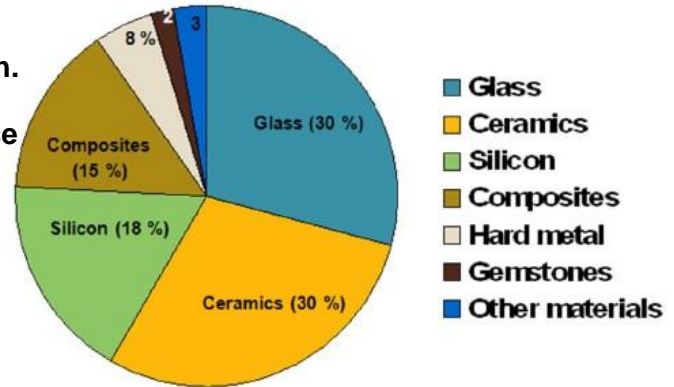


ULTRASONIC MACHINE TOOLS MODULE



MARKET AND TECHNOLOGY

- (1) Low vibration cutting power consumption.
- (2) Small amount of deformation.
- (3) The processed high accuracy, low surface roughness.
- (4) To processing tool lift span.
- (5) Processing a wide range of material.

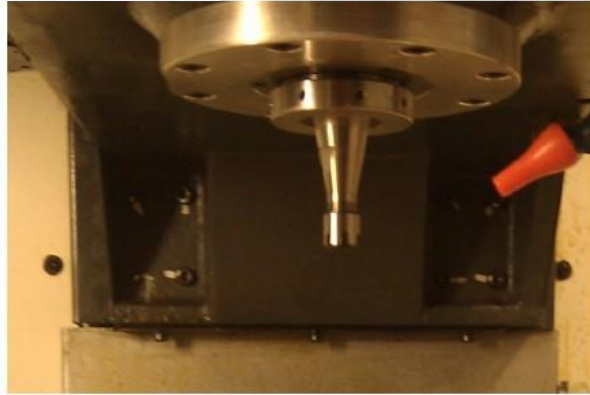


Ultrasonic vibration cutting after years of development, the processing technology is mature, and is now widely used in a variety of composite machining, such as ultrasonic vibration turning, ultrasonic vibration grinding, ultrasonic vibration machining deep hole, etc..



PRO Ultrasonic high-speed engraving spindle module

Applied to materials and products which it?



- ★ Driven by a high-speed high-precision rotary machining spindle with ultrasonic vibration tool to do the processing of application.
- ★ Design generic collet structure, to all kinds of tools used in conjunction.

ULTRASONICS TOOL HOLDER MODULE



- ▲ simple structure
- ▲ easy to install
- ▲ Automatic Tool Changer

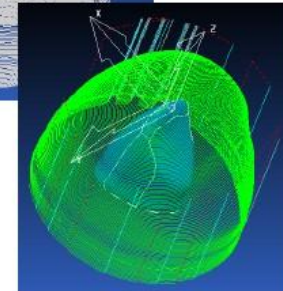
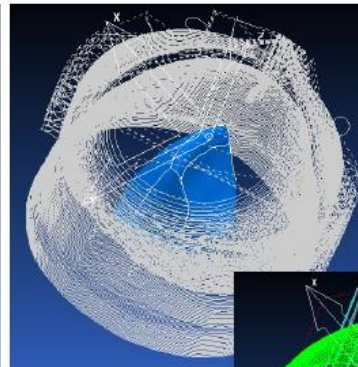
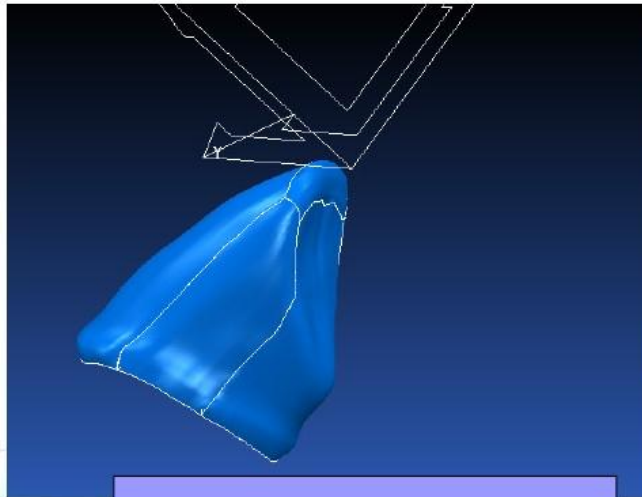
- ▲ plug-ins
- ▲ Simple modification
- ▲ original machine use



