



**INDIAN INSTITUTE OF TECHNOLOGY  
BOMBAY  
MATERIALS MANAGEMENT DIVISION  
Powai, Mumbai 400076**

**Purchase Requisition No. 1000008481 (SRM/RFX No. 6100000122)**

**Technical Specification for Thermal Atomic Layer Deposition System**

**Thermal Atomic Layer Deposition system for the metal oxide and transparent conducting oxides for Perovskite solar cells**

**1. Major Application:**

Perovskite and perovskite-silicon tandem solar cells.

**2. Major Requirement**

Thermal Atomic layer deposition system capable of depositing very thin films of electron and hole transport layers, the inter layers and transparent conducting oxide films for perovskite and perovskite-silicon tandem solar cells.

**3. Technical Details:**

1. 5 (min) or more ALD sources can be installed at a time of which
  - a) ALD solid/liquid organometallic precursor lines: 3 (min) or more lines
  - b) reductant/oxidant line : 2 lines ( 1 for high purity H<sub>2</sub>O and the second can be used for either O<sub>2</sub>, NH<sub>3</sub>, O<sub>3</sub>, etc.)
2. The precursor and the oxidant/reductant lines equipped with fast ALD switching valves (4 or more)
3. Separate flow paths for metal sources and counter reactants which ensures that film growth is confined to deposition chamber
4. Carrier/purging gas N<sub>2</sub>/Ar with 200sccm (min.) Mass flow controller (reputed make)
5. All Source Lines are electropolished stainless steel tubes with metal sealed VCR fittings
6. Air cooled ALD reactor chamber made in Aluminium
7. Sample holder for 100mm or more
8. Substrate temperature upto  $\approx 300$  to  $325^{\circ}\text{C}$  with an accuracy of  $\pm 1^{\circ}\text{C}$
9. Deposition chamber can process a 4" Si wafer, small pieces of wafers/ glass up to 3mm in thickness, porous materials, materials with high aspect ratio features and 3-D substrates
10. Capacitance manometer pressure gauge
11. Accommodates standard 50cc Swagelok style precursor bottles
12. Precursor Bottle Heater, conformal heating element/ jacket up to  $150^{\circ}\text{C}$ , quantity: 1
13. Vacuum Inlet trap made in stainless steel installed with activated charcoal for the precursor abatement, which can be connected to the rotary pumping.
14. PLC/ computer controlled system
15. Recipe database for high quality, tested and proven processes (recipes for SnO<sub>2</sub>, Al<sub>2</sub>O<sub>3</sub>, TiO<sub>2</sub>, ZnO, ZnO:Al are mandatory).
16. Custom recipe input screen
17. Real time display of process status
18. Built-in pulsing sequences for ternary compounds and nano-laminates
19. Free software upgrades
20. Should be possible in future to integrate to glove box.

21. Power supply: 230V AC, 50Hz as per Indian standard.
22. Safety: Physical emergency off (EMO) button on front panel, normally closed pneumatic valves (all valves will be closed in the event of a system failure or EMO)
23. Installation and training
24. Essential spare parts for preventive maintenance
25. Foot print: minimum as possible and favourable to have a bench top model

**Other terms and conditions:**

1. The facility requirements like vacuum, exhaust, gases, and requirements for installation etc. to be stated in the bid.
2. We may require the evaluation of test samples as part of technical evaluation.
3. List of consumers (Industry/ acclaimed research and development centers) who are using the equipment, with contact details should be included.
4. Proven results as publications showing the use of this system
5. Immediate technical service support is to be provided, in case of technical problems/failure with the system.
6. We will be providing a two-stage vane pump (335L/M), which is to be connected with the ALD system.
7. Warranty: At least 1 year (Parts & Labor) and 1 year process development support.