

REPORT: Ceramic cutting by Laser-MicroJet®

for

Anonymous

by

Dr. Fabien Coursimault; Synova SA

TASK

The Laser-MicroJet® technology has been tested for cutting alumina substrates. Synova received 20 pieces to process.

The aim is to cut the bottom of the piece (see following drawing) and the final piece is the frame.

SAMPLE DESCRIPTION AND PREPARATION

SAMPLE	Material	Al ₂ O ₃ (96 %)
	Dimension	26.424 x 22.225 mm
	Thickness	1180 µm
	Quantity sent back	2 pcs



Fig1. View of the piece before and after cutting.

Release of application report			
Project Leader		Responsible Application Group	
Name:	Dr. Fabien Coursimault	Name:	D ^r Benjamin Carron
Date:	16.02.2012	Date:	17.02.2012
Visum:		Visum:	

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PROCESS: INSTRUMENT & TEST PARAMETERS




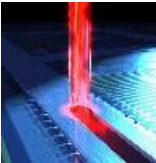
For these experiments, the LCS 300 equipped with a frequency-double Q-switched Nd:YAG laser has been used as the machine configuration in our lab.

It is a fully automatic machine, allowing to cut, drill, groove, trench, or mark any kind of material specially ceramic.

Major advantages of Laser-MicroJet[®] technology with regards to your application are:

- Cutting of arbitrary shapes
- Negligible contamination / re-deposition
- Minimal chipping on front side and on backside
- Parallel and smooth cut walls
- Good fracture strength (stress generated in dry laser slotting weakens the chips considerably)

In the table below, the optimized processing parameters used in the experiments are summarized:

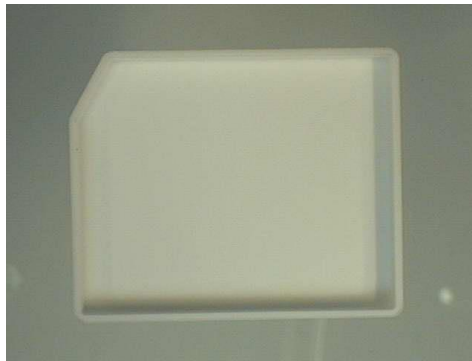
	SYSTEM	Machine type	LCS
	MICROJET[®] PARAMETER	Nozzle diameter	80 μm
		MicroJet [®] diameter	67 μm
		Water pressure	300 <i>bar</i>
		Assist gas	He
	LASER PARAMETER	Laser type	L101G
		Wavelength	532 <i>nm</i>
		Pulse frequency	8 <i>kHz</i>
		Average power	80 <i>W</i>
	CUTTING PARAMETER	Cutting speed	40 <i>mm/s</i>
		Number of passes	315
		Process time	13.1 <i>min</i>
		Fixture	clamps

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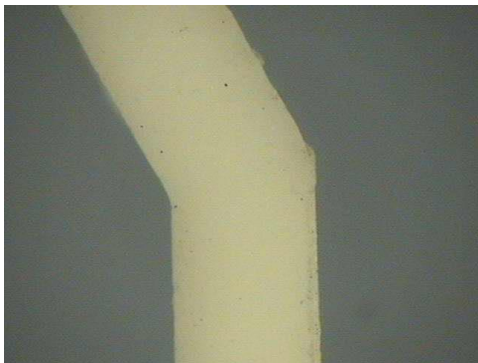
RESULTS

Some pieces have been processed with different cutting parameters, which enable to check for the quality and select the parameters that are best suited for your application. To avoid the stagnation of water, which can disturb the water jet, we recommend to cut from the bottom of the piece. In the following report, we call top the bottom of the piece (it is the top side from the cutting point of view).

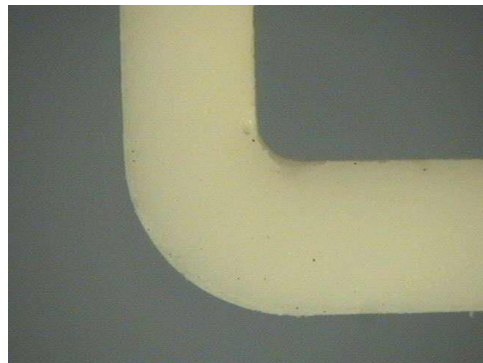
The following microscope picture give an overview on the quality obtained with the Laser-Microjet® technology.



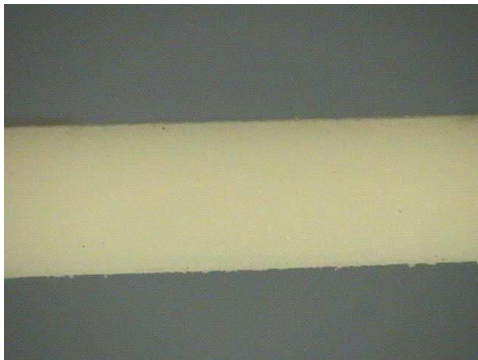
PICTURE1: General view of the piece before cutting.



PICTURE 2: Image of the frame (Top view). 40x



PICTURE 3: Image of the frame (Top view). 40x



PICTURE 4: Image of the frame (Top view). 40x



PICTURE 5: Image of the frame (Top view). 40x

The alumina pieces can be cut by Laser-Microjet. But from time to time, a shipping can be observed on the top side.

	Customer's priorities	Quantified expectations or improvements
• Speed / throughput:	X	Not specify
• Kerf-width:		
• Burr-free:		
• Depth control:		
• Contamination/Particles:	X	No contamination
• Heat-damage free:		
• Chipping/Cracks:	X	Some crack have been observed
• Edge Roughness:		
• Tolerances:		
• Fracture strength:	X	Not possible to verify at Synova
• Other:		

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CONCLUSION

The cutting of the bottom of Al_2O_3 pieces was investigated on SYNOVA LCS 300. 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 preventing the sample from particle contamination, advantages that are essential for cutting of ceramic with high quality.

These tests show that:

- It is possible to remove the bottom of the alumina piece.
- No contamination have been observed.

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