Processing application example introduced



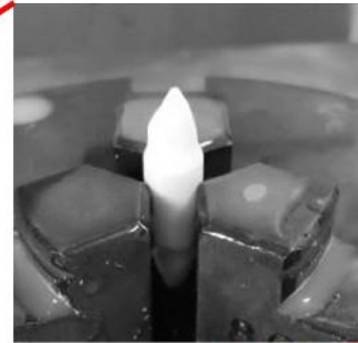
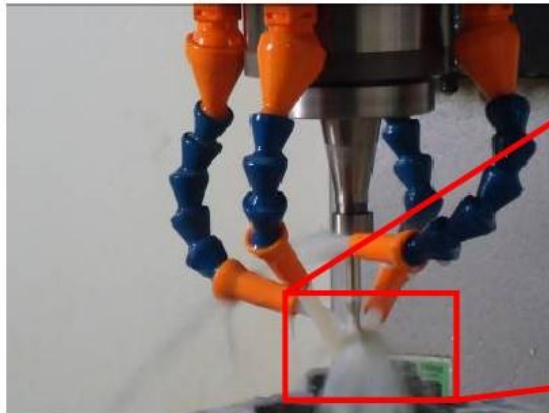
TOOTH CAVRING MACHINING PATH PLANNING



Big remove amount / High processing speed test



THE ULTRASONIC 3D FULL SINTERED CROWN ENGRAVING



WORKERS CONT.	FEEDRATE	EACH DEPTH	SPINDLE SPEED	PROCESSING TIME
ROUGHING	500 mm/min	0.14 mm	10000 RPM	23minutes33s
FINISHING	800 mm/min	0.1 mm	12000 RPM	5minutes12s

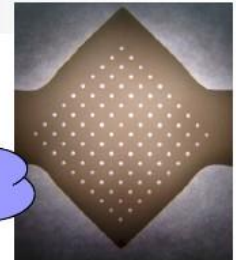
ULTRASONIC 3D TEETH CRAVING



Monodentate roughing and finishing of total working hours to 28 minutes and 45 seconds (tooth length 7.6mm 2mm length, finishing plus cut set aside about 12min).

The experimental results show that ultrasound-assisted tooth carving processing in addition can effectively enhance the processing speed to the movement of machine processing and the generation of noise can directly determine the resistance is very low processing toothed precision machined through simple correction method to upgrade.

