

**Central Glass & Ceramic Research Institute
KOLKATA (WEST BENGAL) INDIA**

CORRIGENDUM

REFERENCE NO. :- P/NC/67/SB/DB/OTE/22-23

DATE: 15/08/2022

**NAME OF SERVICE: COMPREHENSIVE ANNUAL MAINTENANCE CONTRACT
OF IT ITEMS AT CSIR-CGCRI, KOLKATA.**

CONSEQUENT TO THE PRE-BID MEETING HELD ON 12/09/2022 AGAINST OUR TENDER ENQUIRY No. P/NC/67/SB/DB/OTE/22-23, the revised technical specifications are given below.

Specification of "High Temperature Controlled Atmosphere Twin Chamber Furnace with Accessories"

- 1) The first chamber will have resistive heating for chemical vapour deposition/Infiltration. The second chamber will have inductive heating for melt processing /infiltration.
- 2) Both the resistive and induction chambers will be vertical.
- 3) Both chambers should be double wall water cooled and cylindrical in shape.
- 4) The furnace walls and tubing should be made of SS304 / SS321 or substantially equivalent material of construction (MOC).
- 5) Useful work space within the uniform hot zone required: Minimum 350 mm dia. x 350 mm height for both the chambers
- 6) Maximum operating condition: 1600°C for 5 hours for resistive chamber and 2000°C for 2 hours for induction chamber.
- 7) Maximum working temperature for continuous operation in the process / purged gas atmosphere: 1500°C for resistive chamber (upto 96 hours) and 1800°C for 2 hours for induction chamber.
- 8) Temperature sensor: C type thermocouple - 2 numbers for resistive chamber, Pyrometer -1 number with measurement range 850°C- 2000°C or higher range with accuracy $\pm 0.3\%$ of the measured value for induction chamber.
- 9) Maximum heating rate 15°C/Min for resistive heating and 200°C/min for induction heating.
- 10) Heating system: Graphite heaters for resistive heating system and graphite crucible for induction heating system. All graphite heaters and crucible must be from a reputed manufacturer (e.g., M/s Mersen /SGL make or substantially equivalent).
- 11) Vacuum system: Vacuum system should have combination of mechanical pump (rotary pump) and diffusion pump along with suitable baffle and/or oil trap (using LN₂) for sequential evacuation of one chamber at a time. Vacuum creation capability should be minimum 1×10^{-5} mbar at room temperature (within 90 minutes in empty dry condition) and holding at the level of 1×10^{-4} - 1×10^{-5} mbar till 1500°C operation for both the chambers (in empty dry condition).
- 12) Leak rate of the furnace chamber: should not exceed 5×10^{-3} mbar.liter/sec.

- 13) The cold water supply should be made through properly designed refrigerated chilling plant. The walls and tubing as well as the cold water tank of the chilling plant should be made of SS304 / SS 321 or with substantially equivalent MOC. The chiller unit and piping design should be common for both heating chambers.
- 14) Insulation: Furnace chamber insulation design should meet the outer wall (skin) temperature not exceeding 50°C.
- 15) Temperature uniformity $\pm 5^{\circ}\text{C}$ for resistive and $\pm 15^{\circ}\text{C}$ for induction chamber at maximum operating temperature.
- 16) **Gas flow in resistive heating chamber:** One combined inlet port for two inert gases (Nitrogen and argon) and one combined inlet port for four process gases and one single outlet port off-gases should be present in the resistive heating chamber.
 - a. Inlet port should be designed at the top of the chamber; whereas, outlet port for the off-gases should be constructed at the bottom of the chamber.
 - b. Reactive process gases [Methane, Ammonia, BCl_3 (trichloro borane), Methyltrichlorosilane] should be introduced into the chamber through 2 nos of individual mass-flow controller (MFC), make: MKS, Broncho's, Alicat or substantially equivalent, respectively.
 - c. The required mass flow rate range for the each MFC should be within 0-500 ml/min.
- 17) In the resistive heating chamber, the flow of the process gases should be continuous and maintaining a positive pressure in the range of 2-100 mbar inside the chamber.
- 18) One inlet port for inert gas and one outlet port for off gases are required for induction heating chamber. Induction chamber should also operate at positive pressure.
- 19) **Control System:** The control system should contain two independent control systems for each chamber, integrated in a single panel unit. It should be PLC controlled. PLC operation/control should be of Siemens / Stange / Allen Bradley / G.E/Schneider/Eurotherm make (latest user friendly version SCADA) or substantially equivalent. All parameters of the furnace during operation should be shown by Human Machine Interface (HMI).
- 20) Power Supply - 3phase, 50Hz, 400V \pm 8%

21) Acceptance: The furnace should be installed at the user's site by the manufacturer or their authorized representative and should be handed over by them to the user after commissioning and training upto the satisfaction of the user which includes high temperature operation following the programme/schedule, vacuum and other parameters as mentioned below :

- a) Vacuum level, with leak rate of the both chambers to be demonstrated as mentioned in point no-11 and 12.
- b) The uniformity of temperature at 1500°C to be demonstrated with standard calibration system. (As per point no-15)
- c) Operation of the resistive heating chamber will be demonstrated by performing chemical vapour infiltration with a Carbon-preform (C-preform) using methane gas at 1500°C for 4 hrs of duration at the customer site. Chemicals and C-preform will be supplied by the customer.
- d) Operation of induction heating chamber will be demonstrated using the CVI processed preform by infiltrating with suitable resin and cracking it to produce pyrolytic C-preform at 1500°C for 2 hrs at the customer site. Chemicals and C-preform will be supplied by the customer.

22) Training: Onsite training on operation and maintenance of the complete system with accessories should be given by competent technical personnel of the OEM or their authorised representative to 4-5 persons for five working days on completion of the acceptance test in point 21, to the complete satisfaction of the user at CSIR - Central Glass Ceramic Res. Institute, Kolkata.

23) Warranty: The furnace should be covered under comprehensive warranty of one year.

24) Pre-despatch inspection (PDI) should be arranged by the bidder for 2 persons for 3 days at customer premises before delivery. Travelling and hospitality cost will be borne by CSIR-CGCRI.

25) Delivery time- 120 days from the date of issue of purchase order.

- **The Essential Qualifications mentioned in Chapter-4 of the tender document stands withdrawn.**
- **Delivery time as mentioned in SCC Sl. No. 5 and in Chapter-4 of tender document may be read as follows:-**

S.N.	GCC Clause Ref	Condition
SCC Sl. No. 5	GCC 2.16.1	Delivery of all ordered materials is to be made within 120 days from the date of receipt of Purchase Order.

The above amendments shall amount to amendments of the relevant terms of our Bid Document for CGCRI Tender No. **P/NC/67/SB/DB/OTE/22-23**.

All the other Tender terms remain unchanged.

31/09/2022

(Anjani Kr. Pandey)
Stores & Purchase Officer

अंजनी कुमार पाण्डेय/Anjani Kumar Pandey
भण्डार एवं क्रय अधिकारी/Stores & Purchase Officer
सीएसआईआर - केन्द्रीय काँच एवं सिरामिक अनुसंधान संस्थान
CSIR - CENTRAL GLASS & CERAMIC RESEARCH INSTITUTE
196, राजा एस. सी. मल्लिक रोड / 196, Raja S. C. Mullick Road
कोलकाता / Kolkata- 700 032