

Quotation for supply and installation of chemical vapor deposition system (Ref # NRC TO 16-015-01-CVD)

#	Component	Specifications	Price (USD)
1	Tube Furnace	Max temp 1300°C	
		Heating zone 300 mm	
		Tube material - Quartz	
		The uniform working temperature of up to 1100°C in 150 mm mid zone	
		Temperature Accuracy $\pm 1^\circ\text{C}$ in the entire temperature range during both heating and cooling.	
		Heating Rate Temp Ramp Up rate (Programmable) 20°C per min.	
		Cooling Rate Temp Ramp Down rate (Programmable) 20°C per min.	
2	Sample holder	Suitable for controlled CNT and Graphene growth on at least 1 inch X 1 inch specimen.	
		Sample size variable with in the range(100-10)L*(20-10)H*(30-2)W mm.	
		Sample loading Module	
		3 Additional quartz tubes	
3	High Vacuum Station	diaphragm pump	
		accessories (digital vacuum gauges; SS vacuum bellows, Flanges, digital display, ball valves etc.)	
		Two Anti-corrosive pressure gauge (~10-3-10 Torr, and 1-1000 Torr measurement range)	
		digital display + Touch screen	
4	Gas Supply System	1. Gas Supply Chamber :	
		Two Mass flow controllers, Controls, Regulators, Valves,	
		316 steel corrosion resistance tubing and Flow monitoring devices and digital read out.	
		Gas cabinet (with gas leakage detection sensors and alarms)	
		Gas Mixer (Float flowmeter type)	
		2. Mass flow Controllers :	
		calibrated for, Ar, H2, C2H4, CH4, C2H2, N2	
		Control Range: 1-1000 sccm	
		Accuracy: $\leq \pm 0.02\%$ of Full Scale Material: Stainless Steel (316L), Non Magnetic.	
		Control Stability: $\leq \pm 0.1\%$ of Full Scale Control Valve: Closed Solenoid (Fast-Response)	
5	Humidity	Water generator(water bubbler)	
		Sensor	

6	Control system	Temperature control Precision temperature controllers with <b>PID function</b> and 30 segments programmable. One extra temperature monitor should be built in to shut down power when temperature out of control by accident with electrical power single phase 200-230 V, 50 Hz	
		Computer control system with Graphical User interface for complete process-related controls such as vacuum level, gas flow rates, gas pressure, process temperature, voltage and current. User interface:	
		provision for Manual settings, automated experiment programming	
		Real time instrument read-out, Alarm display, administration management.	
		Preprogramed settings for SW/MW CNT's, graphene and oxide nanowires and nanotubes etc.	
		Other displays/controls such as those for gas leak detectors, bubbler, status of safety valves, alarms, interlocks etc., process deviation etc. Remote diagnostics/trouble shooting	
7	Electrical system	Suitable UPS (for the complete CVD system) voltage distributor	
8	Other components	Water cooler / Chiller(water cooling on the flange is mainly for cooling down the o ring in side the flange to ensure best sealing at high temperature) Laptop, Frames, enclosures, cabinets, Water Cold Sealing Flange etc	

**Total**

9	Other Charges	Research and Development, Product testing	
		Training and demonstration	

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