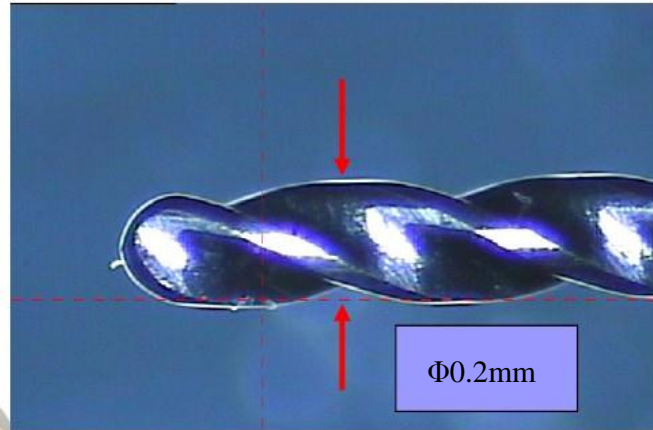
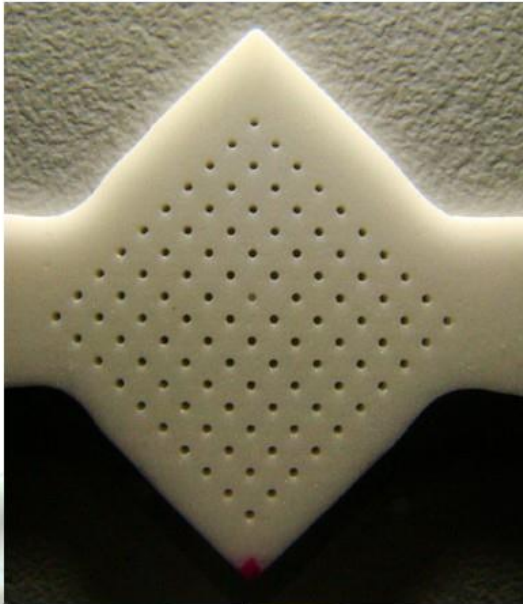
THE CERAMIC PORES PROCESSING TEST



Diameter accuracy
 $\pm 5\mu\text{m}$

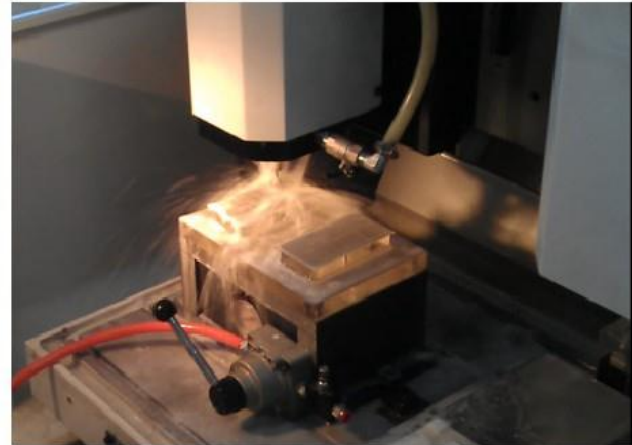
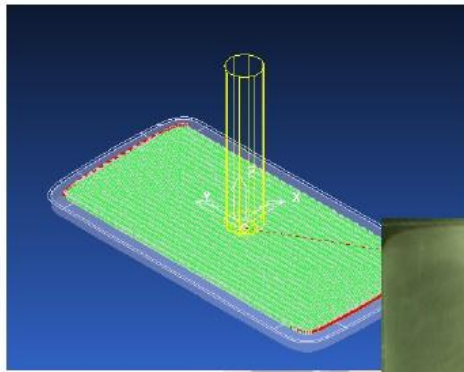
編號	#1	#2	#3	#4	#5
孔径	0.200	0.251	0.250	0.249	0.247
圓度	0.005	0.002	0.005	0.003	0.004
照片					
編號	#6	#7	#8	#9	#10
孔径	0.254	0.252	0.258	0.251	0.254
圓度	0.006	0.004	0.005	0.004	0.006
照片					

THE CERAMIC PORES PROCESSING TEST



- ◆ Tungsten steel tool layers consumption phenomenon.
- ◆ Overcome the hard material a soft material.

