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September 18, 2009

Dear Prospective Offeror:

REQUEST FOR PROPOSAL (RFP) NO. 108405, Amendment 1
THIN FILM DEPOSITION SYSTEM

This letter serves as Amendment 1 to the subject RFP that was issued on August 28, 2009. The purpose of this Amendment is to: 1) provide responses to questions received; 2) extend the due date for receipt of proposals; and 3) incorporate a revised Technical Specification dated September 17, 2009.

QUESTIONS RECEIVED WITH BATTELLE RESPONSES:

Attachment 1 provides a summary of questions received with Battelle's responses.

PROPOSAL DUE DATE:

The date for receipt of proposals is extended to September 30, 2009.

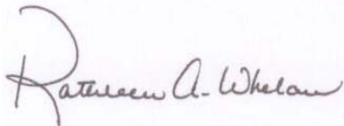
REVISED TECHNICAL SPECIFICATION:

The Thin Film Deposition System specification dated August 10, 2009 is deleted and the attached Thin Film Deposition System specification dated September 17, 2009 is incorporated in lieu thereof.

Except as provided herein, all terms and conditions of the referenced RFP remain unchanged and in full force and effect.

Offerors shall acknowledge receipt of this Amendment in accordance with the RFP section entitled "Amendments to RFP."

Sincerely,



Kathleen A. Whelan
Sr. Contracts Specialist

ATTACHMENT 1

REQUEST FOR PROPOSAL 108405

QUESTIONS RECEIVED AND RESPONSES

September 17, 2009

Question 1: Three RF and three DC power supplies are requested. Do you want one DC and one RF supply hooked up to one sputter source with a computer controlled selectable switch (for RF or DC)? Or do you just want to swap cables when shifting from RF to DC?

Response: No, all power supplies shall be operable simultaneously.

Question 2: Three effusion cells are requested. These cells come in many flavors and power requirements. Please tell us what materials you will want to evaporate with these cells, or the type of cell, i.e., high temp cell, dual zone cell, etc. This information is needed to configure the system properly. Also the size of the crucibles for these cells is needed.

Response: The materials we will be evaporating are stated in the RFP.

Question 3: The size of the ebeam power source is not mentioned. An idea of the materials you want to evaporate or the size of the power supply are needed.

Response: A power source of one to five kW should be sufficient.

Question 4: An ebeam source with three pockets is requested. What size pockets do you have in mind?

Response: The pocket size shall be 15 cc.

Question 5: A base pressure below 5×10^{-8} Torr with a turbo pump is specified. Given the expected size of the system, the time to reach this pressure will be fairly long. Adding a loadlock will allow this pressure to be readily achieved. How long are you willing to wait to achieve the desired base pressure with a system without a loadlock? Or is a base pressure of 5×10^{-7} Torr acceptable without the loadlock.

Response: The chamber shall reach final pressure within one hour.

Question 6: You request six MFC's and mention 5 gasses. What gas is the sixth MFC going to be used for?

Response: The sixth gas will be oxygen.

Question 7: Please clarify Specification 22.

Response: With respect to Specification 22, for all sputter sources and effusion cells, the system shall provide real-time, in situ thickness monitoring without interfering with the deposition on the substrate.

Question 8: You ask for the magnetron sputter sources to have tilt capability. There are multiple ways to accomplish this; what is your preference?

Response: Basic manual tilt is sufficient.

Question 9: In a deposition system like this, it is wise to put some removable shields on the chamber walls. Do you require such shields?

Response: We will install aluminum foil for shielding.

Question 10: Do you want the effusion cells to have water cooling around the OD?

Response: Yes.

Question 11: Are crucibles to be provided with the effusion cells.

Response: Yes. The materials are specified in the RFP.

Question 12: Regarding point 21 in the Specification, does the Lab have a RHEED gun that they wish to use or does that need to be provided by the supplier of the deposition system? Also, would the RHEED system be used during all modes of deposition?

Response: The vendor shall provide a RHEED gun. We plan to use RHEED gun only during low pressure e-beam evaporation mode and NOT during sputter deposition mode.

Optional Items

Question 1: You request quartz viewports. We assume that the chamber will have at least one main viewport and a viewport for a pyrometer. What is the quartz viewport or ports going to be used for? Do you want two ports on opposite sides of the system for AA measurements, ellipsometry, etc.?

Response: Viewports will be used for additional viewing of the process or other analysis such as ellipsometry, etc.

Question 2: What do you mean by additional system enclosure? Please describe.

Response: The enclosure would be used to contain and direct exhaust, if a future need arises.

