Laser Cutter Materials

Thank you to Martin Bogo and ATX Hackerspace for putting together much of this information.

There are a wide range of materials that the Laser Cutter can cut, etch or mark - but some simply don't work (e.g. metals) and some are extremely hazardous to either humans or the machine itself (e.g. PVC and ABS). It is therefore imperative that you check these lists before attempting to cut materials that you have not worked with before. Anything that emits Chlorine or Hydrogen chloride gas is BAD for the machines and you. Check Material Data Safety Sheets for more information about specific materials.

It is not always obvious which materials will work. For example, Polycarbonate/Lexan produces flames and creates a horribly burnt edge. Yet Acrylic - which looks, smells, feels and tastes[citation needed] just like Lexan, cuts smoothly and cleanly and is one of the best materials to use with the laser! So check and double-check what you're cutting.

Safe-ish (read carefully) Materials

The laser can cut or etch. The materials that the laser can cut materials like wood, paper, cork, and some kinds of plastics. Etching can be done on almost anything, wood, cardboard, aluminum, stainless steel, plastic, marble, stone, tile, and glass.

Cutting

Material	Max thickness	Notes	WARNINGS!
Many woods	1/2"	Avoid oily/resinous woods	(F) Be very careful about cutting oily woods, or very resinous woods as they also may catch fire.
Plywood /Composite woods	1/2"	(E) These contain glue, and may not laser cut as well as solid wood.	
MDF /Engineered woods	1/2"	(E) These are okay to use but may experience a higher amount of charring when cut.	
Paper, card stock	thick	Cuts very well on the laser cutter, and also very quickly.	(F) Cut single layer at a time. Multiple layers catch fire easily.
Cardboard, carton	thicker	Cuts well but may catch fire.	(F) Watch for fire.
Cork	1/4"	Cuts nicely, but the quality of the cut depends on the thickness and quality of the cork. Mostly, the cut depends on the glue used as a binder.	
Acrylic/Lucite /Plexiglas/PMMA	1/2"	Cuts extremely well leaving a beautifully polished edge.	
Extruded Polystyrene	2"	Blue or Pink rigid foam insulation. Expanded Polystyrene (usually white and made of small white balls) is not OK at this time. (foam coolers)	(F) Please watch it carefully when cutting. Uses fastest speed possible and lowest power needed to cut through.
Delrin (POM)	thin	Delrin comes in a number of shore strengths (hardness) and the harder Delrin tends to work better. Great for gears!	(T) Contains formaldehyde (a known carcinogen) in the smoke generated during cutting. Advisable to keep ventilation system running for a couple minutes after cutting to clear out all of the smoke.
High density (48 lb/ft3) urethane board.		HD version of tooling/model/precision board. https://www.inventables.com/technologies/precision-board-plus	
Depron foam	1/4"	a type of extruded polystyrene: http://depronfoam.com/ . Used a lot for hobby, RC aircraft, architectural models, and toys. 1/4" cuts nicely, with a smooth edge.	(F) Must be constantly monitored.
Foam Core	any	Cuts extremely well on the facings. The center can shrink and melt away if too much power or too low a speed is used.	(F) Watch it carefully. Paper coated foam core is best. Be careful that your facing material isn't waxy, plastic or something on the prohibited list.
Gator foam		Foam core gets burned and eaten away compared to the top and bottom hard paper shell.	(E) Not a fantastic thing to cut, but it can be cut if watched.
PEVA or EVA Foam - (Poly) Ethylene Vinyl Acetate	1"	Expanded foam rubber. Used for flip-flop soles, exercise foam floor mats, exercise equipment padding, foam sheets for crafts.	Smells bad - can result in charred brown edges.

Kapton tape (Polyimide)	1/16"	Works well, in thin sheets and strips like tape.	
Mylar	1/16"	Works well if it's thin. Thick mylar has a tendency to warp, bubble, and curl	(E) Gold coated mylar will not work.
Styrene, Solid	1/16"	Smokes a lot when cut, but can be cut.	(T) Keep it thin.
Cloth/felt/hemp /cotton		They all cut well. Our "advanced" laser training class teaches lace-making.	Not plastic coated or impregnated cloth!
Leather/Suede	1/8"	Leather is very hard to cut, but can be if it's thinner than a belt (call it 1/8" or 4 oz). Our "Advanced" laser training class covers this. Smells like burning hair when cut, so let vent before opening after cut.	(T) Real, veg-tanned leather only! **Not** chrome-tanned real leather. **Not** 'pleather' or other imitations!
Magnetic Sheet		Cuts beautifully	
NON-CHLORINE-containing rubber		Fine for cutting.	(T) Beware of chlorine-containing rubber! Use only rubber labeled "laserable" or "chlorine-free".
Teflon (PTFE)	thin	Cuts OK in thin sheets	
Carbon fiber mats/weave that has **not** had epoxy applied		Can be cut, very slowly.	(E) You must not cut carbon fiber that has been coated!!
Coroplast ('corrugated plastic')	1/4"	Difficult because of the vertical strips. Three passes at 80% power, 7mm speed, and it will be slightly connected still at the bottom from the vertical strips.	Test. This data many be referring to the old lasers. -gorman 2018.01.18 (Coroplast is typically Polypropylene)

Etching

All the above "cuttable" materials can be etched, in some cases very deeply.