Basin-type panel processing



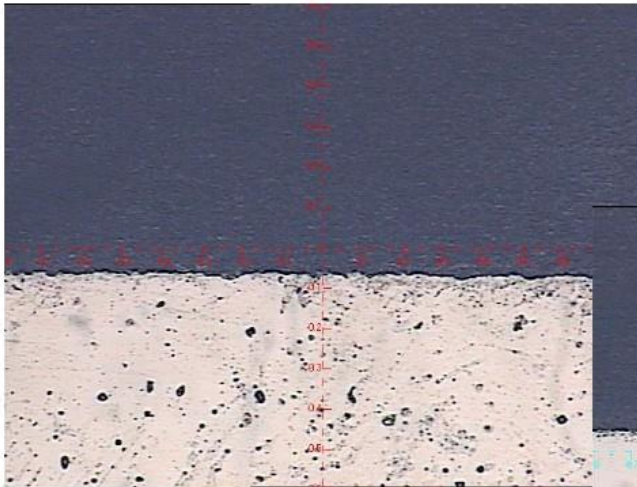
ULTRASONIC CUTTING VS GENERAL HIGH-SPEED CUTTING

★ ULTRASOUND SURFACE ACCURACY BETTER

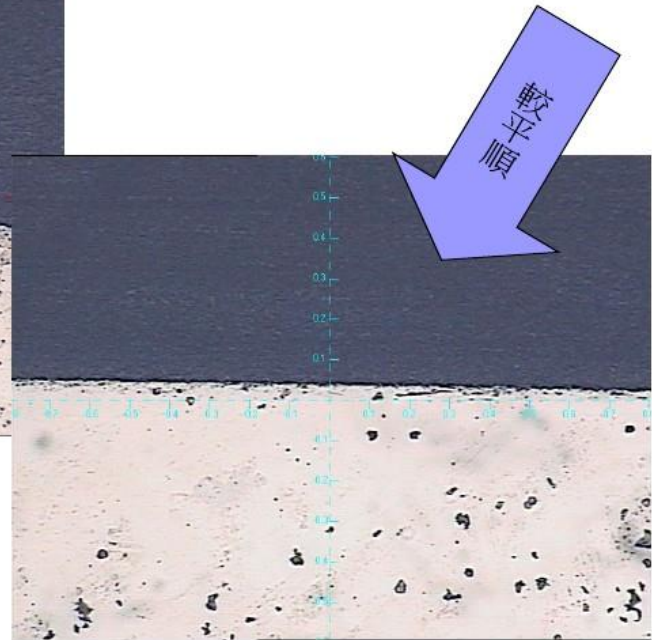


UNIT : μm	PERPENDICULAR TO THE MACHINING PATH			WITH THE LEVEL OF PROCESSING PATH		
	1	2	3	1	2	3
ULTRASONIC SPINDLE						
Ra (mean)	0.576	0.568	0.561	0.642	0.64	0.599
Rmax (maximum)	5.66	5.52	6.85	5.16	5.92	5.22
SPINDLE 60000 rpm						
Ra (mean)	1.022	0.924	0.794	1.023	1.132	0.878
Rmax (maximum)	15.7	11.7	9.35	12.1	9.84	9.94

