

B.I.T. Sindri  
P.O. - Sindri Institute, Sindri,  
Dhanbad, Jharkhand -828123

**Notice**

**Description : Supply and Installation of Chemical Vapour Deposition (CVD) system for nanotechnology laboratory**

**Package Code : TEQIP-III/JH/bits/18**

**Package Name : TEQIP-III/BITSindri/OTH/NANO-CVD**

B.I.T. Sindri, Dhanbad wishes to establish a Nanotechnology lab as a central research facility. The Technical specifications of the equipments/goods are provided below.

Interested manufacturers / authorized supplier are requested to fill in the Information Form (Annexure - A) given below and send the filled, signed and stamped hard copy on or before **4:00 P.M. of 10/07/2019** at following address -

Director, B.I.T. Sindri,  
P.O. - Sindri Institute, Sindri,  
Dhanbad, Jharkhand -828123

Formal request for Financial and Technical proposal will be sent to the applied valid firms after 10/07/2019.

**Technical Specification**

Following are the specifications and details for Chemical Vapour Deposition (CVD) system for nanotechnology laboratory at B.I.T. Sindri, Dhanbad.

**Chemical Vapour Deposition (CVD)** should be fully automatically controlled by computer, it should consist of a fused quartz tube furnace, a precision mass flow gas control station, atmospheric as well as low pressure station, automatic sample loader, metal enclosure with exhaust port, gas leak detector and other safety interlocks, and other assembling parts for the controlled growth of low dimensional materials. Maximum temperature of this workstation should be 1100°C or higher. The mass flow gas control station should be able to mix two or more different gases together and input the mixed gas into a fused quartz tube inside the furnace. The individual gas flow rates should be precisely controllable. The system should offer wide range of material deposition. The system should have the following technical and general specifications.

| SI. No. | Features            | Detailed specifications of the features  |
|---------|---------------------|--|
| 1.      | Tube Furnace        | <ul style="list-style-type: none"> <li>a) Maximum Temperature Resistance Furnace Temp. 1100°C or more<br/>Uniform working temperature of up to 1100°C in 150 mm mid zone must be ensured in the quartz tube reactor.</li> <li>b) Temperature Accuracy <math>\pm 1^\circ\text{C}</math> in the entire temperature range during both heating and cooling.</li> <li>c) Heating Rate Temp Ramp Up rate (Programmable)</li> <li>d) Cooling Rate Temp Ramp Down rate (Programmable)</li> <li>e. Number of Zones Three</li> <li>e) Heating Zone 300 mm or more (constant temp zone 150 mm)</li> <li>f) Temperature control Precision temperature controllers with PID function and 30 segments programmable. One extra temperature monitor should be built in to shut down power when temperature out of control by accident.</li> <li>g) Electrical Power Single Phase 220-240 V, 50 Hz</li> </ul> |
| 2.      | Sample Holder       | <ul style="list-style-type: none"> <li>a) Reaction Chamber Quartz Reaction Tube of suitable size to enable laminar flow to achieve controlled CNT, Graphene, metal oxides, and two dimensional semiconductor/insulator/metals etc. growth on at least 1 inch X 1 inch specimen. Additional quartz tubes (up to three) may be quoted (optional). Provision for using different size (diameter) quartz tube.</li> <li>b) Sample/component size Variable, but the maximum size can be 100 L x 20 H x 30 W mm and minimum size can be 10 L x 10 H x 2 W mm. 1 Reduction of working zone size should be possible for carrying out coating deposition on small sized samples (Optional).</li> <li>c) Sample Mounting Automatic Cantilevered Sample loading/unloading (Optional).</li> </ul>  |
| 3.      | High Vacuum Station | <ul style="list-style-type: none"> <li>a) Pump-1 Heavy duty rotary (oil free) pump. 2 stage exhaust with pressure of <math>10^{-3}</math> torr.</li> <li>b) Pump-2 (Optional) Turbo Pump with pressure of maximum <math>10^{-6}</math> torr, with needle valve and connecting accessories (Optional).</li> <li>c) Cleaning of Chamber (Purge Line) Pump should enable <math>\text{N}_2</math> or Ar purging for cleaning Process tube (Reaction chamber) after deposition shall be flushed with Ar/<math>\text{N}_2</math> for which separate line should be provided.</li> <li>d) Accessories Two Anti-corrosive, gas independent pressure gauge (<math>\sim 10^{-3}</math>-<math>10^0</math> Torr, and 1-1000 torr measurement range), digital display, high accuracy, and reproducibility at atmosphere, easy to exchange plug &amp; play sensor element.</li> </ul>                      |

