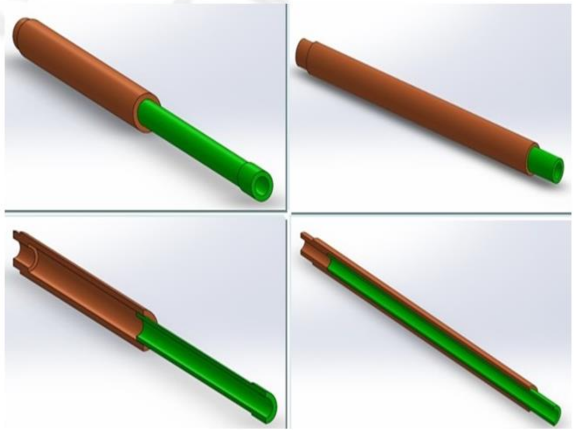
Closed electrode to prevent vapor convection



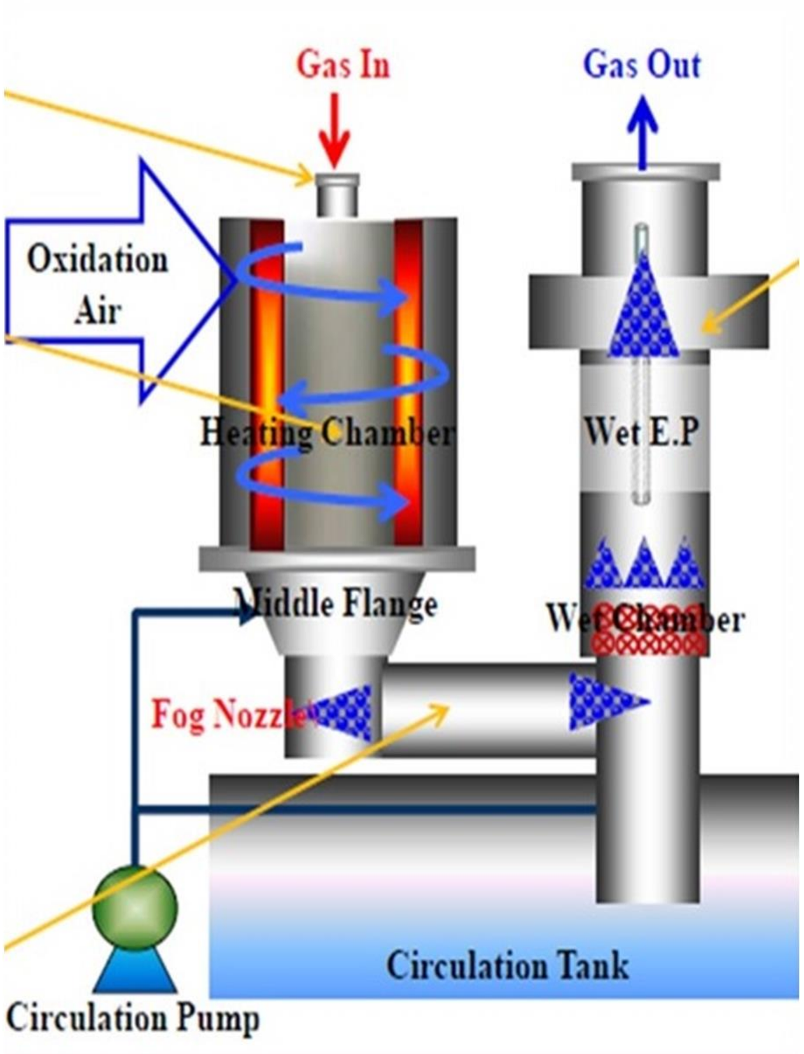
Prevention of backflow to dry pump



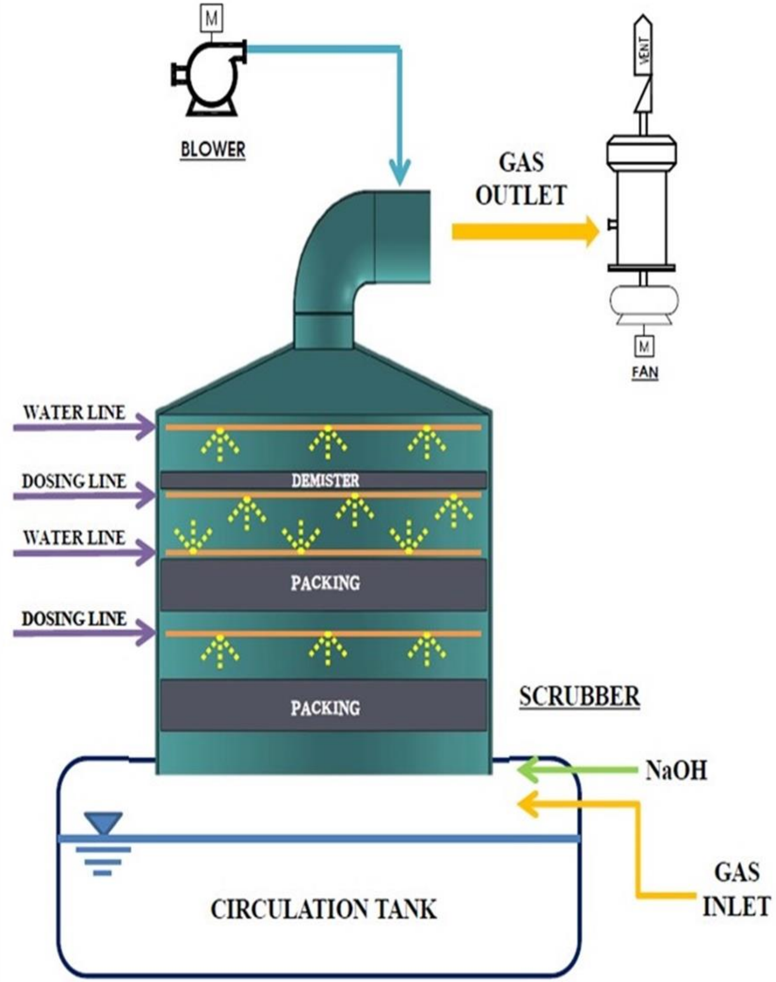
Easy disassembling of nozzle components



[Details _ Scrubber]

