Advance Contract Award Notice (ACAN)

23-58021
Differential Scanning Calorimeter (DSC) & Thermogravimetric Analysis (TGA)

1. Advance Contract Award Notice (ACAN)

   An ACAN is a public notice indicating to the supplier community that a department or agency intends to award a contract for goods, services or construction to a pre-identified supplier, thereby allowing other suppliers to signal their interest in bidding, by submitting a statement of capabilities. If no supplier submits a statement of capabilities that meets the requirements set out in the ACAN, on or before the closing date stated in the ACAN, the contracting officer may then proceed with the award to the pre-identified supplier.

2. Definition of the requirement

   The National Research Council Canada has a requirement for the supply of quantity 1 Differential Scanning Calorimeter (DSC) and 1 Thermogravimetric Analysis (TGA). The DSC is employed to analyze thermal properties of polymers, composites and various materials and must feature modulated temperature to separate overlapping transitions and complex thermal events.
   The TGA is employed to monitor the changing of the mass of a sample material over time as the temperature changes. This instrument investigates degradation mechanisms and reaction kinetics and determines organic and inorganic content in a sample.

3. Criteria for assessment of the Statement of Capabilities (Minimum Essential Requirements)

   Criteria for DSC:

   - The DSC must be of the Heat Flux design whereby the sample and reference are measured in the same furnace, on separate stages.
   - The DSC must employ area temperature detectors directly beneath the sample and reference positions, not platinum resistance thermometers or thermopiles.
   - The DSC furnace shall be constructed of silver, with Platine heater windings.
   - The DSC must include a third thermocouple, thermally isolated from the sample and reference, to act as an objective reference point for temperature control.
   - The DSC cell must include integrated, temperature-controlled electronics for stable signal processing.

- The DSC must include integrated purge gas delivery control accommodating at least two simultaneously installed gases. This capability must be incorporated into the instrument (i.e., shall not be a separate unit) and should not require external tubing to deliver the gas flow from the controlling components to the DSC cell. Purge gas flow rate must be programmable within operating software, and deliverable as a saved signal in the data file. Gas delivery control must also allow for automated switching between the two gases during an experiment.
- Purge gas is pre-heated prior to entering the sample chamber and sweeps across sample for optimal purge interaction with sample. By design, all oxygen is purged from "dead spaces" of cell; reliance on diffusion of purge gas is avoided.
- Data files must contain measured sensor temperature, not calculated temperature. This allows the user to know what temperature the sample is actually at during different heating rate experiments and makes for accurate and precise transition temperatures.
- The DSC must have up to five points for temperature calibration.
- The DSC must feature modulated temperature to separate overlapping transitions and complex thermal events. The temperature modulation should be strictly periodic to ensure continuous steady-state control and exact experiment reproducibility, random temperature perturbations are not acceptable. Must be able to view the following signals in real-time during the experiment: Total Heat Flow, Total Heat Capacity, Reversing Heat Capacity, Reversing Heat Flow, Non-Reversing (Kinetic) Heat Flow, Modulated Temperature, Modulated Heat Flow, Heat Flow Phase, Reference Sine Angle, Temperature Amplitude, Heat Flow Amplitude.

Criteria for TGA:

- The TGA must employ horizontal purge gas flow to minimize buoyancy effects from purge gas and for direct output to off gas analysis.
- Data files must contain measured sample temperature, not calculated temperature. This allows the user to know what temperature the sample is actually at during different heating rate experiments and makes for accurate and precise transition temperatures.
- The TGA must employ single thermocouple design with continuous use of the measured sample temperature to control the furnace so as to minimize thermal lag.
- The TGA must demonstrate ability to have up to five points for temperature calibration to provide greater temperature accuracy over wide temperature ranges. It must be capable of Curie Point temperature calibration using an external magnet.

