Specification of Chemical Vapor Deposition (CVD) System

A. FURNACE STRUCTURE

1.	Shell size	:	≈1000(W) x 600(D) x 600(H) mm
2.	**Hot zone Isotherm length**	**:**	**60(ID) x 200 mm (L) (for each zone)**
3.	**Number of zones**	**:**	**2**
4.	Shell Construction	:	S. S Body and S. S. Angle's structure with proper stiffeners and neat **powder coat painting.**
			Provision need to be available to move the shell horizontally
5.	Furnace stands & panel box	:	Control panel box with a door coupled with furnace stand to a height of 1 meter
6. **mm**	Tubular material	:	Fused quartz **(≈60(ID) X 65(OD) X 1200 (L)** **X 2 No's (one spare)**
7**.**	Cold vacuum inside the tube	:	10^{-1} mbar at room temperature with suitable vacuum attachment
8.	Insulation	:	Mechanically **pressed zirconia blend** **Ceramic fiber (MMTCL make).**
9.	Fittings for controlled atm	:	**Stainless steel fittings** are provided with water cooling arrangement and **Whiton 'o' ring**.

B. END FLANGES:

1 Fittings for controlled atm : Stainless steel (SS310) fittings with water cooling arrangement and Whiton 'o' ring and suitable for vacuum and purging multiple gases

2. Multiple ports in the fittings : SS fittings with 2 ports in one side and two ports in opposite side First side 1. Evacuation 2. gas inlet,
Opposite side 1. gas outlet 2. spare

Good quality needle valves needs to be provided at inlet/outlet for effective gas flow control mechanism

C. HEATING SYSTEM

1.	Heating elements	:	**APM grade kanthal (melting temperature of the coil is 1425 deg C)**
2.	Operation	:	Two Phase / AC / 230V
3.	Power	:	4 - 5 kW
4.	Maximum temperature :		1200**°C**
5.	Working temperature	:	**1100°C (For continuous operation)**
6.	Electrical line requirement	:	**32A – MCB (Two phase) has to arrange by the customer**

D. POWER SUPPLY AND CONTROL SYSTEM

1.	Power supply	:	Through a power isolation transformer

2. Control Panel : The furnace bottom stand converted to control panel with all necessary electric and electronics on par with international standards. All electric and electronic materials from very high profile company like Siemens or equivalent.

3. Temperature control : **TAIE microprocessor 16 segments** digital thyristor controlled Temperature programmable PID controller cum indicator X 2No's

(each zone can be controlled independently)

3. Temperature sensor : K type thermocouple along with Recrystalised alumina beads and sheath X 2No's

4 Number of temperature sensor: Two

5. Accuracy : $\pm 1^{\circ}C$

6. Power Controller : Phase angle controlled Thyristor drive with current feed back

7. Indications : a) Digital Ammeters and Voltmeters one either side of the transformer

b) Mains Indicator

c) Output Indicator

8. Control switches : Mains on/off, out put on/off

9. **Safety** : **Over temperature protection**

Thermocouple break alarm

10. Power for electronics : all the electronic circuit will be designed to withstand 10 kW load

E. MASS FLOW CONTROLLERS

Mass flow controllers	:	Two mass flow controllers (Aalborg make) will be provided
		1. MFC 0-100 sccm – 2 numbers
		2. **Customer has to specify the gases**

F. MASS FLOW CONTROLLERS SPECIFICATION

1.	Mass flow controllers	:	Please see above
2.	Gas mixing chamber	:	Made with SS and available
3.	Mass Flow Controller Make	:	AALBORG USA
4.	Power supply	:	12 volts
5.	Tube Fittings	:	1/4”
6.	Accuracy (+/-)	:	1.5% of FS
7.	Controller Value	:	Normally closed solenoid control value
8.	Adjustment	:	LCD Flow display and Flow adjustment potentiometer.
9.	Metal Body	:	SS body, Viton seals
10.	**Gases**	**:**	**Pre Calibrated**
11.	Analog Input	:	Available
12.	**Accuracy**	**:**	**± (0.8% of Reading + 0.2% of Full Scale) At calibration conditions after tare**
13.	Repeatability	:	± 0.2% Full Scale
14.	**Operating Range**	**:**	**0.5% to 100% Full Scale Measure and Control**
15.	Typical Response Time	:	100 Milliseconds (Adjustable)

16.	Operating Temperature :	−10 to +50 ºCelsius	
17.	Humidity Range	:	0 to 100% Non–Condensing
18.	Controllable Flow Rate :	102.4% Full Scale	
19.	Maximum Pressure	:	145 PSIG
20.	Electrical Connections :	15 Pin Mini-DIN	
21.	Supply Voltage :	12 Vdc	
22.	Supply Current :	0.750Amp	
23.	Input /Output Digital Signal	:	Mass Flow control.
24.	Input / Output Analog Signal	:	Mass Flow 0-5Vdc/0-5 Vdc
25.	Gas temperature	:	Ambient
26.	Typical Response Time :	100 msec	
27.	Warm up period	:	<1 sec

G. Pipe line connection

1.	Pipe lines	:	High Pressure stainless steel pipe lines from -1/4” OD / HP
2.	Needle Valves	:	Automated, air operated 2 way straight SS ¼ “ OD Needle valve This valve will be very rugged and dependable Pneumatic piston actuator ,normally closed
3.	Fittings	:	High-grade corrosion resistant stainless steel with Ferule connection

4. Pressure locking system **:** Reputed make ferrule Fittings

H. VACUUM PUMP (Rotary)

1. Achievable level : **10^{-3} to 10^{-4} mbar**

2. Stage : Dual Stage

3. Flow Rate : 142L/min

I. ACCESSORIES

1. Consumables : 10 no's quartz boat

2. Sample transfer rod will be provided

J. OTHER REQUIREMENTS

1. Demonstration of nanostructures growth, training on CVD system and all manuals hard as well as soft copies.
2. 3 years warranty.