beneq

Equipment

TFS 200

Thin Film System for Atomic Layer Deposition

Thin Film System TFS 200 for ALD Research

The TFS 200 is the most flexible ALD research platform ever designed for academic research and corporate R&D. Every detail of the system is realized with versatility, modularity and ease of use in mind. For us at Beneq, it is important to put the freedom of process and application development in the hands of the operator, and not limit it by system-related restrictions. The TFS 200 represents state-of-the-art design and technical solutions that enable deposition of superior quality coatings on a broad array of substrate materials and sizes.

The TFS 200 can coat wafers, planar objects and porous bulk materials, as well as particles and complex 3D objects with high aspect ratio features. Depending on the substrate, a selection of three standard reaction chamber designs are available, as well as any customized designs our customers' cases might require. Direct and remote plasma-enhanced deposition (PEALD) are available as standard options. Beneq also offers, for the first time in commercial ALD research equipment, Particle ALD™ for the coating of particles. Particle ALD is offered in collaboration with ALD NanoSolutions, Inc.

The precursor capabilities of the TFS 200 are impressive. A total maximum of 8 gas lines, 4 liquid sources and 4 hot sources fulfill the most demanding of requirements. Hot source options include temperature readiness up to 500 °C.

Technical specifications

Substrate temperature range	25 - 500 °C	
Reaction chamber types and dimensions	single wafer	⌀200 × 3 (mm)
	single wafer plasma	⌀200 × 3 (mm)
	3D/batch of wafers	⌀200 × 95 (mm)
	customized	by request
Gas lines	up to 8	
Liquid sources (+5 °C to ambient)	up to 4	
Hot source HS 300 (ambient to 300 °C)	up to 4	
Hot source HS 500 (ambient to 500 °C)	up to 2	
Plasma specifications (PEALD)	power	300 W
	type	capacitive coupled plasma (CCP)
Fluidized bed particle coating option (Particle ALD)	- particle size (min.)[1] : 100 nm - 1 µm - sample volume (max.) : 50 - 75 cm^3 - temperature (max.) : 450 °C	
Control system	PLC control with PC user interface	
Main dimensions, ALD system (L × W × H)	1325 × 600 × 1298 (mm)	
Main dimensions, electric cabinet (L × W × H)	1000 × 300 × 1600 (mm)	

[1] particle property dependent

Features

Performance

- Process cycle time customarily less than 2 seconds. In specific cases even less than 1 second (thickness uniformity variation < ±1% for, *e.g.*, Al_2O_3. on ⌀200 mm wafer).
- High Aspect Ratio (HAR) option available for structures with deep trenches and porous substrates.
- Hot source versatility, up to 500 °C setups as standard options.
- Direct and remote capacitive coupled plasma (CCP) available as standard options.
- High speed and capacity data logging and trend tools for human machine interface (HMI).
- Particle ALD option available for particle coating.

The TFS 200 is ideal for depositing, *e.g.,* oxides, nitrides, carbides, metals, sulfides, fluorides, biomaterials, polymers, doping, nanolaminates and mixed structures.

Versatile and modular

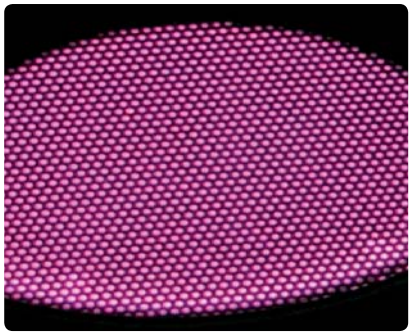
In research, technical reliability and repeatability is of an essence. Also, flexibility in terms of trial setups and process variations is of great importance. Hence, we designed the TFS 200 to be a modular research tool, easily and quickly modified to address different substrate and process requirements.

- Cold-wall vacuum chamber for rapid heating and cooling.
- Auxiliary entry ports in vacuum chamber enable plasma, *in situ* diagnostics etc.
- Hot-wall reaction chamber for uniform substrate temperature and to prevent precursor condensation and secondary reactions.
- Three different reaction chamber designs, as well as any customized design a customer might require.
- Substrate rotation option.
- Load lock for rapid substrate change and integration with other equipment.
- Clean-room compatible.

Safety

Beneq takes pride in manufacturing equipment that encompasses ease of use and safety for its users, be that scientist, operator or maintenance personnel. All functions of the TFS 200 are controlled by programmable logic control (PLC) and additional EN safety relays. HMI user interface and data logging are provided for by a PC. The TFS 200 complies with the requirements of the CE, UL and CSA.

TFS 200 load lock with turbo pump option.



TFS 200 plasma in operation.

TFS 200 load lock with substrate inside.

TFS 200, 9./2011

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