- The TGA must employ a vertical null-balance design for accurate, precise and reliable weighing of samples. It must be well insulated, electrically grounded, separately gas purged, and thermally isolated from the furnace. This is essential for high performance baseline performance.
- The furnace design must include a horizontal gas purge system using Gas Delivery Module to provide highly accurate and precise control purge gas flow rate and gas switching capability. The system software should include automatic buoyancy corrections for temperature and gas flow rate.
- Furnace type must be either a wire-wound, low mass ceramic furnace or a quartz-lined evolved gas analysis furnace.
- Gas Delivery Manifold: Integrated purge gas delivery control accommodating up to four simultaneously installed gases. This capability must be incorporated into the instrument (i.e. shall not be a separate unit). Purge gas flow rate must be programmable within operating software, and deliverable as a saved signal in the data file. Gas delivery control must also allow for automated switching between the gases during an experiment. An optional accessory should allow blending of binary mixtures of gases in controllable ratios.

  - Any interested supplier must demonstrate by way of a statement of capabilities that its *product/equipment/system (as appropriate)* meets the following requirements:

The **DSC** must meet or exceed the following technical specifications:

- **Baseline Bow (-50°C to 300°C) < 100 μW**
  Defined as the largest deviation from a flat, drawn baseline to the instrument baseline maxima without any smoothing or blank subtraction applied.
- **Baseline Repeatability (-50°C to 300°C) <40 μW**
  Defined as the average standard deviation of at least 10 empty cell baseline scans (data collected at 1°C intervals), opening and closing the lid in between each run.
- **Baseline Accuracy (-50°C to 300°C): ±75 μW**
  Defined as the maximum allowable error from the theoretical value (0 μW) for any measured baseline value over the temperature range noted.
- **Heat Flow Digital Resolution: 0.001 μW**
  Defined as the smallest measurable difference between two adjacent values.
- **Baseline Noise (-50°C to 300°C) <0.2 μW**
  Defined as the average root mean square rms noise over the temperature range noted.

- **Temperature Accuracy: ±0.1°C**
  Defined as the standard deviation of the measured error (at least 10 replicate runs after temperature calibration) of the onset temperature of an indium melting measurement at 10°C/min, removing and replacing the sample in between each run.
- **Temperature Precision: ±0.01°C**
  Defined as the standard deviation of the measured onset melting temperature of at least 10 indium runs, without disturbing the sample in between each run.
- **Temperature Repeatability: ±0.1°C**
  Defined as the standard deviation of the measured onset melting temperature of at least 10 indium runs, removing and replacing the sample in between each run.
- **Enthalpy Precision: ±0.1%**
  Defined as the relative standard deviation of the measured enthalpy of at least 10 indium runs, without disturbing the sample in between each run.
- **Enthalpy Repeatability: ±0.4%**
  Defined as the relative standard deviation of the measured enthalpy of at least 10 indium runs, removing and replacing the sample in between each run.
- **Indium Response Ratio ≥8**
  Defined as the height to width ratio of an indium melting peak, 1±0.02 mg sample, 10°C/min, N_2 atmosphere, data measured as collected from the instrument with no post-test manipulation.

The **TGA** must meet or exceed the following technical specifications:

- **Sample Weight Capacity: 1000 mg**
  Defined as the maximum sample weight measurable (independent of pans).
- **Dynamic Weighing Range: 1000 mg**
  Defined as the maximum measurable weight change (independent of pans).
- **Weighing Precision: ± 0.01%**
  Defined as the standard deviation of at least 10 measurements of a 100mg standard weight, with removing and replacing the sample in between each measurement.
- **Dynamic Baseline Drift (50°C to 1,000°C): <25 µg, with platinum pans**
  Defined as the maximum deviation from the smallest measured weight to the largest measured weight of an empty platinum pan, while being heated at 20°C/min in flowing nitrogen atmosphere (without any blank subtraction applied).
- **Signal Resolution: 0.002µg**
  Defined as the smallest measurable difference between two adjacent values.
- **Sensitivity: 0.1 µg (1 ppm)**

Defined as 3X the average rms noise over the temperature range 50°C to 1,000°C.