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| 4. | Gas Supply System             | <p>a) Gas Supply Chamber Gas feed system shall be provided with Mass flow controller, Controls, Regulators, Valves, 316 steel corrosion resistance tubing and Flow monitoring devices and digital read out.</p> <p>b) Mass flow Controllers 4 Precision MFCs (Provision for 2 Extras) MFCs should be calibrated for, Ar, H<sub>2</sub>, C<sub>2</sub>H<sub>4</sub>, CH<sub>4</sub>. Optional Gases: C<sub>2</sub>H<sub>2</sub>, N<sub>2</sub> Control Range:1-1000 sccm Accuracy:≤ ± 0.02% of Full Scale Material: Stainless Steel (316L), Non Magnetic. Control Stability: ≤ ± 0.1% of Full Scale Control Valve: Closed Solenoid (Fast-Response) Solid source kit (Optional).</p>  |
| 5. | Control System                | <p>a) 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.</p> <p>b) User interface: Fully computer controlled system with window based software for operating the microscope along with keyboard, mouse, control panel including multifunction for control.</p> <p>c) Software should have provision for Manual settings, automated experiment programming, Real time instrument read-out, Alarm display, administration management.</p> <p>d) Other displays/controls such as those for gas leak detectors, bubbler, status of safety valves, alarms, interlocks etc., process deviation etc. should also be provided on the control panel.</p> <p>e) Remote diagnostics/trouble shooting of the system/process by the supplier through internet /tele-maintenance shall be included.</p>  |
| 6. | Safety and other requirements | <p>a) The entire system should be thoroughly checked for leak (leak rate should be less than 10-6 cc/s). This should be shown at the time of inspection.</p> <p>b) Gas delivery system must shut off the supply in the event of leak rate exceeds the desired limits. The sensors should be interlocked with PLC/PID controllers. PLC system shall also be linked with air delivery system.</p> <p>c) Suitable audible and visual alarm should be provided in case of malfunction of CVD furnace like temperature shoot-up, high power drawing, vacuum loss and deviation from in water/gas flow rates.</p> <p>d) Sensors with audible/visible alarms for dangerous gas leakage (H<sub>2</sub>, AlCl<sub>3</sub>, Cl<sub>2</sub>, HCl, SiCl<sub>4</sub> etc.) should be provided.</p> <p>e) Thermal insulation for minimum heat loss (Less than 5% of the reactor temperature) to the surrounding.</p> <p>f) Supplier should specify the maximum power rating and weight of the furnace.</p> <p>g) All the emergency procedures should be outlined.</p> |

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| 7.  | Warranty and support          | <p>a) 3 years comprehensive on-site warranty for all parts of the entire system including accessories supplied with the instruments from the date of successful installation and commissioning post warranty period will be for another 3 years for supply of all parts of the entire system, including accessories. If the system breakdown during warranty period, the warranty period will be extended for the full breakdown period after the expiry of initial warranty.</p> <p>b) Service response time must be 48 hours or less.</p> <p>c) On-site training must be provided by trained engineering at free of cost.</p> |
| 8.  | Maintenance                   | The supplier is required to confirm that the spares and accessories would be available for more than 6 years after expiry of warranty and post warranty.  |
| 9.  | Upgradation                   | The supplier shall supply upgraded software for CVD operation whenever they are available.  |
| 10. | Application notes & Manuals   | The supplier shall provide detailed application notes and manuals of CVD in hard and soft copy along with the detailed drawings and circuit diagrams (in English).  |
| 11. | Required Documents            | The supplier should have installed at least 10 CVD across the country for last 3 years. The supplier must provide a comprehensive list of uses of CVD in India.   |
| 12. | Compliance statement          | The supplier must submit a table indicating the compliance of the features of the model of the equipment being quoted with those given in indent.   |
| 13. | Pre-installation Requirement  | Pre-installation requirement such as room size, tolerable limits of EM field and vibration (mechanical), required power rating, utility requirements are to be stated clearly, and to be verified/ surveyed by the supplier at the installation site. It is the supplier's responsibility to clearly provide details of the above mentioned requirements before delivery of the equipment.  |
| 14. | Delivery & Insurance Coverage | Vendor will be fully responsible in successful delivery (including unloading), installation and commissioning of the instrument at site of installation in B.I.T. Sindri with fully insurance coverage as per rule.   |

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**INFORMATION FORM**

(To be properly filled, signed and stamped)

**Description : Supply and installation of Chemical Vapour Deposition (CVD) system for nanotechnology laboratory**

**Package Code : TEQIP-III/JH/bits/18**

**Package Name : TEQIP-III/BITSindri/OTH/NANO-CVD**

**1) Name of the firm :**

**2) Official address with Pin Code :**

**3) e-mail address :**

**4) Phone/Mobile Number :**

**5) PAN Number :**

**6) TAN Number :**

**7) GST Number :**

**8) Name of official Representative :**

**a) Post held :**

**b) Phone Number :**

**c) e-mail Address**

We declare that we are interested to supply the above mentioned equipments/Goods

Date

Signature and official stamp