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TENDER NO. CBS/CA019 – 061/PUB **December 10, 2019**

Notice Inviting Tender (Two Part Tender) for the following item:

Sr. No.	Item Description	Qty
1	2.45 GHz Microwave Plasma Chemical Vapor Deposition (MPCVD) 6 kw systems. (Details as per attached specifications)	01 Set

Published on	11/12/2019
Type of Tender	Two Part Limited Tender
Estimated Cost	Rs.99/-Lakh (approx.)
Last date for Submission of Bid	15/01/2020 on or before 13.00 hours
Date of Opening Bids	15/01/2020 at 14.00 hours
Tender Fees	Rs.500/- by DD favoring **UM-DAE CBS**

Tender should be submitted in One sealed envelope enclosing both Technical and Commercial Bids duly superscribed with the Tender No., Due Date in Bold Letters addressed to Registrar CEBS . A DD of Rs. 500/- favoring **UM-DAE CBS** may be enclosed in the "Technical Bid".

Please refer to "Terms and Conditions"

(REGISTRAR)

Technical Specification of 2.45 GHz Microwave Plasma Chemical Vapor Deposition System

Microwave Plasma Chemical Vapour Deposition (MPCVD) system of 2.45 GHz frequency operating at high power and stable plasmas densities for large area (about 2 inches diameter) with high deposition rate (20-40 μm/hr) in the temperature window 800-1400 ^{0}C. The system should incorporate the latest microwave technology with PLC control for stable operation and safety interlocks and for unattended operation. The system consist of a microwave assembly, substrate stage, vacuum control assembly, gas delivery system, reactor assembly, water flow control assembly for stage, chamber and microwave components and water temperature control assembly (chiller). The part wise features / specifications of the system are given below.

1. **Vacuum System and Microwave Reactor Cavity**
   - Operating pressure range: 20-180 Torr
   - Pump speed: 27.5/33.0 m^3/h (50/60Hz)
   - Maximum gas load: 1150 SCCM
   - Base vacuum pressure: 0.05 Torr
   - Vacuum leak integrity better than 6×10^{-7} Torr liter / sec
   - Pressure control: Independent closed-loop control by Barton (Make: MKS / Alikat)
   - Vacuum pump type: Mechanical pump with solenoid shutter and outlet mist filter (Make: Edward / Pfeiffer)
   - Vacuum pump capacity: 220 liter/min
   - Water cooled microwave reactor cavity matching with TM_{01} mode (dominant) for 2.45 GHz frequency: Single block cylindrical cavity made of Aluminium (Neck cylinder – (121 mm inner diameter, 167 mm outer diameter, 48 mm inner height) and body cylinder – (381 mm inner diameter, 427 mm outer diameter, 73 mm inner height). Finish of the inner surface (diamond polish) and outer surface powder coated. Drawing of the reactor cavity should be included in the offer.
   - Vacuum seals: Elastomer O-rings
   - Diagnostics ports: Ten ports of 0.5 inch diameter
2. **Substrate Stage**
   - Stage: Water-cooled Copper of 219 mm diameter.
   - Substrate holder: Molybdenum; diameter 2-inch with provision for variation and control of substrate temperature, using gas flow / pressure
   - Substrate temperature control: Plenum pressure control (MKS / Alikat)
   - Access to substrate stage: Via opening of chamber lid is acceptable
3. **Microwave Generator and Power Supply (Make: Muegge / Sairem)**
   - Frequency: 2.45GHz

- Microwave power: 6.0 kW (max. sustained process power) (magnetron source: compatible for output mentioned above)
- High voltage power supply type: High frequency, low ripple switching power supply
- Magnetron Isolator - Muegge /Sairem
- Microwave Detector – Muegge / Sairem
- Wave Guide – Muegge / Sairem
- Manual stub-tuners – three numbers
- Microwave Leak Tester: Frequency response 2.45 GHz Range-2, 0-10, 1-100 mW/cm^2 and accuracy ± 1.0 dB (0-2, 0-10 range)

4. **Gas Manifold Box:** System should be supplied with four gas delivery channels (upgradable to six) using mass flow controllers (Make: Fujikin / MKS / Alikat)
   - Channel 1: Hydrogen (H_2): 0-1000 SCCM (flow range)
   - Channel 2: Methane (CH_4): 0-100 SCCM (flow range)
   - Channel 3: Nitrogen(N_2): 0-3 SCCM (flow range)
   - Channel 4: Oxygen(O_2): 0-20 SCCM (flow range)

5. **Chilled Water System:**
   a) **Chiller**
      - Close loop water supply (25 lit/min)
      - Cooling capacity (3.5 ton)
      - Water inlet pressure (6 bar)
      - Water return pressure (0.8 bar)

   b) **Auxiliary Units**
      - Water flow meters at the outlet of reactor cavity, microwave components and stage (make and model: Regal Joint Co. Ltd., METER/KSL-10 L)
      - Water line fittings (make and model: Regal Joint Co. Ltd., RGL RC3/4)
      - Water connection pipe fittings (make and model: Regal Joint Co. Ltd., RGL THL19 Elbow)

6. **Temperature monitoring (Make: Williamson)**

Dual-wavelength IR pyrometer should have the provision for oblique view (through plasma) of substrate surface temperature measurement through the diagnostic port of reactor cavity.

- Dual-wavelength type pyrometer with fibre optic cable.
- Measurement range: 475 - 1475 ^0C

7. **Electrical Power Distribution Unit**
   - 415 volt (+ / - 10%)
   - 3 phase supply

8. Mounting System

Electronic units and reactor assembly (including gas manifold box, close-loop vacuum line and microwave components) should be mounted on finished Rack / Frame system.

9. Operation

The system should be PLC (Keyence / Siemens) controlled including monitoring and alarm point updates. The operation mode should be automatic or semi-automatic with interlock fault sequencing facilities.

10. Safety Features

System should have safety interlock and audio visual alarm for the following:

1. Gas flow alarm for lower and higher value than set value
2. Water flow alarm for lower and higher value than set value
3. Chamber pressure alarm for lower and higher value than set value
4. Camber pressure alarm for pressure higher than 180 torr
5. Reflected power higher than limiting value
6. Microwave power alarm for lower and higher value than set value
7. Substrate temperature higher than 1475°C (only indication)
8. All safety interlock relation to safe microwave operation

11. Optional:

a) UPS of 10 kW compatible to system (10-15 min backup power)
b) Spare parts for 5 years of trouble free operation (quote separately)
c) Additional quartz window (0.5 inch diameter)
d) O-rings

Terms and Conditions:

1. The offered quotation should include suitable drawing of the set-up indicating the dimensions of the set-up.
2. The detailed CAD drawing to be submitted before manufacturing once the PO is released.
3. Manuals and CDs of components should also be provided.