

Lab : LMIS1
Operator Name :
Supervisor Name : J. Brügger
Process Flow Date : 23.11.2023

Phone :
Office :
E-mail :

☐ Semestral Project ☐ Master Project ☐ Thesis ☒ Other

MICRO-373 Bimorph Cantilever

Description of the fabrication project

Fabrication of SiO₂ cantilevers with Cr tracks for electrothermal actuation for the class MICRO-373 Advanced Microfabrication (J. Brugger, I.-C. Benea-Chelmus, A. Bertsch). The teaching assistants are CMi users and will take groups of 3 Bachelor students to CMi for the fabrication sessions.

Technologies used			
Mask fabrication, evaporation, positive resist, Wet etching, SEM			
Photolitho masks - Laser direct write data			
Mask #	Critical Dimension	Critical Alignment	Remarks
1	3um	First Mask	Cr structuration - MASK LAYER 1 METAL
2	20 um	2um	SiO ₂ structuration - MASK LAYER 2 OXIDE
Substrate Type and size			
Silicon <100>, Ø100mm, 525um thick, Single Side polished, test wafers			

Interconnections and packaging of final device

Thinning/grinding/polishing of the samples is required at some stage of the process.

☒ No ☐ Yes => confirm involved materials with CMi staff

Dicing of the samples is required at some stage of the process.

☒ No ☐ Yes => confirm dicing layout with CMi staff

Wire-bonding of dies, with glob-top protection, is required at the end of the process.

☒ No ☐ Yes => confirm pads design (size, pitch) and involved materials with CMi staff

Step-by-step process outline

Step	Process description	Cross-section after process
01	Substrate: Si test Wafer preparation & wet oxidation (by CMi) * RCA cleaning * Wet Oxidation SiO ₂ 1.5µm Machines: Plade RCA, Centrotherm furnace	
02	Metal deposition by PVD (by CMi) * Cr evaporation (500nm) * e-beam source Machine : EVA760 Z11	
03	Cr Mask fabrication/exposure Machine: Heidelberg Instruments VPG200, i-line photoresist laser writer Z05	
04	Cr Mask development Machine: Hamatech HMR900, mask (Cr-blanks) processing equipment Z06	
05	Photolithography to pattern heaters (with students, CMi session 1) * Spin coating AZ1512 HS * UV exposure * Development Machines: SSE VB20 HMDS vapor prime module, Machines: Sawatec SB20 coater line Z13, MJB4 Z13, Base wet bench Z13, Microscopes Z11/Z15	
06	Cr etch (with students, CMi session 2) * Cr wet etching * Resist stripping * Resistance measurement Machines : Acid bench Z14 (Cr etch), PR stripping Z12, MPI TS150 Prober station Z11	
07	Photolithography to pattern beams (with students, CMi session 3) * Spin coating AZ1512 HS * UV exposure with alignment * Development Machines: SSE VB20 HMDS vapor prime module, Sawatec SB20 coater line Z13, MJB4	

	Z13, Base wet bench Z13, Microscopes Z11/Z15	
08	<i>SiO₂ etch (with students, CMi session 4)</i> *Oxide wet etching by HF (BOE) *Alternative process: Oxide dry etching *Resist tripping *Cr and SiO ₂ thickness measurement Machines: Acid bench Z14 (BOE), PR stripping Z12, Bruker Dektak XT surface profiler Z15 Alternative machine: SPTS APS Dielectric Etcher Z02	
09	<i>Si etch and cantilever release (with students, CMi session 5)</i> *Anisotropic wet Si etching in KOH *Alternative process: isotropic dry Si etching Machine : Base wet bench Z14 (KOH 23% at 80°C for 50 min), Solvent wet bench Z14 (for drying with IPA to avoid cantilevers pinning down) Alternative machine: Alcatel AMS 200 SE Z2	
10	<i>SEM imaging (with students, Cmi session 5)</i> Machine: SEM Merlin Z15 / SEM Crossbeam Z15	