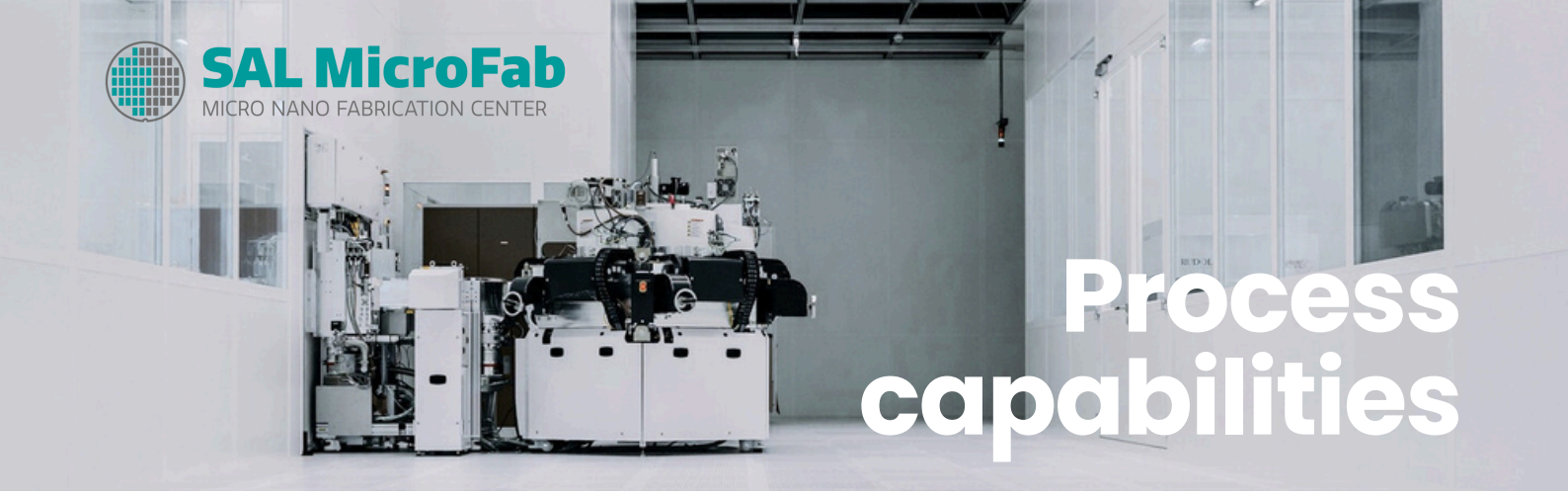
SAL MicroFab
MICRO NANO FABRICATION CENTER



Process capabilities

1400 m² state-of-the-art cleanroom in ISO classes 4-6

Micro & nano fabrication: M(O)EMS, RF filters, integrated photonics

State-of-the-art tools & characterization equipment

Material flexibility from semiconductors, photonics, piezo-electrics to metals and dielectrics.

Abbrev.:
*BPT = batch processing tool
**BB = broadband

Deposition & Thermal processing

Equipment	Further Info
Sputters	BPT: DC and DC+RF sputter sources Sputtering of dielectrics, metals, III-V materials and ALD Etching and film treatment chamber In-situ process control: optical and plasma emission monitoring, Flipper module for backside coating
Evaporators	Single wafer tool + BPT: Metal thin films from 50nm up to 500nm BPT: Planetary rotating loading platform MKS E-vision for rest gas analyzing 2x cryo pumps with compressor – pumping to 2*10^-6 for 20 min
PECVD	Single wafer tool: Mixed frequency Silane-based PECVD Dielectric materials like SiO_2, SiN, SiON, SiCN, SiOC, a-Si
RTP	Single wafer tool: RTP up to 1200°C Bench-top furnace
Parylene coater	Single wafer tool (with holder up to 7 wafers): Room temperature depositions of C-based and F-based parylene types Thicknesses from 200nm up to 50µm

Lithography

Equipment	Further Info
E-beam exposure	Single wafer tool: Overlay Accuracy below 5nm and 8nm min linewidth Minimum CD 20nm
Optical Maskless Exposure	Single wafer tool: 375nm wavelength Front and backside alignment Standard greyscale mode (128 levels) CD ≥ 0.7µm *BPT: 375-nm and/or 405-nm Infrared alignment, top and backside alignment CD ≥ 2µm
Optical Mask Aligners	Single wafer tool: Mask exposure tool (365, 405, 436nm, **BB) Front and backside alignment CD ≥ 1µm BPT: 365nm, **BB Front and backside alignment CD ≥ 1µm
Nano-Imprint Lithography and wafer Level Optics	Single wafer tool: Resolution <40nm Dedicated spin coater and hot plate for resist processing Soft and hard master capabilities
Resist Track System	Single-wafer tool: Spin coater and developer stages Hot plates HMDS BPT: 2 spin coaters Spray coater (high topography and heating plate) Developer (puddle and spray) Set of hot and chill plates HMDS

