

☐ Semestral Project ☐ Master Project ☐ Thesis ☒ Other

Fabrication of High Aspect Ratio Silicon Mold

Description of the fabrication project

The goal is to fabricate cavities (trenches and holes) in silicon that could later serve to create metallic pieces at the small scale. We will use deep reactive ion etching to create 2.5D shaped components in silicon, and different coating processes to deposit a protection layer on top.

Technologies used			
Mask fabrication, sputtering, evaporation, positive resist, Dry etching, Wet etching, Electro-Plating, Dicing, SEM			
Ebeam litho data - Photolitho masks - Laser direct write data			
Mask #	Critical Dimension	Critical Alignment	Remarks
1	10 μm	First Mask	Mold shape
Substrate Type			
4 inch Si{100} wafer with 2um SiO2			

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.

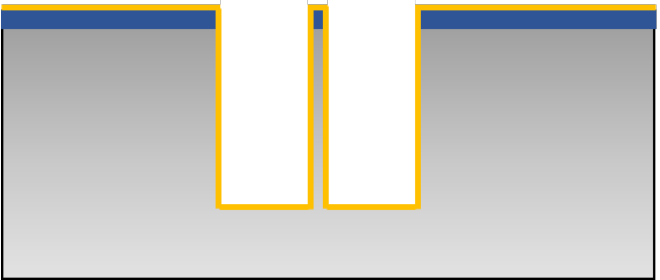
☐ No ☒ Yes => confirm dicing layout with CMi staff

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	<i>Photolith PR Coat</i> Machine: <i>Süss ACS200</i> PR: <i>AZ10XT-20 (HDMS)</i> Thickness: $4\ \mu\text{m}$	
02	<i>Photolith expo + develop</i> Machine: <i>MLA150</i>	
03	<i>Hard Mask Etching</i> Machine: <i>SPTS APS Diele etcher</i> Material: SiO_2 Depth: $2\ \mu\text{m}$	
04	<i>DRIE Bosch Process</i> Machine: <i>Rapier etcher</i> Material: Si Depth: $250\text{-}500\ \mu\text{m}$ Inner width: $25\text{-}50\ \mu\text{m}$ Outer width: $75\text{-}175\ \mu\text{m}$	
05	<i>O2 plasma treatment</i> Machine: <i>Tepla 300</i> Time: <i>10 min (high power)</i>	

06	<i>Oxide layer deposition</i> Machine: <i>Thermal Process, CMi</i> Material: <i>SiO₂</i> Thickness: <i>2 μm</i> Preprocessing: <i>RCA cleaning</i>	
07	<i>Dicing (with UV-tape top protection)</i> Dimensions: <i>9x9 mm²</i>	