

1. Outline of Procurement

The Advanced Fuel Fabrication Group develops a wide variety of fuel forms, the fabrication of which requires high-temperature thermal conversions conducted under strict conditions. A graphite rotary furnace can reach the high temperatures required for those thermal conversions while gently mixing the materials inside to ensure consistent products. The Advanced Fuel Fabrication Group is seeking to expand capabilities for fuel kernel fabrication in terms of both batch size and quality. To meet this objective, it is expected that a graphite rotary furnace with the capacity to use multiple process gases will be required to reach the required temperatures, ramp rates, agitation, and gas parameters to convert varied fuel kernels.

2. Technical Specifications

The Fuel Development Section is attempting to procure a high-temperature rotary furnace capable of converting large batches of samples made of a wide range of materials and requiring a variety of capabilities. The key instrument attributes to support this range of capability are high temperatures, tightly controlled ramp rates, vacuum capabilities, and process gas controls. The conversions can only occur at certain temperatures, and different heating and cooling rates are required to avoid damaging the samples. The materials are air-sensitive, so a vacuum system for removing air and conducting periodic bakeouts will be required.

The purchased instrument must include the following technical features:

- a. Maximum operating temperature ≥ 2000 °C
 - i. Ramp rates must be closely controllable from 1-30 °C / minute
 - ii. Outer shell temperature ≤ 60 °C
- b. Crucible
 - i. Material: graphite
 - ii. Internal dimensions: at least 3” diameter, 17” length
 - iii. The hot zone / crucible must be fully accessible for loading and unloading of particles without disassembly
- c. Chamber and crucible vacuum-capable for at least 1E-3 mbar
 - i. Vacuum system included for same range
- d. Chamber shall be able to accommodate small overpressure of approximately 300 mbar
- e. Rotation rate: 0.5 to at least 15 RPM
- f. Process gasses
 - i. Separate lines for Ar, N₂, CO, H₂
 - ii. 10 SLPM maximum flow rate MFCs for each process gas
- g. Programmable temperature and gas controls
 - i. Include readouts for chamber pressure and temperature, overtemperature, and gas flows
 - ii. Logs data and allows for data to be offloaded via USB to other devices.
- h. Furnace must include interlocks for temperature, water, and gas flow anomalies

3. Other Requirements

- The requirements for the power supply cannot exceed 80 kVA, 460 V / 3 PH / 60 Hz
- Bidders must indicate ability, cost, and timeline for Nationally Recognized and Testing Laboratory (NRTL) certification of the instrument prior to delivery to ORNL
- Bidders must provide shipping, on-site installation, and follow-on maintenance cost and schedule
- Bidders must be fully registered as an ORNL Supplier by [date]

4. Evaluation Criteria

Criterion 1: Offers must meet all technical specifications. The proposed instrument must be capable of meeting all technical specifications and offers must demonstrate an understanding of the technical requirements. Offerors must describe their project management and technical capabilities to perform the work and provide diagrams of the final equipment with specifications listed.

Criterion 2: Offers must have demonstrated excellence with design and production of similar high-temperature furnaces and provide support of relevant past experiences. Relevant past experience may include furnace designs that do not incorporate all technical specifications in one instrument, but can be a demonstration of several examples that display capabilities with all areas of concern.

Criterion 3: Offerors will demonstrate dedication to Quality Assurance (QA). In addition to Quality Assurance requirements flowed in Section H, Special Provisions, of the solicitation, Offerors will provide documented experience managing quality assurance of equipment design, manufacturing, and inspection according to specifications, managing documents (including change control and configuration management), and maintaining material traceability.

Criterion 4: Offerors must provide a plan for shipping, installation, and follow-on maintenance.