



**Government of India
Bhabha Atomic Research Centre**



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Ref. – G&AMD/PKM/2022/P-45918

Date: 27. 05. 2022

**Sub: Design, Development, Installation and Commissioning of Spouted Bed Reactor
Furnace for CVD Process as per Annexure-S**

Dear Sir,

For & On behalf of the President of India, quotations are invited by the undersigned for following fabrication work to be carried out at Modlab, BARC, Trombay, Mumbai. The scope of work is detailed below.

Nature / Description of Work
Design, Development, Installation and Commissioning of Spouted Bed Reactor Furnace for CVD Process as per Annexure-S The item has to be delivered and installed at UED, BARC, Trombay, Mumbai-400085.

The quotation in sealed cover should super scribe nature of work and should be addressed to following person and should reach him/her by India Post (speed) only, on or before the date and time mentioned.

Dr. Palash Kumar Mollick Scientific Officer (F), Glass & Advanced Materials Division, Materials Group, Modlab, Trombay, Mumbai-400085	On or before: 7 th June, 2022 at 16.00hrs.
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Special Note: The vendor must certify the delivery period not exceeding 30 days from the received and accepted date of work order.

Instructions to the tenderer:

- The tenderer should write in words as well as figures, the rate(s) quoted by him. All corrections must be attested by the dated initials of the tenderer.
- The tenderer may note that in case the work is awarded to him, he has to produce police verification certificate for the employees to be deputed for the work inside the BARC, Trombay, Mumbai.
- Income-Tax and surcharge on income-tax as applicable shall be deducted from the bill. The payment for the work done shall be paid by our Accounts Division only on satisfactory completion of the work within one month.
- The time allowed for completion of the job is **30 working days**. The same shall be reckoned from the date of issue of the work order.
- The acceptance of the tender rests upon the undersigned with a right to reject the tender without assigning any reason.

Thanking you,

Yours faithfully,



(Dr. P. K. Mollick)

Scientific Officer (F), G&AMD

CC:

AAO (Works),

Accounts Division

BARC

ANNEXURE-S

TECHNICAL SPECIFICATION OF VERTICAL TYPE SPOUTED BED REACTOR FURNACE (1400°C)

A vertical, split type, resistance heating (electrical), water / gas cooled high temperature spouted bed reactor to be designed, developed, installed and commissioned for CVD process.

HIGHLIGHTED SPECIFICATIONS

- ❖ Reactor should be double walled, made of Mild steel square pipes and sheets
- ❖ Reactor should be vertical type.
- ❖ Effective hot zone (Job size) :- 100 mm dia X 250 mm height
- ❖ Max. design temperature : - 1450° C.
- ❖ Operating temperature range: 1400 ° C. (Programmable).
- ❖ Temperature Uniformity: - +/- 2 ° C, from 400 ° C to 1400 ° C.
- ❖ Working environment: - inert atmosphere
- ❖ Heating rate: - 1 °C/min to 15°C/min
- ❖ Thermocouple: R – type, Special grade

Note: Quotation must be submitted along with conceptual schematic design of the furnace failing which the quotation will be considered as invalid.

DETAIL SPECIFICATION

S.No	Specifications/ Descriptions
1	Design: Vertical type stainless steel Furnace.
2	<p>Metal structure :</p> <ul style="list-style-type: none">• Double Wall smooth finish fabrication of MS Body• Maximum metal structure size - 600mm dia X 2200mm height• Useful vaoulume - 170mm dia X 400mm height• Furnace opening-vertical both end open• Reactor stand-_M.S heavy metal structure for reactor stand• Furnace structure should be kept at least 900mm height• Neat structured powder coating to be provided• Asbestos free construction should be ensured
3	<p>Heating Elements: Element - SiC</p> <ul style="list-style-type: none">• type - Soild type Heaters• hearting elements may plced horizontally• Size - 16mm dia X 600 mm height• heatzone Isotherm – 150 mm dia X 250 mm height• Electrical connections - At the side of the furnace• Easily disconnectable heaters for facilitating quick replacement
4	<p>Temperature :</p> <ul style="list-style-type: none">• Maximum temperature 1450 °C (at the zone)• Working temperature 1400 °C for continuous operation• Temperature Accuracy: $\pm 1^{\circ}\text{C}$
5	<p>Insulation:</p> <ul style="list-style-type: none">• High qulaity vacuum formed light weight ceramic fibre board insulation to ensure low skin temperatrue and light weight construction• Insulation thickness at least be 145 mm at all sides• Top side insulation at least be 150 mm• Capable of maintaining heating/cooling rate of $10^{\circ}\text{C}/\text{min}$• Double wall structure & Special air circulating fan should be provided to maintain the skin temperatures just above ambient

6	<p>Electrical Power:</p> <ul style="list-style-type: none"> • Heat load: 5 to 6 Kw • 415 / 3 phase / 26 A/ AC pupply • Rate of heating Rapid heating 1to 10 deg/minute • Temperature Accuracy : $\pm 1^{\circ}\text{C}$ • Special Master and Slave temperature controller system will should be used
7	<p>Tubular Material:</p> <ul style="list-style-type: none"> • Tubular material -99.9 % alumina tube • Size -100mmOD x 90mm ID X 900 mm Height • Alumina Inner (spouted bed reactor tube) tubular material holder • Gas entry- Gas entry at the bottom to be provided along with exit downcomer. • Fittings for controlled atmosphere - Stainless steel fittings to be provided with copper 'O-ring fittings -Two numbers should be fixed either side
8	<p>Spouted Bed Reactor</p> <p>Spouted bed reactor to be fixed at the inner side of the alumina tube</p> <p>Spouted bed reactor to be made of graphite material</p> <p>Spouted bed reactor top end should have SS water jacket with "O" ring for control atmosphere</p>
9	<p>Thermocouple: Easily replaceable R-type thermocouple in Inconel sheath</p> <p>2 nos thermocouple</p>
10	<p>SAFETY:</p> <p>Over temperature protection: In the event of over temperature it will switch off the heater power with indicator light and provide alarm sound.</p> <p>Emergency: Mushroom type emergency button to be provided.</p>