LINEAR CHIPPING CONDITIONS

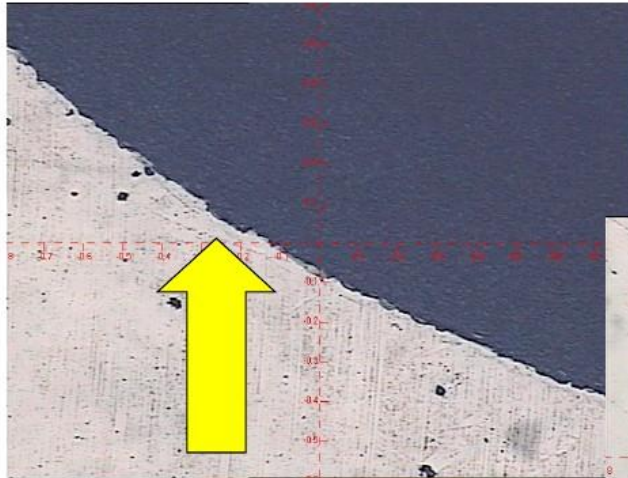


Non-ultrasonic machining-----rough

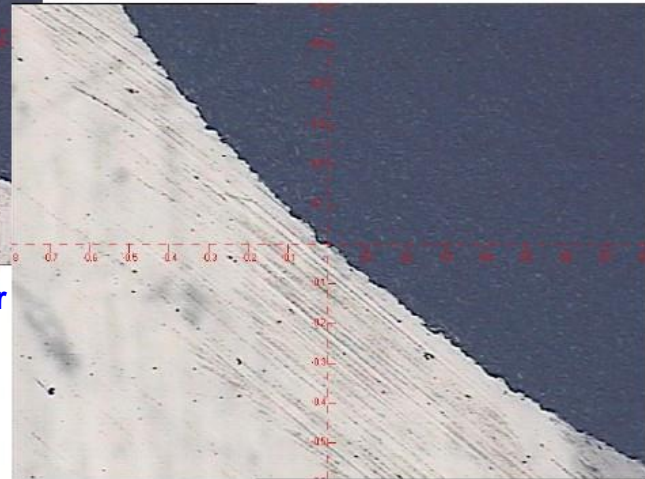


Ultrasonic machining----- flat

ROUNDED CHIPPING CONDITIONS



Non-ultrasonic machining-----irregular crack



Ultrasonic machining----- smooth

ULTRASONIC DRILLING SUS 316

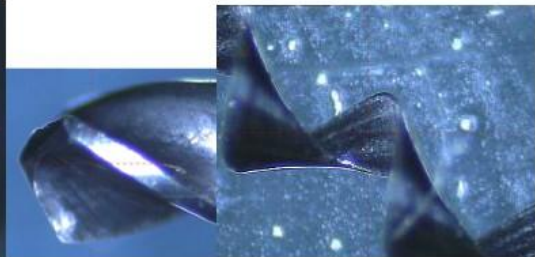
ϕ 1mm stainless steel 316 drilling speed 6000 rpm.

Enhance tool life more than 40 times, the processing speed of 3 times.
(F: 60 raised to 210mm/min, number of holes: 26 holes deep x1mm increased to more than 3000 holes x1mm deep)

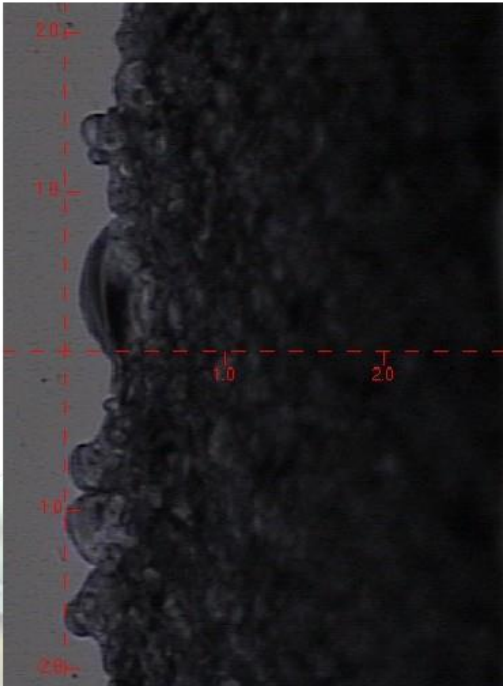
Ultrasonic no auxiliary



Ultrasonic Aided



Glass materials, high-speed edging technology



Poor ductility of the glass, the material will be in the high-speed processing extrusion force of grinding tools, when the compression force is greater than the glass can withstand rupture.

