

## **Technical Specifications for Isothermal Titration Calorimeter**

Vendors should quote their advanced ITC Module with control unit, degassing station, filling & cleaning assemblies, injection syringes, other start-up accessories, necessary software's for instrument control, operation analysis of data, viewing and printing enabling accurate determination of thermodynamic parameters such as binding constants, reaction stoichiometry, enthalpy, entropy etc. Isothermal Titration Calorimeter should have following detailed specifications:

1. Characterization of molecular interactions of small molecules, proteins, antibodies, nucleic acids, lipids and other biomolecules, Lead optimization, Assessment of the effect of molecular structure changes on binding, Enzyme kinetics, Assessment of biological activity etc.
2. Determination of thermodynamic characteristics of interactions between any two molecules/ions in terms of binding parameters like  $K_d$ - Binding affinity in range of millimolar to nano molar,  $n$ - Number of binding sites, Multiple and different binding sites,  $\Delta H$ - Enthalpy and  $\Delta S$ - Entropy of binding.
3. Measuring principle: Should be Direct or power compensation
4. The instrument must have a Fixed Cell Cylindrical Configuration attached to Peltier elements.
5. Cell type: Should be Non-capillary, enclosed in an adiabatic chamber, must be fixed in place, with active volume of the cell should be 190 $\mu$ L or lower. Vendors to specify the working volume and the dead volume for the offered cell.
6. The instrument must have a high-sensitivity cell made of 99.999 % Gold (Au(0)) to allow for the widest range of reagent chemistry, easy cleaning and facilities efficient stirring of the solution.
7. Samples: In solution state including turbid samples
8. Minimum detectable heat: 0.04  $\mu$ J
9. Maximum measurable heat: 5,000  $\mu$ J
10. Injection syringe capacity:  $\leq 250\mu$ L
11. Injection Volume Precision: 0.01  $\mu$ L
12. Quick re-equilibration between injections. ITC model should have shorter equilibration time between injections, leading to increased productivity. Movement of instrument operating temperature should be fast with short system equilibration time when moving the temperature
13. The instrument must have a Low Short term noise  $\leq 0.0013 \mu$ Watt

14. The instrument should have a baseline stability 0.02  $\mu$ Watt/hr
15. The instrument must have a Response Time 3.3 Seconds
16. Should have user definable mixing speed with twisted stirring paddle for increasing the mixing efficiency at slow speeds
17. The instrument must have a Temperature Stability  $\leq 8 \mu$  °C at 25°C
18. Operating temperature: 2 to 80°C
19. Peltier controlled system for rapid temperature equilibration. Movement of instrument operating temperature should be easy and quick with short system equilibration times when moving to a lower temperature
20. Binding constants detectable range should be sub-milimolar to Nano-molar range
21. ITC Sample Cell filling syringe should have improved design to make sure minimal breakage of cell filling syringes when filling the samples. Software should have the option for titrant sample retrieval.
22. Temperature control system: Solid-state thermoelectric devices with active heating and cooling to maintain accurate, precise temperature control
23. Instrument Cleaning: Instrument should have separate solvent access ports available on the instrument for easy cleaning. Cleaning of the stirring and injection systems should be user programmable and fully automated. No manual repositioning of the injection and stirring systems. Require less operator involvement for cleaning.
24. Degassing station should be provided along with the instrument and should have the facility for cleaning the sample cell using vacuum to pull solvent through the cell
25. There should be at least one service engineer and one application scientist based in India trained on the same quoted instrument.
26. Software: Should be capable of running instrument, injector control, providing user-selectable binding models, and data merging like: single site, two site, sequential site, competitive site, and enzyme kinetics. Non-linear least square analysis of the data should include calculations to correct for the excluded concentrations of the macromolecules and ligands during each injection. It should be easy to export and use data in other formats. Should allow corrections for heats of dilution and blank effects, Should have experiment optimization tool for post-titration adjustments of all experimental parameters for optimizing subsequent titrations. Should have Dedicated fitting model for Enthalpy Screening data.

27. Computer and necessary software for operation, data collection and analysis, viewing and printing and 5 KVA UPS back for the system should be provided. Also the vendor is requested to provide a Air-Conditioner in addition to maintain the ambient temperature.
28. Analysis software: should provide 10 unlimited copies of offline analysis software and should not require a separate software supporting license.
29. The system must be quoted with complete control unit, filling & cleaning assemblies, degassing systems, Additional pipette assemblies, other necessary accessories and software/s to control instrument, analysis of data, accurate determination of thermodynamic parameters such as binding constants (in the order of 10<sup>2</sup> to enthalpy, reaction stoichiometry, entropy, binding of nano-particle with proteins etc. with the above specifications.
30. A user-list should be provided highlighting installation of similar equipment in other research institutes in India in the recent past
31. An International user-list of the quoted instrument (same model) must be provided.