TECHNICAL SPECIFICATIONS - E-Beam Metal Deposition System

System Description: This system will be used for thin-film deposition of high-purity metal and dielectric layers under vacuum in semiconductor, microsystem, and optoelectronic applications. The system must operate fully automatically, have high vacuum capacity, and provide thin-film thickness control.

1. GENERAL REQUIREMENTS

- The system must be compatible with wafers with a minimum diameter of 4".
- The sample must be temperature controlled up to 500°C during coating.
- The material crucible structure must have multiple pockets (at least 6 and a minimum volume of 7 cc) and be water-cooled.
- The system must be fully automatic, and a structure that allows for manual intervention must be supported.
- Installation, commissioning, and training must be provided by the contractor.

2. TECHNICAL SPECIFICATIONS

2.1 Vacuum Chamber and Body

- The vacuum chamber front cover must be easily accessible from the inside of the vacuum chamber.
- It must have a viewing window and be equipped with protective shutters.
- The interior must be equipped with a protective liner (jacket).

2.2 Vacuum System

- The turbo molecular pump must be a minimum of 800 l/s.
- The front pump must be a dry-type pump and have a minimum capacity of 30 m^3/h.
- It must be delivered assembled and tested with appropriate valves and hose connections.
- Final vacuum It should be better than 5×10^{-7} mbar.

2.3 Electron Beam Welding and Power Control

- Power capacity should be at least 6 kW, and the accelerating voltage should be 4–10 kV (it should have a power and accelerating voltage suitable for coating refractory metals).
- A multi-pocket welding system should include at least six multi-pocket crucible structures with a volume of at least 7 cc (preferably 7 cc), and a motorized indexer (crucible rotator).
- Safety systems should include at least a door interlock switch and a grounding rod.
- A control unit and a remote operation box/handheld controller should be included.

2.4 Thin Film Thickness Measurement

- The system should include a thickness monitoring system for the deposited thin films.
- Frequency resolution should be ≤ 0.1 Hz, PID-controlled coating should be used, and the thickness accuracy should be at least ±0.1 Å.
- Gold-plated It should be supplied with quartz crystals and sensor heads.
- The system should automatically stop the coating process when the prescribed thin film thickness is reached. It should include an automatic shutter system. The shutter should be manually controlled when necessary.

2.5 Substrate Handling and Heating Unit
- The substrate tray should support a minimum of 4” diameter and be water-cooled and heated.
- The heating temperature should be capable of reaching 500°C and should be PID-controlled.
- The turntable speed should be adjustable within a range of at least 0–20 rpm.

2.6 Electrical and Software Control Cabinet
- The system should be controlled by a user-friendly touchscreen and PLC (preferably with a Windows operating system).
- Recipe definition, a data recording system, and preferably user authorization.
- The software should include automatic pumping, discharging, thickness monitoring, temperature, sample rotation speed settings, and relevant process parameters.
- An emergency button should be located in the operator area.

3. PERFORMANCE CRITERIA
- Base vacuum must be ≤ 5×10^{-7} mbar.
- Film thickness uniformity must be no more than ±5% on a 4” wafer.
- Heating temperature deviation must be no more than ±1°C.

4. WARRANTY AND SERVICE
- The system must have a minimum 24-month warranty.
- Technical support (spare parts and labor) must be provided for at least 10 years.
- Documentation must be provided confirming that a malfunction can be repaired within 10 days at the latest.
- Documentation must be provided confirming that a malfunction can be repaired within 2 days at the latest, and on-site repair within 10 days at the latest.
- Training and installation services must be included in the offer.

5. DELIVERY AND TRAINING
- Device installation, testing, and initial user training must be provided by the contractor. Post-installation on-site training must be at least 2 days.
- Delivery time must not exceed 10 months.
- Training documents, user manuals, and maintenance documentation must be in Turkish and/or English.

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