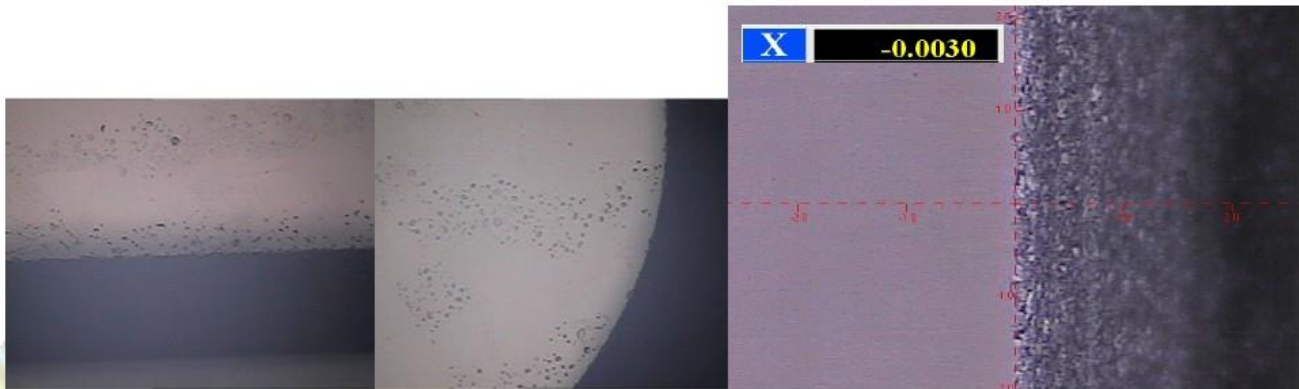
Basically, glass grinding process is the rupture of the application, the use of diamond abrasive tool tough the glass grinding bifida and curettage.

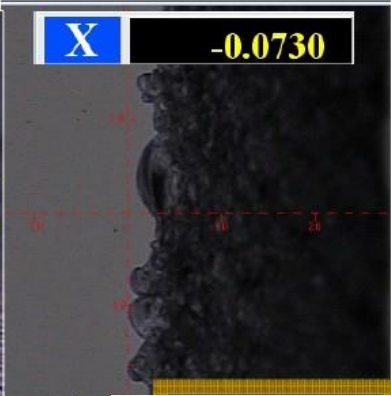
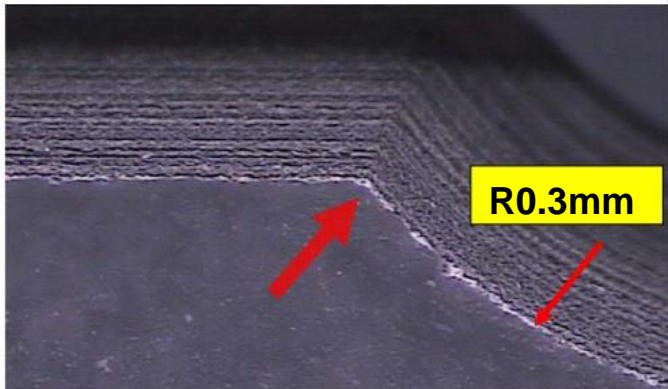
Therefore, is that when the high-speed grinding glass, its damaged condition directly related to particle size and processing speed.

Irregular shells crack the glass side of the high-speed grinding engineering methods

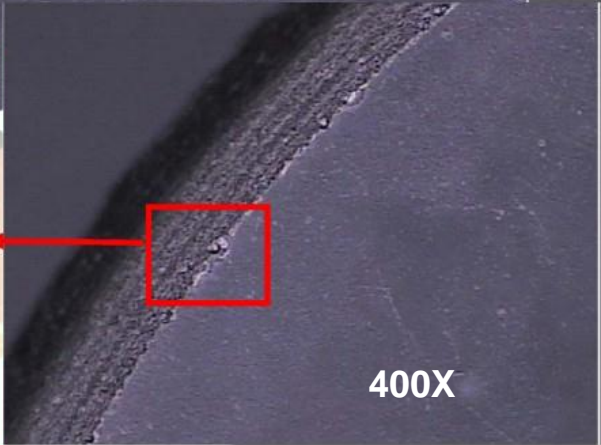
TOUCHPANEL

The crisp edge amount can be controlled at $20\mu\text{m}$ or less, preferably $3\mu\text{m}$. The crisp edge amount can be controlled at $20\mu\text{m}$ or less, preferably $3\mu\text{m}$. The processed feed speed $20\mu\text{m}$ $900\text{mm}/\text{min}$, feed 0.2mm 0.2mm . $900\text{mm}/\text{min}$, feed 0.2mm .