Dry Etch

Equipment	Further Info
ICP-DRIE etch	Single wafer tool: Etching capability: Si, SiOx, SixNy, in-situ resist strip Process gas lines: Ar, O_2, SF_6, C_4F_8, CHF_3 OES and Interferometric end point detection
ICP-RIE etch	Single wafer tool: Etching capability: • WBG materials (e.g. SiC, AlN, AlScN, GaN) • dielectrics, metals (Mo, Cr, Ti) • polymers (parylene, teflon) Process gas lines: Cl_2, BCl_3, Ar, O_2, CF_4, SF_6, H2, HBr, CH_4, C_4F_8, CHF_3 OES and Interferometric end point detection
Ion Beam Etch	Single wafer tool: Ar-based ion beam etching with tunable ion source Etching capabilities: Cu, Au, Ag, Mo, Pt, Ti, Cr, PZT, AlScN, $LiNbO_3$ SIMS
HF-vapor Etch	Single wafer tool: SiO2 etch + release
Plasma Ashers	RF and Microwave Ashers for surface treatment and resist strip Precursors: O_2, Ar, CF_4
RIE etch	BPT: 4 ICP chambers: ALE and III-V materials; dielectrics; DRIE, metals OES endpoint detection 200-800nm FAST GAS-Exchange enabling ALE

Wet Processing

Equipment	Further Info
CMP	BPT: Dry-in / dry-out 4 loadports Dielectric films (with optical and TCM EPD) Metal films (with Eddy-current and TCM EPD)
Acid Wetbench	Single wafer tool (with tank processing up to 5 wafers) Wet etch and clean Tanks: BOE, HF 1% Beaker: SC2, Piranha, Al-, Cr-, Cu- Au-, Ti- etchants, Aqua regia, H_3PO_4, Glass etch QDR tank
Base Wetbench	Single wafer tool (with tank processing up to 5 wafers) Wet etch and clean Tanks: SC1, KOH QDR tank
Solvent Wetbenches	Single wafer tool (with tank processing up to 5 wafers) Clean and resist processing (development, strip and lift-off) PR strip: DMSO, NI555, AZ100, NMP, IPA, acetone Lift-off: DMSO, NI555 Developers: AZ726MIF, AZ400K Tank: DMSO Ultrasonic bath with heating option QDR tank
Semi-automatic Solvent Wetbench	BPT: Dry-in / dry-out PR strip and Lift-Off separated tanks: DMSO Cleaning: IPA
Spin-rinse-dryer	BPT: Automatic tool with 2 chambers DI water cleaning, N_2 drying
Mask Cleaner	Photomask cleaning with H_2O_2+H_2SO_4+NH_4OH

Characterization

Equipment	Further Info
SEM	Single wafer tool: SEM resolution < 1nm, Ga FIB resolution ~ 10nm Equipped with Brucker EDS, resolution < 30nm
Particle Measurement	BPT: Advanced all-surface macro inspection and inline metrology for both bare and patterned wafers Bright field / Dark field / HARL 2µm / 0.5µm maximum sensitivity (BF / DF)
XRD	Single wafer tool: Determination of lattice constants Stress and texture measurements XRR and HR measurements Crystal orientation and grain size, phase analysis (also for GIXRD) Rocking curves and reciprocal space maps In-plane measurements
Resistivity mapping 4PP and EC	Single wafer tool 4PP Simple and direct measurement of resistance Measurement range (Rs): 1 mΩ/sq - 200MΩ/sq Temperation correction EC: Non-contact measurement of resistance Measurement range (Rs): 5 mΩ/sq - 10 Ω/sq Dynamically adjusts for the probe sample height
Ellipsometer	Single wafer tool: Wavelength range from deep UV (190 nm) up to mid-IR (25 mm) Automatic incidence angle range control from 35°C to 90°C Full Mueller-matrix determination from 245 nm to 800 nm Linkam high temperature cell from RT up to 1000°C
Reflectometer	Single wafer tool+BPT: Automated thin-film thickness mapping system Wavelength range from 190nm to 1100nm Thickness range from 4nm to 30µm For BPT: Pattern recognition option
AFM	Single wafer tool: Surface morphology & roughness, defects and failure analysis In-situ heating stage
Profilometer	Single wafer tool+BPT: Two-dimensional surface profile measurements Stylus Force 1 to 15mg with Low Force Option Scan Length Range 55mm (200mm with scan stitching capability) For BPT: Pattern recognition option

Stress Measurement	Single wafer tool: Stress (bow) on full wafer
Optical Microscopes	Single wafer tools: Set of optical and stereo microscopes Zoom up to 100x
Wafer Prober	BPT: Automated wafer prober based on MPI TS3500-SE platform Chuck temperature regulation from -40°C to 200°C Probing system: • 4 Micropositioners • 2 RF probes • 4 Kelvin DC probes DC characterizations + RF (VNA, Impedance analyzer)

Contact

If you have any questions, feel free to contact us.

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