REPORT: Wafer dicing by Laser-MicroJet®

For Anonymous

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TASK

The Laser-MicroJet® technology has been tested for dicing a silicon wafer with a “CMOS stack” on the top. The main goal was to determine the feasibility of the process in order to give an overview of the technology.

SAMPLE DESCRIPTION AND PREPARATION

One wafer was available for the tests and a vacuum chuck was used as support.

SAMPLE 1	Material	Si and CMOS stack (SiO_2, metal, and SiN)	
	Thickness	50 + 8	*µm*
	Quantity	1	*pcs*

Release of application report			
Project Leader		Responsible Application Group	
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PROCESS: INSTRUMENT & TEST PARAMETERS

For these experiments, the LCS300 equipped with a frequency-doubled Q-switched Nd-YAG laser has been used as the machine configuration in our lab.

It is a manually clean-room compatible machine, allowing to cut, drill, groove, scribe, trench, mark, or grind wafers of any kind of semiconductor material.

In the table below, the machine configuration is summarized:

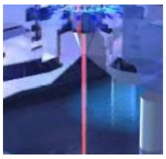
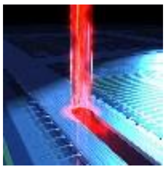
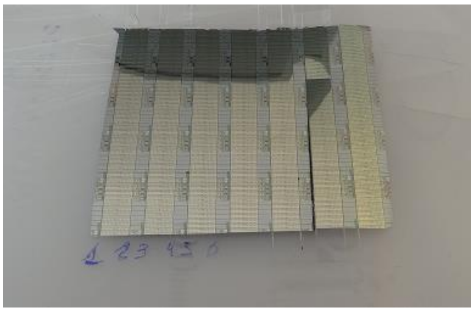
	**SYSTEM**	Machine type	LCS300
		Helium flow (MFC)	*0.7 L/min*
		Working distance	*10 mm*
		Laser fiber	150 *µm*
		Collimator	250 *mm*
		Transmission	*~60 %*
	**MICROJET® PARAMETER**	Nozzle diameter	30 *µm*
		MicroJet® diameter	~26 *µm*
		Water pressure	350 *bar*
		Assist gas	He
	**LASER PARAMETER**	Laser type	L101G
		Wavelength	532 *nm*
		Pulse frequency	30 *kHz*
		Power (in jet)	9 (~6) *W*
		Pulse width	<200 *ns*
	**CUTTING PARAMETER**	Cutting speed	120 *mm/s*
		Number of passes	2
		Process time	~2 s/line
		Fixation	Vacuum chuck

Table1: Machine configuration summary

RESULTS

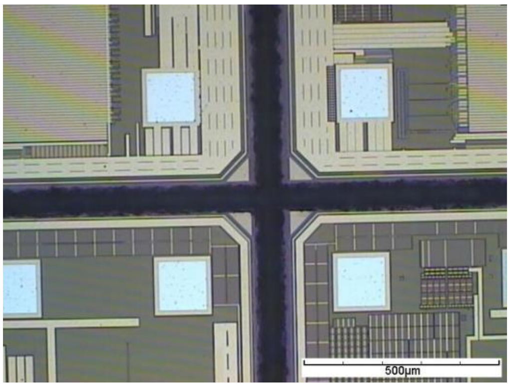
The following microscope pictures give an overview on the quality obtained with the Laser-Microjet® technology.



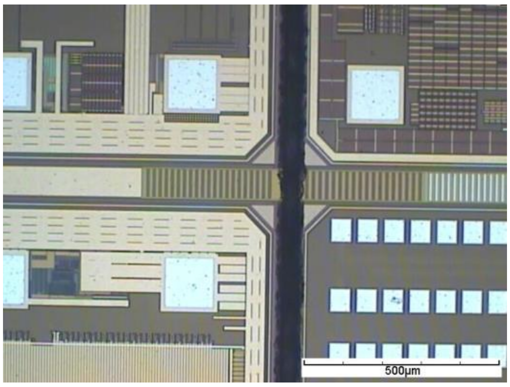
Picture 1: digital camera image of the sample

Two different laser sources were tested:

1. Long pulse green (<200ns) laser

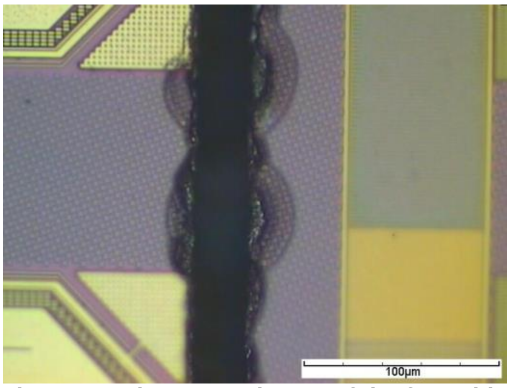


Picture 2: Microscope image of the frontside



Picture 3: Microscope image of the frontside

2. Short pulse (<30ns) green laser



Picture 4: Microscope image of the frontside

CONCLUSION

The cutting of wafers was investigated on SYNOVA LCS300. This machine is based on the MicroJet® technology and combines the advantages of the high energy pulsed laser with a hair-thin water jet. While the laser is used for material ablation, the water jet is used for guiding the laser light, cooling the edges and allowing an excellent accuracy, advantages that are essential for cutting wafers with high quality.

These tests show that:

- Silicon oxide layer in the streets is transparent to the laser and chips away. Nevertheless it stops at the 'crack' stop ring in the street
- No major impact on the cutting quality is visible with the short pulse laser source
- An overall cutting speed of 60 mm/s is achievable

We thank you for your interest in our technology and we hope our results meet your requirements. We will contact you soon to obtain a feedback about the analysis of these results and to discuss with you the further steps.