CRYSTEX COMPOSITES LLC
Mykroy/Mycalex Ceramics
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Machining Guidelines of Glass-Mica Composite Materials

Mykroy/Mycalex Ceramics manufactures a glass-bonded mica which is a composite material whose properties are between ceramic and a plastic. Ceramics are very hard to machine while plastics are readily machinable. Unlike plastics, ceramics are dimensionally stable over a large temperature range. Mykroy/Mycalex is the link between these two materials being easily machined by conventional machine shop tools and dimensionally stable over a large temperature range.

In machining Mykroy/Mykalex here are a few basic guidelines which should be used in almost all machining operations.

LUBRICANT
Do not cut dry. Plenty of water is the most satisfactory lubricant. Keep a continuous stream pouring on the work and cutting tools to keep it cool – insufficient cooling can result in chipping and rapid tool wear. It is best to add water-soluble oil to the water to reduce tooling rust; (advisable to use 1% of soluble oil in lubricant.)

SUPPORT
Provide adequate support for the piece to prevent chipping on break through of edges. This is particularly important where the cutting tools are leaving the material. Avoid point loading from chuck or vise pressures. Always work out ways to hold Mykroy/Mycalex glass-bonded mica by using stops and similar devices. Where pressures must be applied, use scrap Mykroy/Mycalex glass-bonded mica pieces as facings between the materials and the holding device. Where there is no scrap available, use plastic, copper, or aluminum for facings.

CUTTING
Use sharp cutting tools and maintain them in sharp condition. Mykroy/Mycalex can be machined with standard machine shop equipment, however, the material is glass-bonded mica which is abrasive by nature and therefore the need for resharpening is imperative. Dull cutters may cause localized heating to be generated and impose heavy local stresses on the material which may lead to chipping. Carbide tools (Titanium coated or Tungsten) and/or bonded diamond wheels are the preferred cutting tools but high speed cutting tools can be used for short runs. Work slowly and steadily, do not force the tools, and keep tool speeds to suggested levels. Cut down into the work – never up from the bottom. Keep speed between 2000 & 2500 rpm and advance the cut by feel. The wheel should cut steadily without dragging.

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TURNING

Carbide tools are recommended. Use tool bits of micro grain carbide with positive cutting edge.

OUTSIDE DIAMETER	SPINDLE SPEED
¼" – ½"	600-800 RPM
5/8"- 1.0"	400-600 RPM
1.0" – 2.0"	300-400 RPM

Feeding Rate	.002-.005 inches per revolution
Depth of Cut	.025-.250 inches/cut depending on conditions. (advance by feel)

DRILLING

Solid Carbide Drills, preferably with micro grain carbide, will give the best results.
To avoid chipping, do not drill hole all the way through.
For better results, work from one side, then turn the piece over and work from the other side.
For large quantities, accurately making two-sided hardened bushed drill jigs will assure the most accurate work.
Use pecking motion when drilling deep holes. (preferably above 3/8") no more than .250" deep per peck.

DRILL SIZE	SPINDLE SPEED	FEEDING RATE
Up to ¼" diameter	~1200-2000 RPM	.003 inches per revolution
¼" diameter	~1200 RPM	.004 inches per revolution
½" diameter	~ 700 RPM	.005 inches per revolution
¾" diameter	~ 400 RPM	.006 inches per revolution
1.0" diameter	~ 300 RPM	.008 inches per revolution

NOTES:
Allow 1/16" of extra material on drill break through side for grinding cleanup after drilling. For best results use a pecking motion while drilling. Drill "sharpness" will affect the above rates.

MILLING

Micro grain Carbide end mills are recommended.

OUTSIDE DIAMETER	SPINDLE SPEED
Up to 1/8"	1400 RPM
1/4"	1000 RPM
½"	800 RPM
¾"	600 RPM
1.0"	400 RPM
Depth of Cut	.050-.070 inches/cut depending on conditions
Feed rate 3" / minute	

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THREADING

Use a tungsten carbide tool bit and chase threads as with metals. Keep tools sharp. For internal threads, make clearance holes slightly larger than standard tap drill recommendations. Chamfer both sides of hole prior to threading to minimize shipping and fracture. Turn up in the direction of threads only, a back and forth motion will create chipping on the minimum thread diameter. Use plenty of water for flushing chips away from the lead cutting edge.

TAPPING

Carbide tools can be used but high speed steel taps will suffice. Use regular tap drill sizes. Tapping heads recommended for production. Should not exceed 400 RPM. Flood with water to cool tap and flush chips. Generous chamfer is recommended. (after drilling)

SLOTTING

Slotting may be done in one of two ways: use a metal bonded diamond wheel or silicon carbide wheel of proper width on surface grinder up to .050" cut depth. Alternatively, use a milling xxxx, preferably a carbide end mill. Take small cuts – not more than .025" and plenty of water. When slotting with an end mill, start for outside part to eliminate chipping.

GRINDING

To grind flat surfaces on any surface grinder, use silicon carbide resin bonded wheels at speeds recommended by the manufacturer of the equipment. For heavy grinding, use a soft, coarse-grained wheel. To prolong the life of grinding wheels, it is advisable to use 1% of soluble oil in the lubricant.

Rough Heavy Grind	- 36 grit blanchard/besley type grinder
Surface Grinders	- 60-80 grit