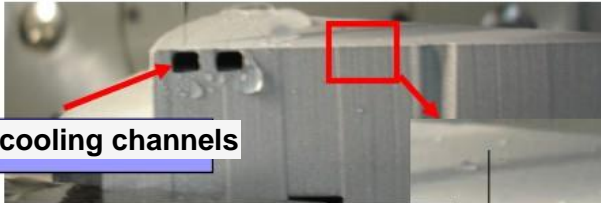




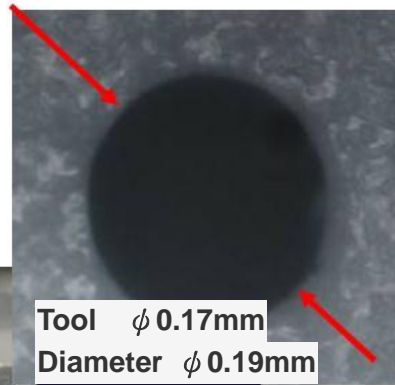
Traditional high-speed grinding



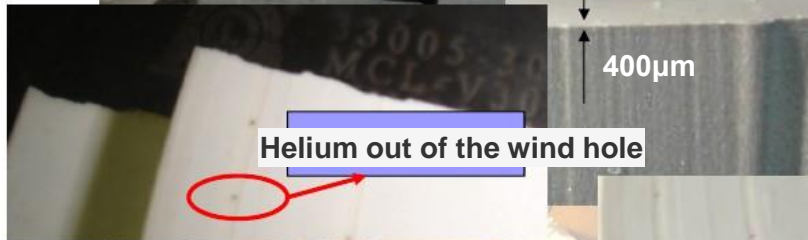
Alumina micro hole drilling



Helium cooling channels

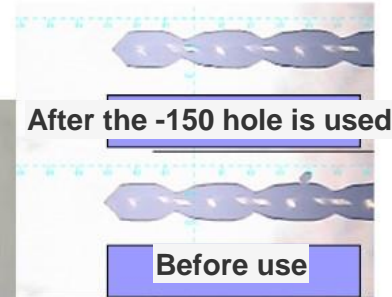


Tool ϕ 0.17mm
Diameter ϕ 0.19mm



Helium out of the wind hole

400 μ m

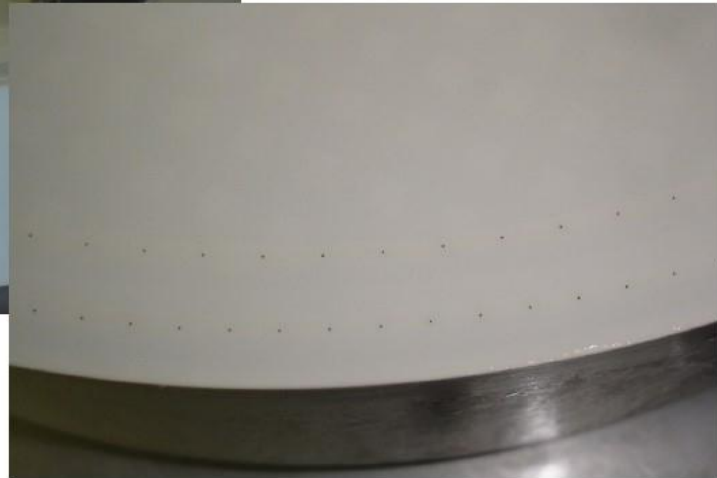
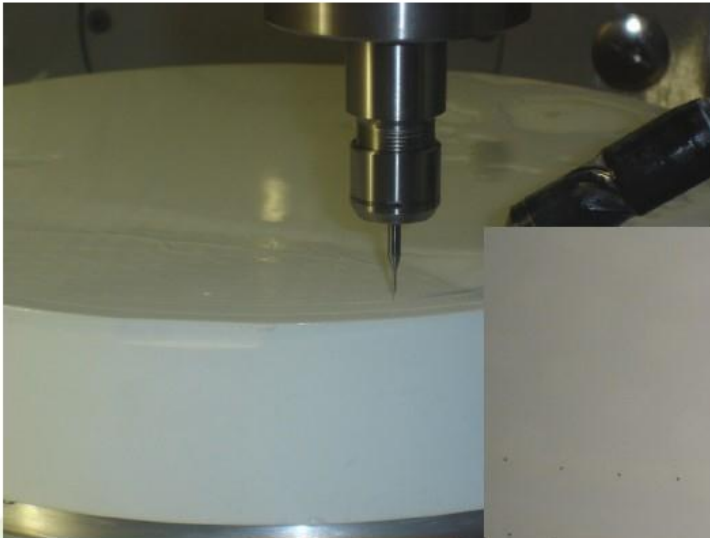


