R&D VACUUM DEPOSITION TOOL

SAF L-EM

1. APPLICATION AND MAIN FEATURES

1.1 Main application

R&D vacuum deposition tool SAF L-EM is a laboratory scale system designed for producing single-sided metal coatings on flat substrates.

The tool is aimed to produce coated material for Customer's investigated product concept/technology proof. The found solutions can be subsequently used for scaling up of the proven product technology.

The tool can be used to deposit several materials by evaporation and magnetron sputtering that provides possibility to have various combinations of coatings.

The design of the tool allows to add deposition capacity for other materials besides mentioned in this specification.

1.2 Design

R&D tool SAF L-EM is one of the Sidrabe's SAF cluster tool product line deposition systems.

Please refer to: https://www.sidrabe.com/products/special-equipment/cluster-tool.html

Some examples of SAF product line single- and multi-chamber coaters.

1.3 Main features of the tool

1.3.1 The tool is a batch-operating machine with substrate set loading before beginning of the cycle and product unloading after the cycle is finished.

1.3.2 The tool is intended for processing thin ceramic or glass substrates.

Fig. 1 Conceptual image of Pilot vacuum deposition tool SAF L-EM

1.3.3 The tool consists of 2 chambers: storage and loading/unloading chamber and a coating deposition or process chamber. A linear manipulator transfers the cassettes with substrates between the chambers.

1.3.4 Coating deposition is carried out either by means of thermal evaporation of lithium or by means of magnetron sputtering from metallic targets. During deposition, orientation of the substrate is horizontal. Debris-free and uniform coating is ensured due to upward deposition.

1.3.5 The pumping station consists of turbopumps and dry forevacuum pumps.

1.3.6 The control system of the tool is based on Simatic S7 - series PLC by Siemens.

The tool is designed and constructed for operation in a dry room provided by the Customer.

The design of the tool is ergonomically justified and provides easy access to all its components for operational and maintenance works. All components and materials of the vacuum internals are compatible with the process conditions (temperature, pressure, environment).

2. MAIN COMPONENTS OF THE TOOL

2.1 Process chamber

2.1.1 View port.

2.1.2 Heated/cooled walls.

2.1.3 Lid (to change deposition source, change magnetron target or load crucible).

2.1.4 Infrared thermometers.

2.1.5 Li evaporation set consisting of heated crucible with shutter, electrical heaters, water-free cooled enclosure for crucible.

2.1.6 Magnetron deposition set consisting of a planar magnetron and shields.

2.2 Storage loading/unloading chamber

2.2.1 View port.

2.2.2 Lid (to load and unload cassette holder with samples).

2.2.3 Heated/cooled walls.

2.2.4 Zone for sample cooling.

2.2.5 Zone for installation of the ion etch unit.

2.2.6 Linear magnetic manipulator for cassette transport.

2.2.7 Cassette holder.

2.2.8 Screw driven linear actuator for cassette holder positioning.

2.2.9 A set of cassettes for two substrate sizes.

2.3 Service systems

2.3.1 Dry forevacuum pump for each chamber.

2.3.2 Turbomolecular pump for each chamber.

2.3.3 Electric panel with control system.

2.3.4 HMI interface.

2.3.5 Evaporator power supply.

2.3.6 Magnetron power supply.

2.3.7 Thermostating system.

2.3.8 Pneumatic system.

2.3.9 Gas system.

2.4 Spare parts

2.5 Set of technical and user documentation

2.6 Software backup copy

3. OPTIONAL EQUIPMENT

- Ion etch unit in the storage chamber.

4. TECHNICAL PARAMETERS OF THE TOOL

4.1 Substrate

4.1.1	Material	ceramics, glass
4.1.2	Flat substrate shape	rectangular round
4.1.3	Maximum substrate thickness	200 μm

4.2 Coatings

4.2.1	Coating type	single-sided coating
4.2.2	Masking of the substrate outer edges	~ 1 mm
4.2.3	Li coating thickness	≤ 20 μm
4.2.4	Metal coating thickness	≤ 800 nm
4.2.5	Targeted coating uniformity	± 5%

4.3 Li evaporator

4.3.1	Type	heated, batch loaded crucible
4.3.2	Expected dynamic deposition rate	0.6 μm*m/min
5.3.3	Crucible loading	~ 50 g

4.4 Magnetron sputtering device

4.4.1	Type	planar rectangular magnetron with balanced magnetic system
4.4.2	Estimated target area	160 x 120 mm
4.4.3	Operating pressure	8×10^{-4} – 5×10^{-3} Torr

4.5 Pumping system

4.5.1	Base pressure in the storage chamber	1 x 10^{-6} Torr
4.5.2	Base pressure in the process chamber	< 5 x 10^{-7} Torr

4.6 Thermostating system

4.6.1	Supply line temperature	-10 – +80^{o} C
4.6.2	Type of cooling/heating aggregate	Air cooled recirculating chiller

4.7 Compressed air and Argon (supplied by the Customer)

4.7.1	Compressed air pressure	4.0 – 7.0 bar
4.7.2	Ar purity	6N
4.7.3	Ar Supply pressure	2.0 – 6.0 bar

4.9 Overall dimensions of the tool

4.9.1	Tool (excluding electrical cabinets) with service zone (minimum), L x W x H	3.8 x 3.0 x 2.0 m
4.9.2	Weight	~ 1 t.

4.10 Electrical system

4.10.1	Mains frequency	60 Hz
4.10.2	Mains voltage	208 VAC
4.10.3	Control voltage	24 VDC
4.10.4	Estimated installed power	≤ 10 kW

4.11 Operation conditions

4.11.1	Temperature	18 – 20 °C
4.11.2	Relative humidity	<2%

5. SAFETY STANDARDS

5.1 The tool is built in accordance with the safety regulations of European Commission and European Standards:

- 2006/42/EC (Machinery Directive);
- 2006/95/EC (Low Voltage Directive);
- EN60204-1:2006+A1:2009 (Safety of Machinery).

5.2 Safety standards and regulations of the Customer's country and as provided by the Customer are regarded as well.