INDIAN INSTITUTE OF TECHNOLOGY BOMBAY
MATERIALS MANAGEMENT DIVISION
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Detailed Technical Specifications for Simultaneous Thermogravimetric- Differential Thermal(Simultaneous TG-DTA system)

1. Instrument Specifications (Room Temperature to 1500 ˚C or better):

1.1 **Balance design** should be Differential type, and should have built in Thermostated Ultra- Micro Balance to detect very small mass changes accurately and precisely.

1.2 Balance housing should be isolated from sample/furnace chamber. Temperature Control in the balance housing should ensure minimum drift in baseline and maintain good stability over a wide temperature range.

1.3 Balance Beam should be Horizontal/Top loading with Dual beam or equivalent design to ensure high baseline stability and lower noise level.

1.4 STA system to provide with user friendly sensor assembly, with replacement-by-user feature.

1.5 Measurement Range: Sample Weighing TGA range +/- 200 mg or better.

1.6 Balance Sensitivity of the system should be 0.2 µg or better.

1.7 Balance Noise/Resolution of the system should be 0.25 µg or better.

1.8 TGA Baseline stability or drift should be < 50 µg for RT to 1000 ˚C

1.9 TGA Reproducibility should be < 50 µg for isothermal hold temperature of 1000 ˚C

1.10 TGA Balance Accuracy should be < +/- 0.1%

1.11 DTA Sensitivity should be 1.3 µV or better

1.12 DTA resolution should be 0.6 µV or better

1.13 **Furnace Design:** Furnace shall have high grade ceramic insulation. The furnace movement, opening and closing with both, software and push button control.

1.14 Furnace should have Pt alloy heating elements.

1.15 The sample and reference pan holders should have embedded sensor to ensure temperature accuracy and precision.

1.16 Temperature program settings: Temperature range should be from Room Temperature to 1500 ˚C or better. Temperature settings should be software controlled.

1.17 Heating Rates should be minimum 0.1 ˚C, and maximum 50 ˚C/min or better.

1.18 Temperature accuracy should be +/- 1 ℃ or better.
1.19 Temperature control should be +/- 0.5 ℃ or better.
1.20 Cooling time of the system from 1500 ℃ to 50 ℃ should be within 90 minutes.
1.21 **Gas flow controls:** Flow rates at least up to 250 ml/min with built in mass flow controller to control through software for gas flow setting and auto switch over at set time or temperature.
1.22 Measurement atmosphere should be Nitrogen, Air, Argon, Oxygen, Argon-H_2 and Helium-O_2. Software based gas switching facility during the time course measurement should be possible.
1.23 The system should have the facility to purge all inert gases or reactive gases with automatic gas purging and sweeping during sample runs.
1.24 **Auto sampler** for minimum of 20 or more positions for unattended operation.
1.25 **Personal Computer** with following Specs or better – CPU i7 or better. Windows 10 or later, 16GB RAM, 1TB HDD, Graphics Card with 4GB memory, 24-inch LED Screen, Keyboard, Laser Printer and Mouse (Branded).
1.26 **UPS system:** Appropriate standard make UPS (and isolation transformer) with at least one hour back up for the uninterrupted and smooth functioning of the entire system. The power requirement for proper functioning of the system along with all accessories should also be provided by the vendor.
1.27 **Upgradation:** System should be capable of future onsite upgradation to evolved gas analyzer (EGA) coupling (FTIR, GCMS, etc.)
1.28 All tools required for analysis for the above systems should be part of the supply.

2. Consumables and Accessories (Vendor MUST provide cost for each item; all such items quoted for, should be compatible with the respective main instrument mentioned in point 1):

2.1 Ceramic Pans (~80 µl Volume) 15 numbers
2.2 Ceramic Pans (~40 µl Volume) 15 numbers
2.3 Platinum Pans (~80 µl Volume) 15 numbers
2.4 Platinum Pans (~40 µl Volume) 15 numbers
2.5 Aluminum Pans (~40 µl Volume) 400 numbers
2.6 Platinum Pans along with lids (10 nos.), Aluminum pans along with lids (400 nos).
2.7 Alpha Al_2O_3 powder as inert base (100 gm).
2.8 Standard samples for Calibration-- 5 gm each Indium (In), Tin (Sn), Zinc (Zn), Gold (Au),
etc. *Separate quotes for all available standards should be provided*.
2.9 Gas Cylinders (High Purity) and Regulators for STA system: ie. Nitrogen, Air, Argon, Oxygen, Argon-H_2 (with 2-10% H_2), Helium-O_2 (with 5-10 % O_2) gas cylinders with dual stage regulators must be quoted along with the system.

3. Software:

3.1 Windows 10 (or later version) -based system with appropriate advanced Thermal Analysis software for data collection and further analysis in Thermal Analysis. Multitasking and multi-module software with licensed version and working under Windows O/S for data acquisition and storage. All the parameters like DTA, TGA and DTG are measured and displayed on the screen for calculations. The software has the flexibility to measure data with respect to temp and/ or time. Various calculations like mass change, %change, derivative calculations, peak area, onset point, onset temperature, end point, peak point, baseline correction, add, subtract, display of more curves on the screen, smoothening of data, slope adjustment, overlay of curves should be built-in. The software should have the capability to export data in excel or other commonly used formats that can be processed further using standard data analysis/plotting software like excel, Origin, etc. It should be supplied with calibration routines for temperature, mass calibration for regular calibration purpose.

3.2 Various Advanced software shall be included in the main offer with Kinetics, analysis
of thermal rates or equivalent, Simulation, and Purity software for advanced calculations.

4. Warranty:

4.1 The supplied system should have a minimum of 5 years on-site comprehensive
warranty. The warranty should include all parts of quoted system and its accessories.

4.2 The entire system should be protected against obsolescence for at least 10 years. Moreover, supply of spares and service should be guaranteed for 10 years from date of purchase.

5. The following technical requirements should be strictly met and necessary document has to be enclosed along with the main quotation:

5.1 Maintenance network: Mention address of the institutions and contact persons where the systems are in working conditions. Mention the maintenance network in India for the instrument.

5.2 The vendor should have installed the quoted machine in India/Reputed Academic and Research labs globally and should provide documentary evidence of the same; evidence of satisfactory working & after sales support has to be submitted along with the tender document; and the vendor should have Service Centre in India for providing service support in a timely manner.

5.3 All specifications should be demonstrated through verifiable results against each specification submitted with the technical bid. All such results presented should be demonstrated on the instrument at the time of installation.

5.4 Technical bid should include all the necessary electrical, mechanical, civil and environmental requirements for the instruments to be installed and operated.

5.5 Availability of applications/service Engineer to handle instrument problems immediately.

5.6 All manuals (service & operational) should be given as hard copies and/or soft copies on USB drives.

5.7 Complete product catalogues describing all the required basic items should be produced.

5.8 Installation: An OEM trained engineer should install, on site, including all the electrical and mechanical systems, and accessories. This should be included in the quote.

5.9 Onsite Training by competent Application Scientist for 1 week on applications and capabilities of the System and all the components. This should be included in the quote.

5.10 Upgradation of software should be given free of cost as and when the new extension versions are released by the manufacturer/vendor at no additional cost during the period of warranty.

5.11. A compliance certificate duly signed by the OEM against all the specifications, with a yes or no for each specification, as listed under items 1, 2 and 3 above.

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