After the -150 hole is used

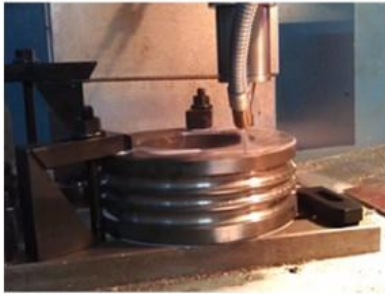
Before use

High-density, high hardness aluminum oxide, ceramic aluminum oxide ceramic (18mm) drill microporous (ϕ 0.18mm) ultrasound Drilling technology development and parameter studies.
Drilling Technology

CERAMIC ELECTROSTATIC CHUCK



TUNGSTEN STEEL GRINDING



Use the tool : # 120, the 3mm diameter electroforming rod mill.

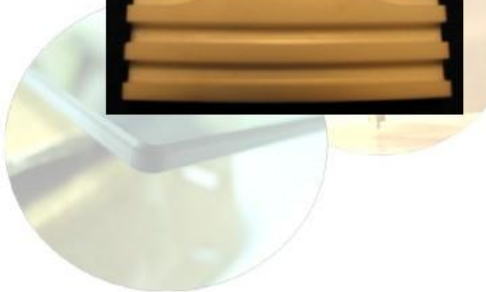
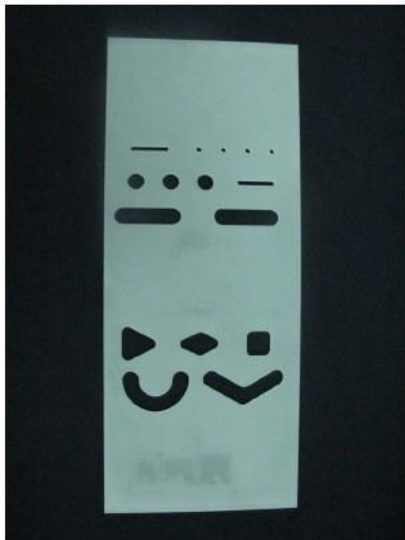
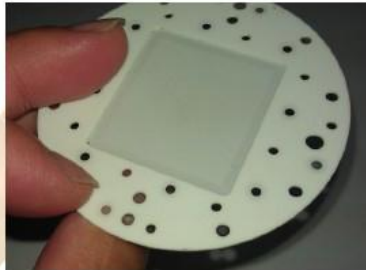
Use parameters : frequency of 20kHz , speed 4400rpm ,
Depth of 1.5mm (a feed) , feed the linear feed speed 3mm/min





OTHER PROCESSED SAMPLES







STRUCTURE OF PLUG-IN MODULE

