



Neutron Optical Components
& Instruments 

Coatings, Substrate Refinement, Characterisation

THIN FILM DEPOSITION

COMPETENCES AND SERVICES

Special skills for special needs

Thin film coatings from the nano- to micrometre scale

SwissNeutronics prepares coatings for science and industry. The deposition process is highly developed to obtain layers with extremely smooth surfaces and homogeneous thickness on large areas. The thin films are coated on substrates with special refined surfaces. Dedicated metrology is applied for the characterisation of coatings and substrates in R&D and production.

Particular highlights are:

Thin film coatings

- Thin film coatings, in particular multilayer coatings in the range of nano- to micrometre
- Metallic coatings: **Al, Cr, Fe, FeCoV, Ni, NiCr, NiV, Ta, Ti, TiB2, TiGd, V, Zr**; other metals are available on demand
- Metal oxides and nitrides with a defined stoichiometry by employing reactive sputtering
- Non-metallic coatings: **C, Si**
- Small (few mm²) to large (1100 × 600 × mm²) areas
- Precise and homogeneous layer thickness
- On various substrate materials like glass, ceramics, metals, silicon, etc.

Substrate refinement

- Super-polishing of substrate surface with a roughness <0.2 nm (RMS)
- Formatting of substrates using 5-axis CNC grinding/milling
- Various substrate materials:

	thickness	typical size
standard float glass	0.5–10 mm	320 × 500 mm ²
Borofloat®33	0.7–15 mm	320 × 500 mm ²
DESAG 263T	0.2–0.5 mm	300 × 420 mm ²
N-BK7	2.5–30 mm	320 × 500 mm ²
silicon wafer	0.1–1 mm	Ø 300 mm (dependent on thickness)
aluminium	6–30 mm	200 × 500 mm ²

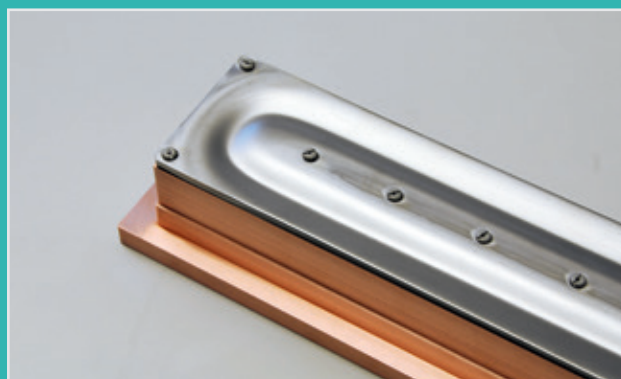
Other materials, thicknesses or formats may be available on demand.

Surface and interface characterisation

- Neutron reflectometry
 - Layer thickness
 - Interface roughness
 - Layer-resolved magnetisation
 - Access to buried layers
- X-ray reflectometry and diffraction
 - Layer thickness
 - Interface roughness
 - Texture
 - Access to buried layers
- Atomic force microscopy
 - Surface roughness
 - Topography
- White light interferometry
 - Surface roughness
 - Planarity (figure error)
- Long-range profilometry
 - Planarity (figure error)
- Stylus profilometry
 - Internal stress of coatings
 - Layer thickness
- DC Magnetometry
 - Bulk magnetisation



Inspection ports of the sputtering plant Z900



Magnetron sputter cathode

EQUIPMENT

Preparation and characterisation up to your needs

Coating facilities

- 2 inline DC magnetron sputter facilities (types Z900, Z600)

	Z900	Z600
Coating area	1100 mm × 600 mm	540 mm × 420 mm
Number of magnetrons	4	3
Homogeneity of layer thickness	±1%	
Typical layer thickness	1 nm to 10 µm	
Reactive sputtering	N ₂ and O ₂ ; H ₂ on demand	

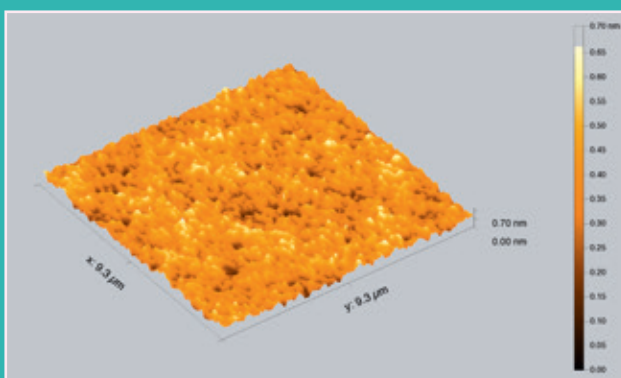


Equipment for substrate refinement

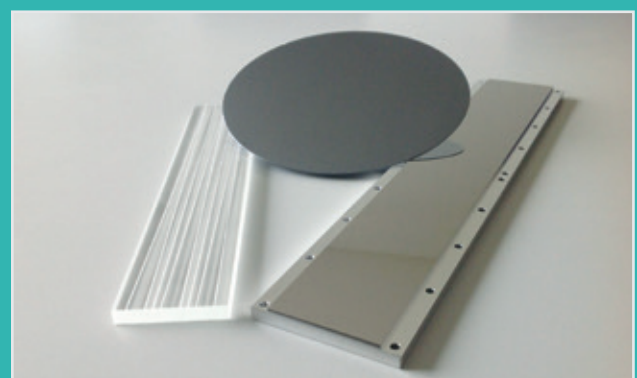
- 1 polishing machine for surface finish (super-polishing)
 - typical format: 320 × 500 mm²
- 2 CNC 5-axis milling/grinding machines
 - maximum length: 600 mm
 - typical format: 320 × 500 mm²
 - accuracy: 0.005 mm

Instrumentation for characterisation of substrates and coatings

- Neutron reflectometer (NARZISS @ SINQ)
- X-ray powder diffractometer (Siemens D500)
- Atomic force microscope (Nanosurf Easyscan)
- White light interferometer (Zygo)
- Long-range profilometer
- Stylus profilometer (Dektak Surface Profiler)
- Magnetometer (Quantum Design PPMS)



Atomic force microscopy of a super-polished substrate surface with roughness <0.1 nm (RMS)



Refined substrates: super-polished glass, silicon wafer and aluminium

PORTRAIT

SwissNeutronics and the department Thin Film Deposition



First class performance for excellence in science

SwissNeutronics was founded in 1999 as a spin-off company of the Paul Scherrer Institute in Villigen (Switzerland). We are the world-leading supplier of neutron optics. Our products cover a wide range of neutron optics as well as the planning, design, construction, and installation of complete instruments.

Thin Film Deposition

The majority of modern neutron optics use sophisticated multilayer coatings for the reflection of neutrons. The coatings require a profound knowledge for the preparation of the substrates and the multilayers (typically a few thousand layers) with atomically smooth surfaces and interfaces respectively. In addition to this we produce functional coatings for industrial applications, for example for heat transport or protection. We are open to provide our profound expertise for a variety of other applications of thin film coatings.

Team

Our team comprises scientists and technicians with more than 20 years experience in the field of thin film coatings. Further capabilities (draftsmen, mechanists) are available for support from other divisions of SwissNeutronics. The team produced several outstanding achievements in the field of neutron optics and functional coatings, and is ready to tackle your challenges.

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