- **Temperature Range: ambient to 1000°C**
  Defined as the measured temperature at the sample thermocouple (not furnace temperature or programmed temperature).
- **Temperature Accuracy: ±1°C**
  Defined as the standard deviation of the measured error (at least 10 replicate runs after temperature calibration) of the onset temperature of a nickel Curie Point measured at 10°C/min, removing and replacing the sample in between each run.
- **Dynamic Temperature Precision: ±1°C**
  Defined as the standard deviation of the measured Curie Point temperature of at least 10 nickel runs, removing and replacing the sample in between each run.
- **Isothermal Temperature Precision: ±0.1°C**
- **Furnace Cooling: Forced Air 1000°C to 50°C in < 12 min.**

4. Applicability of the trade agreement(s) to the procurement

This procurement is subject to the following trade agreement(s)

  - *Canadian Free Trade Agreement* (CFTA)
  - *Canada-Chile Free Trade Agreement* (CCFTA)
  - *Canada-Colombia Free Trade Agreement*
  - *Canada-Honduras Free Trade Agreement*
  - *Canada-Korea Free Trade Agreement*
  - *Canada-Panama Free Trade Agreement*

5. Set-aside under the Procurement Strategy for Aboriginal Business

Not applicable

6. Comprehensive Land Claims Agreement(s)

Not applicable

7. Justification for the Pre-Identified Supplier

Our new research facility will be working closely with another federal research facility to scale-up their formulations and designs to semi-industrial level. To reduce the inconsistency in the characterization data, we need to keep the same vendor for the characterization equipment. Since the other research center has both DSC and TGA from TA Instruments, we also would like to procure this two equipment from TA Instruments to rule out the effect of characterization equipment per se on the results. Moreover, our main industrial customer procured their thermal characterization equipment from TA Instruments, which makes it essential for us to do the same to rule out the effect of the make of these instruments on the characterization data and remain coherent and in-line with both ends of the processes.

8. Government Contracts Regulations Exception(s)

The following exception(s) to the *Government Contracts Regulations* is *(are)* invoked for this procurement under subsection (d) - "only one person is capable of performing the work".

9. Exclusions and/or Limited Tendering Reasons

The following exclusion(s) and/or limited tendering reasons are invoked under the:

a. Canadian Free Trade Agreement (CFTA) – Article 513 (1) (b) (iii): due to an absence of competition for technical reasons;
b. Canada-Colombia Free Trade Agreement – Article 1409 (1) (b) (iii): due to an absence of competition for technical reasons;
c. Canada-Honduras Free Trade Agreement – Article 17.11 (2) (b) (iii): due to an absence of competition for technical reasons;
d. Canada-Korea Free Trade Agreement – referencing the WTO Protocol Amending the GPA, Article XIII (1) (b) (iii): due to an absence of competition for technical reasons;
e. Canada-Panama Free Trade Agreement – Article 16.10 (1) (b) (iii): because of the absence of competition for technical reasons;

10. Ownership of Intellectual Property

Not applicable

11. Period of the proposed contract or delivery date

- The *product/system/equipment (as appropriate)* must be delivered on September 29, 2023

12. Cost estimate of the proposed contract

The estimated value of the contract, including option(s), is $ 168,000.00 (GST/HST extra).

13. Name and address of the pre-identified supplier

TA Instruments-Waters LLC
159 Lukens Dr.
New Castle, DE 19720

14. Suppliers' right to submit a statement of capabilities

Suppliers who consider themselves fully qualified and available to provide the goods, services or construction services described in the ACAN may submit a statement of capabilities in writing to the contact person identified in this notice on or before the closing date of this notice. The statement of capabilities must clearly demonstrate how the supplier meets the advertised requirements.

15. Closing date for a submission of a statement of capabilities

The closing date and time for accepting statements of capabilities is June 22, 2023 at 2:00 p.m. Est.

16. Inquiries and submission of statements of capabilities

Inquiries and statements of capabilities are to be directed to:

Name: Kacendra Dion
Title: Procurement Officer

Organization: National Research Council Canada

Telephone: 438-324-8125
E-mail address: Kacendra.Dion@cnrc-nrc.gc.ca