REPORT: Dicing Aluminium Ceramic from a sintered matrix using Laser-MicroJet®

for Anonymous
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TASK/OBJECTIVES

The Laser-MicroJet® technology has been tested for dicing aluminium ceramic from a sintered matrix. The aim of this iteration was to improve the cutting speed with a dual cavity green laser.

SAMPLE DESCRIPTION AND PREPARATION

Material	Al sheet sandwiched between two sintered Al plates
Dimensions	Approx. 2.1340 inch x 1.1058 Inch
Thickness	430 microns
Quantity	> 10 pieces

PICTURE 1: Sample as received.

Release of application report			
Project Leader		Responsible Application Group	
Name:	Stephane Delahaye	Name:	Dr Benjamin Carron
Date:	11.05.2015	Date:	11.05.2015
Visum:	SDE	Visum:	BC

1st layer:	Oxidized Sintered Aluminium	thickness:	200 µm
2end layer:	Solid Aluminium Substrate (1000 Series)	thickness:	30 µm
3rd layer:	Oxidized Sintered Aluminium	thickness:	200 µm

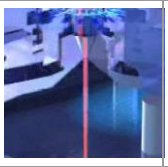
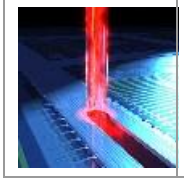
PROCESS: INSTRUMENT & TESTS PARAMETERS

For these experiments, a Synova LDS200 laser cutting system, equipped with a dual cavity green laser was used. The LDS200 is a manually loaded machine that allows cutting and drilling of any kind of metal piece.

Major advantages of the Laser MicroJet technology with regards to your application are:

- High quality cutting
- Low heat damage to the material

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

	**SYSTEM**	Machine type	LDS200
	**MICROJET® PARAMETER**	Nozzle diameter	50 µm
		Water pressure	300 bar
		Assist gas	He (1.00 L/min)
		Working distance	15 mm
	**LASER PARAMETERS**	Laser type	LDP-200MQG
		Wavelength	532 nm
		Pulse frequency	2*20 kHz
		Internal power	85 W
		Pulse width	~220ns
	**CUTTING PARAMETERS**	Speed	40/50/60/70 mm/sec
		No. of passes	1 for Al, 4/5/6/7 for sintered Al
		Cutting time	~18s (without loading unloading)

STRATEGY

The pieces were held by a new fixture specially developed for this application by the customer as shown in the picture below:

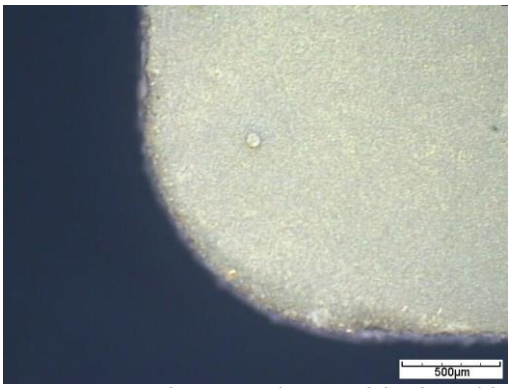
PICTURE 2: Fixture provided by the client

PICTURE 3: general picture of the sample

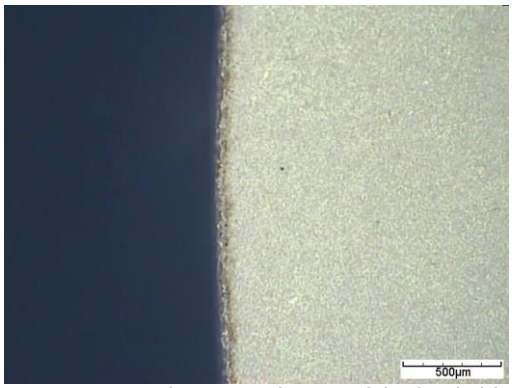
RESULTS

The following pictures highlight the quality obtained with the Laser-Microjet® technology:

- Samples processed at 70 mm/s



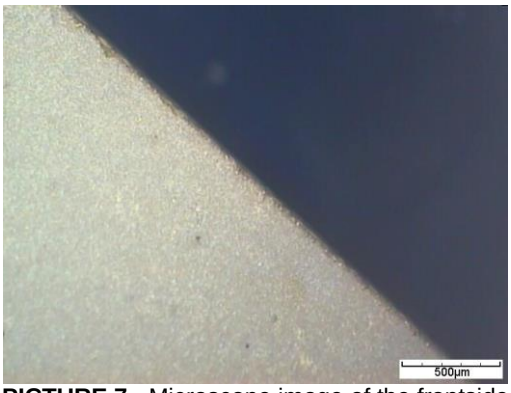
PICTURE 4: Microscope image of the frontside (dark field illumination)



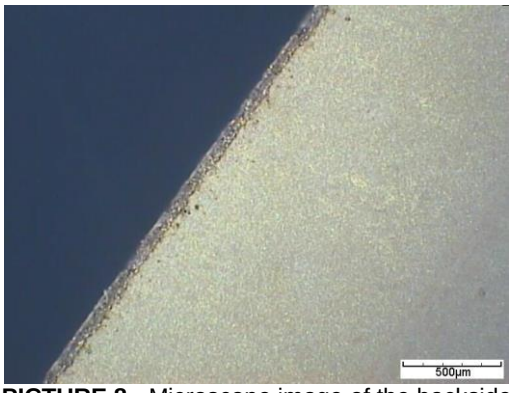
PICTURE 5: Microscope image of the backside (dark field illumination)

PICTURE 6: Microscope image of the sidewall (dark field illumination)

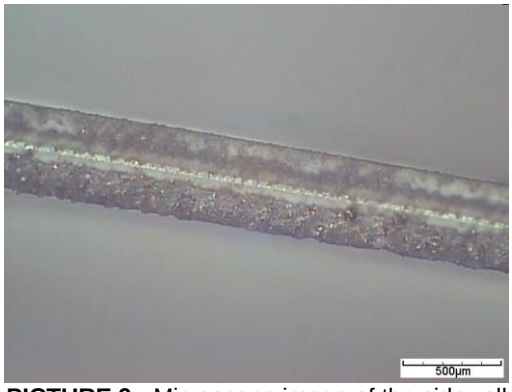
- Samples processed at 40 mm/s



PICTURE 7: Microscope image of the frontside (dark field illumination)



PICTURE 8: Microscope image of the backside (dark field illumination)



PICTURE 9: Microscope image of the sidewall (dark field illumination)

Note:
Ideally, two fiducial reference features should be provided for alignment in order to avoid any risk of dimensional inaccuracy.

CONCLUSION

Cutting of sintered Al was investigated on a SYNOVA LDS200 system. At its core, the machine incorporated Synova's Laser MicroJet® technology, which combines the advantages of a 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 cleaning the surface.

The quality is very good with limited heat affected zones. The edge roughness still seems to be in good conditon. The only issue may be dimensional accuracy due to issues encountered during alignment.

The cutting time per piece is about **18 seconds**. This time does not include the loading / unloading of the parts.

We thank you for your interest in our technology. We do believe that the Laser Microjet technology offers the capability, quality and a path to higher throughputs for this application.