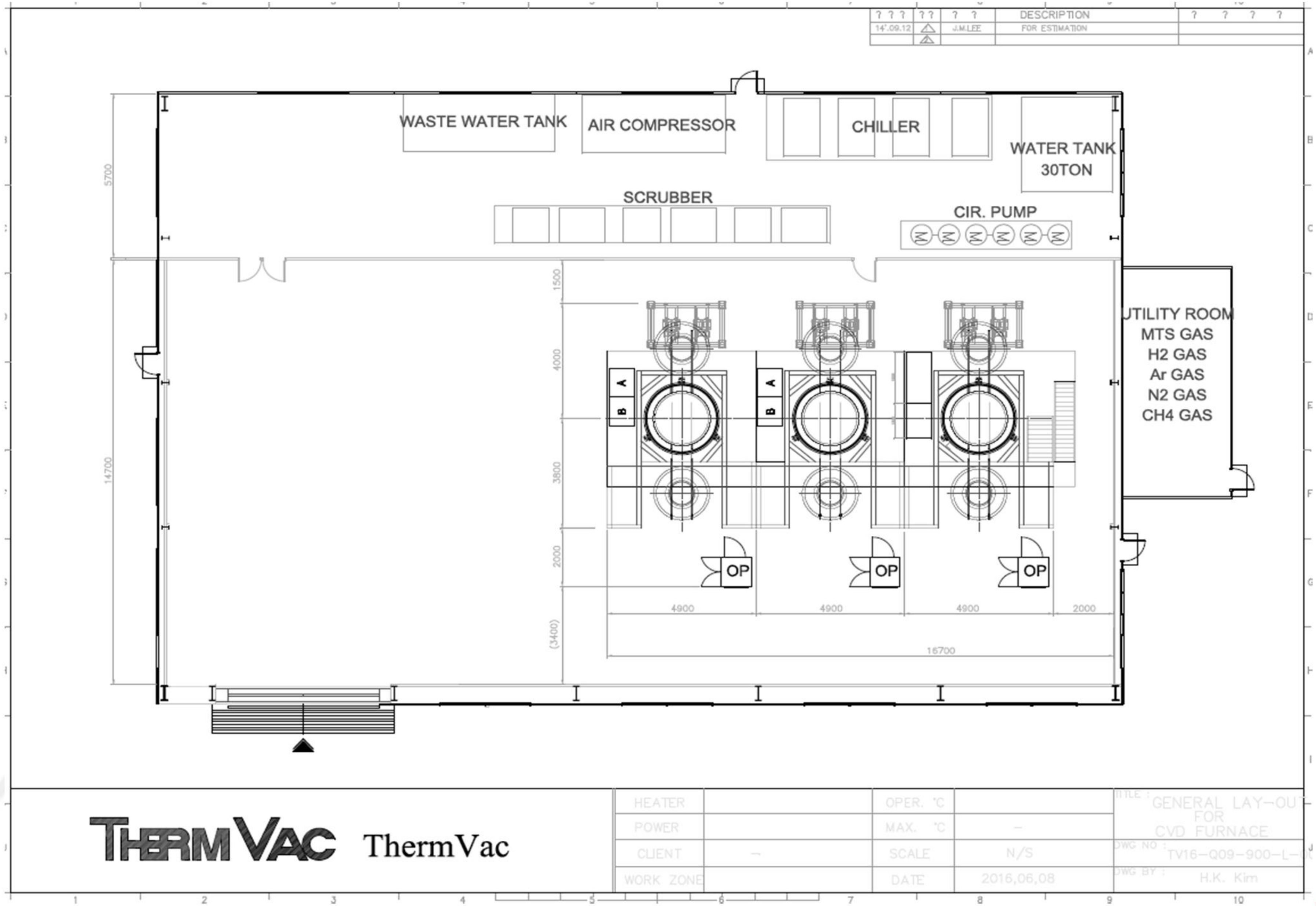


Heat & Wet Type



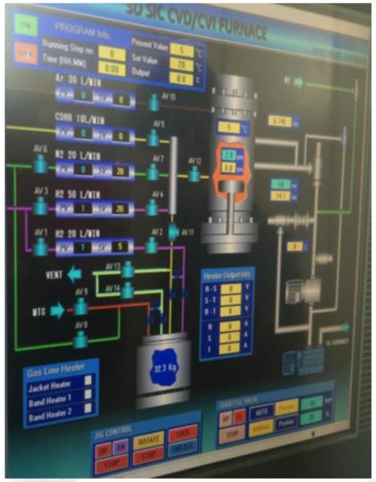
Dilution & Wet Type

[Details _ Layout of CVD Plant]



[CVD Sales Record]

Korea S Co. [SiC CVD]



KICET [SiC/HfC]

JN Technopark [SiC CVD]

Korea K Co. [SiC]

Daeyang [SiC/PC]

Korea T Co. [TaC CVD]

DACC [Carbon CVI]

China A Co. [SiC CVD]