Attachment 2

Request for Proposal 108405

Specification for a Combined Thin Film Deposition Capability using Sputtering & Thermal Evaporation Methods

September 17, 2009

Contractor shall provide a combined thin film deposition instrument using sputtering and thermal evaporation methods. The instrument shall support thin film deposition at room temperature and high temperatures. The instrument shall accommodate a wide range of materials for thin film depositions such as metals, semiconductors and insulating oxides.

The system should be flexible enough for basic research and development activities. This system will not be used in a production environment. Therefore, the system should be able to function with minimum user training. The nature of Battelle's research will demand frequent changing of sources, materials, and parameters, depending upon the different projects. (Battelle will use aluminum foil for shielding within the sputtering chamber so the offeror need not provide shielding.) The system shall accommodate all of these activities without major modifications or major transformation time. Battelle anticipates the following typical scenarios for thin film depositions:

- Typical substrate size - up to 3 inch diameter
- Substrate materials - Si, quartz, glass, single crystals of $LaAlO_3$, Al_2O_3, YSZ, GaN, Si_2N_3, etc.
- Typical gases used - Ar, N_2, CH_4, H_2 ,,He, and O_2
- Typical materials sputtered or evaporated - CeO2, YSZ, YBCO, Cu, Au, Ag, various alloys, Pt, Several types of perovskite and ferroelectric oxides, complex systems

The instrument shall meet the following requirements:

1. The instrument shall be able to deposit multi-component thin films with the help of at least three sputter deposition targets/sources in a simultaneous way.
2. The sputter deposition modes of any of the sources shall be interchangeable from DC to RF sputtering.
3. The RF matching unit shall be switchable between auto and manual.
4. The system shall implement sputter sources with flexible necks for manual tilting.
5. The system shall accommodate a sputter up configuration.
6. The sputter sources should be at least 3” diameter.
7. A shutter shall be provided with each sputter source.
8. The instrument shall include three RF and three DC power supplies that generate at least 1 kW. All power supplies shall be operable simultaneously.
9. The instrument shall have at least three effusion cells. Effusion cells shall be water cooled around the OD. Offeror shall provide crucibles compatible with the materials listed above.
10. The instrument shall have at least one e-beam source with three pockets. The pocket size shall be 15 cc.
11. The instrument shall include one e-beam power supply to operate e-beam heating source.
12. The instrument shall have at least three power supplies used for effusion cells.
13. The instrument shall have a 3” diameter substrate heater capable of reaching at least 800 ^{0}C in a reactive environment.
14. The system shall fit within a 10 ft x 6 ft space.
15. The system shall be compatible with a standard class 1000 clean room environment.
16. The instrument shall include a substrate heater power supply capable of controlling the substrate temperature to within 1^{0}C.
17. The instrument shall have a large cylindrical OR spherical vacuum chamber with multiple ports and capable of reaching a base pressure of 5 x 10^{-8} Torr or less. The chamber shall reach final pressure within 60 minutes.
18. The system shall have a turbo pump package with VAT closed loop pressure control.

19. The system shall have at least six MFC’s with shut off valves.
20. The system shall have all the pressure gauges, such as ion gauges and convectron gauges, required to monitor the vacuum at all the stages.
21. The system shall have a low pressure RHEED system with necessary software to automate k-space analysis. The offeror shall provide a RHEED gun. Battelle will use the RHEED gun only during low pressure e-beam evaporation mode and NOT during sputter deposition mode.
22. For all sputter sources and effusion cells, the system shall provide real-time, in situ thickness monitoring without interfering with the deposition on the substrate. The system shall have a thin film thickness measurement sensor with a resolution of 1 Angstrom. The system shall display film thickness.
23. Full computer control of the entire system is required. This includes all the gas handling, operation of the valves, operation of the shutters for multi-layered films, data management, and operation of the pumps.
24. The system shall accommodate a 208 VAC three phase electrical service. There are no restrictions on electrical current.
25. The system shall provide over-pressure protection for the main vacuum vessel set at less than 15 psig (e.g., vacuum rated rupture disk).
26. On-site installation and training, inclusive of all labor, travel, lodging and expenses, shall be provided.
27. Guaranteed instrument delivery within ten months of contract award is required.

Offeror shall provide technical and cost information for the following items. Battelle reserves the right to exercise such option up to one year following any resulting contract award.

a. Substrate heater accessories, such as heating filaments, ceramic spacers, clamps, etc.
b. Load-lock capability
c. Optional vacuum pumps for backup or replacement

d. Quartz viewing ports. Viewports will be used for additional viewing of the process or other analysis such as ellipsometry, etc.
e. Pyrometer for remote temperature monitoring
f. Additional system enclosure. The enclosure would be used to contain and direct exhaust, if a future need arises.