TECHNICAL SPECIFICATION – Sputter Deposition System

System Description

The system will be used for the deposition of metallic, dielectric, and semiconductor thin films under vacuum by RF and DC sputtering sources for applications in semiconductor, optoelectronic, sensor, and coating technologies. The system shall be multi-target, fully automatic, and software-controlled.

1. GENERAL REQUIREMENTS

- The system shall be compatible with wafers of at least 4" diameter.
- The system shall operate with both RF and DC power supplies.
- A minimum of four separate targets shall be connected simultaneously, with automatic switching between processes.
- Automatic gas control, vacuum regulation, and recipe-based process control shall be provided.
- Installation, commissioning, and training shall be provided by the supplier.

2. TECHNICAL SPECIFICATIONS

2.1 Vacuum Chamber and System Frame

- Large front door and stainless-steel construction.
- Removable stainless-steel liner for internal surfaces.
- Equipped with observation window and shutter system.
- Rear wall heating capability up to at least 120°C inside the chamber.

2.2 Vacuum System

- Turbo pump capacity: minimum 700 l/s.
- Fore pump: dry type, minimum 30 m^3/h capacity.
- Ultimate vacuum: at least 5×10^{-7} mbar.

2.3 Plasma Pressure and Gas Control

- Motorized throttle valve and high-precision capacitive gauge (range: 0.1 Torr – 10^{-5} Torr) for pressure regulation.

- Gas delivery system shall have at least 3 MFCs (Ar, N_2, O_2), each with full scale and ±0.5% accuracy.
- Both automatic and manual gas inlet valves shall be available.

2.4 Sputter Cathodes and Power Supplies

- Magnetron sources compatible with targets of at least 2" diameter, total 4 magnetron sources.
- Each source shall have a gas ring, shutter, and independent water cooling line.
- RF Power Supply: minimum 300 W, 13.56 MHz, with automatic matching network.
- DC and Pulsed DC Power Supply: output power up to 1 kW.
- Pulse frequency range: 10–120 kHz.
- RF/DC selector switch (1 input / 2 outputs), PLC-controlled.
- Co-sputtering capability with 2 DC sources.
- Co-sputtering capability with 1 DC and 1 RF source.
- Reactive sputtering capability with O_2 gas.

2.5 Thickness Measurement System

- QCM-based dual crystal film thickness and deposition rate control system.
- 6 MHz gold-coated crystals with water-cooled sensor heads.
- Integrated thickness monitoring and shutter control via recipe.

2.6 Substrate Stage and Heating

- Rotating substrate holder for wafers up to 4", adjustable speed 0–30 rpm.
- Wafer/sample temperature controllable up to 800°C, PID-controlled with a maximum deviation of ±1°C.
- Motorized Z-axis movement with a minimum travel of 20 mm

2.7 Electrical Cabinet and Software

- Touchscreen interface, PLC-controlled.
- Automatic management of vacuum, gas, temperature, and film thickness.
- Capability to store 100 different recipes, each with at least 50 steps.

- User management functionality.
- Data logging and graphical analysis capability (CSV/log).
- Emergency stop button located in operator area.

3. PERFORMANCE CRITERIA

- Base vacuum: ≤ 5×10^{-7} mbar.
- Film thickness deviation: maximum ±1%.
- Heating temperature deviation: maximum ±1°C.

4. WARRANTY AND SERVICE

- The system shall have a minimum warranty of 24 months.
- Technical support shall be provided for a minimum of 10 years.
- In case of failure, service intervention shall be guaranteed within a maximum of 10 days.
- Training and installation shall be included in the offer.

5. DELIVERY AND TRAINING

- Installation, testing, and initial user training shall be provided by the supplier. On-site training shall last at least 2 days after installation.
- Delivery period shall not exceed 10 months.
- Training materials, user manuals, and maintenance documents shall be provided in Turkish and/or English.