In addition, you can etch:

Material	Notes	WARNINGS!
Glass	Green seems to work best...looks sandblasted.	Only FLAT GLASS can be engraved in our cutter. No round items. Cylindrical items require using the rotary attachment.
Ceramic tile		
Anodized aluminum	Vaporizes the anodization away.	
Painted/coated metals	Vaporizes the paint away. Metals can be marked by pretreating with CerMark or equivalent. Our lasers will not cut or etch uncoated metals.	See below for powder-coated metal.
Powder-coated metals (DIY Powder Coat)	Vaporizes the powder coating.	Read the powder coat jar ingredients - MUST NOT CONTAIN PVC. Some brands like *Harbor Freight* are *not laser safe* because they are PVC-based.
Stone, Marble, Granite, Soapstone, Onyx.	Gets a white "textured" look when etched.	100% power, 50% speed or less works well for etching.

A note about Acrylic

Acrylic is available either cast or extruded. According to Acme Plastics, a large distributor:

Extruded acrylic costs less than cast and is more dimensionally stable, meaning the thickness is more consistent across sheets. Softer, with a lower melting temperature than in its cast form, extruded acrylic is easier to laser cut, rout, and polishes more cost-effectively … Extruded acrylic is less susceptible to dirt, lint, or particulate contamination in the production process. Additionally, because of its lower melting point, it is better suited to cementing and thermoforming.

However, rastering is best done on cast acrylic. Cast acrylic is very popular for trophies and awards. Rastering leaves a frosted image behind. It looks good, even better with LED edge lighting. Rastering on extruded acrylic doesn't work. The image melts back into the acrylic.

ADDITIONAL REFERENCE MATERIAL:

The DMS-published list of approved materials for lasering (above) supersedes any/all documentation found online, including these below. When in doubt, always refer to the Laser Committee Wiki list.

- Handy Guide to Processing Plastics

NEVER CUT THESE MATERIALS

When the DMS evaluates whether a material is suitable for use in our lasers, we typically look at four factors:

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- (G) Is there a chance for gooey melting, or other factors which could damage the machine or the DMS?
- (E) Is the laser effective in cutting the material?
- (F) Is there a large risk of fire?
- (T) Does it create poisonous, corrosive, or otherwise unsafe fumes/gasses?
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WARNING: Because many plastics are dangerous to cut, it is important to know what kind you are planning to use. Make has a How-To for identifying unknown plastics with a simple process.

Material	DANGER!	Cause/Consequence
PVC (Poly Vinyl Chloride)/vinyl/pleather /artificial leather	(T) Emits pure chlorine gas when cut!	Don't ever cut this material as it will ruin the optics, cause the metal of the machine to corrode, and ruin the motion control system.
Polycarbonate/Lexan	(E)(F) Cut very poorly, discolor, catch fire	Polycarbonate is often found as flat, sheet material. The window of the laser cutter is made of Polycarbonate because *polycarbonate strongly absorbs infrared radiation!* This is the frequency of light the laser cutter uses to cut materials, so it is very ineffective at cutting polycarbonate. Polycarbonate is a poor choice for laser cutting in general, and the edges also turn black.
ABS	(T)(G) Emits cyanide gas and tends to melt. Cyanide gas is deadly!	ABS does not cut well in a laser cutter. It tends to melt rather than vaporize, and has a higher chance of catching on fire and leaving behind melted gooey deposits on the vector cutting grid. It also does not engrave well (again, tends to melt). (3D printed objects are often ABS)
HDPE/LDPE/milk bottle plastic (high and low density polyethylene) Recycle codes 2 and 4.	(F)(G) Catches fire and melts	It melts. It gets gooey. Don't use it.
PolyPropylene Foam Recycle code 5.	(F) Catches fire	Like PolyStyrene, it melts, catches fire, and the melted drops continue to burn and turn into rock-hard drips and pebbles. A softer, more flexible foam that feels like a bubbly plastic.
Sheet Fiberglass	(E)(T) Emits fumes	It's a mix of two materials that cant' be cut. Glass (etch, no cut) and epoxy resin (fumes)
Coated Carbon Fiber	(T) Emits noxious fumes	A mix of two materials. Thin carbon fiber mat can be cut, with some fraying - but not when coated.
Neoprene foam	(T) Emits Hydrogen Chloride	Wetsuit material, some foam floor mats.
Chrome-tan Leather	(T) Emits toxic chemicals	Freaky chemicals including chromium, are used for the tanning process and will be released/burnt when lasered.
Corian	(G) Creates shower of sparks	The aluminum mixed in with the otherwise-safe acrylic causes significant sparking that can damage machine.
Rubber stamp-making material not labeled "laserable" or "cholorine-free"	(T) Emits pure chlorine gas when cut! Beware of chlorine-containing rubber!	Don't ever cut this material as it will ruin the optics, cause the metal of the machine to corrode, and ruin the motion control system. Use only rubber labeled "laserable" or "chlorine-free", which also has an entry under "Safe-ish (read carefully) Materials" list below.

Free/Community Materials

The shelf under the work table near the laser cutters contains free, scrap, and donated materials for laser cutter use. Unless someone has their name on a piece of material, it is free for use. Most of the acrylic is brought in by Paul Wilson. The 3mm acrylic is free to use but if you want to use the thicker acrylic please talk to Paul first. Plastics can be found at Home Depot, Lowes, Regal Plastics and Johnson Plastics. Wood can be found at Lowes, Home Depot, Wood World, Rockler, and Woodcraft. Foam board can be found at Dollar Tree ($1 per sheet).