Metal Magic

The expanding markets for compact laser systems continue to grow as new materials and processes emerge. For years the world of laser marking on metals was strictly limited to specialized and expensive lasers. Today, many materials exist for Co2 laser systems to mark on all types of metals. These materials open many new markets and applications to the compact Co2 laser system owner.

Traditional uses for Co2 laser systems include engraving on wood, plastic, acrylic, leather, cardboard, rubber, marble and many more non-ferrous materials. Imagine the opportunities to expand into metal marking with your laser to include such products as corporate premiums, industrial components, machine tags, i.d. plates and so much more.

The process of using a C02 laser for metal marking is based on three process types. The first process is called vaporization which is a removal process. In this process the laser energy removes the coating by turning it to smoke and revealing a base material or color underneath. The vaporization process is what we use when we engrave lacquer coated brass.

The laser can also act to bleach out dyes in soft metal coatings to reveal the base metal color. This simple removal process is how we engrave anodized aluminum. Another process for marking on metals involves a laser sensitive coating that is put on the metal. This sensitive coating reacts to the laser energy in the same way photo film reacts to light. The laser sensitive coating turns black when exposed to low levels of laser energy.

Using a thermo-reactive coating is another way to mark metals easily. In this popular process a specially paint is brushed or sprayed on the uncoated metal. When the area is engraved with a Co2 laser, the special coating bonds to the metal based on the heat generated from the laser. The result is a permanent black mark that is bonded to the metal.

But the real magic in metal marking is not understanding the technical aspects of how the laser alters the molecular structure of a given product. This is the job of application engineers, scientist and chemists. Your main goal, as a laser engraving specialist, is to understand which material works best for your customer’s application and how to create outstanding engraving results. Take the time to learn about applications for metal marking and many new doors will open for your business.
Thermo-Reactive Coatings

Laser activated coatings for metals came about through the development of similar materials for the glass marking industry. The leader in development for these types of coating solutions is Ferro (previously known as Cerdec) in Washington, PA.

Ferro is part of large chemical company and spent years developing the material we know as LMM 6000 Metal Marking Spray. The exact contents of this product are kept under lock and key and for good reason. The LMM 6000 Metal Marking Spray is easy to use and creates excellent engraving results.

Designed for use on uncoated metals, the LMM 6000 can be applied to Stainless Steel (304 grade and up), Chrome, Pewter, Aircraft Grade Aluminum (T-6 alloy) and Titanium. Laser systems with a power of 50 watts or more can also mark on bronze and hard brass alloys using this material.

The solution can be applied to the uncoated metal by use of a brush or by spraying using an airbrush or small cup sprayer. Thinning the material to right consistency can be accomplished by adding denatured alcohol to achieve the correct consistency. The LMM 6000 is shipped in containers and it has a very thick, sludge like appearance. When starting with a new container, add 30% denatured alcohol to achieve the similar thickness of latex house paint.

When thinned to the correct consistency, the LMM 6000 will flow easily when applied with a good quality brush with bristles that are at least 1 inch long. Load the brush fully with the metal marking solution and make smooth strokes in the area that is to be engraved. Enough solution should be applied so the metal is not seen through the brushed on solution. Make sure the material is fully dried before laser engraving. Allow 20 to 30 minutes and the LMM 6000 will dry and turn a lighter color.

Spraying the LMM 6000 on metal plates and larger areas is an excellent alternative to brushing. Start by adding more denatured alcohol to make the solution the consistency of milk. The thinned solution will dry fast and usually require two light coats to completely cover the metal.

The coated metal surface is now ready for engraving logos, text and graphics by your laser system. A setting power and speed value in the print driver is simple using this formula: Power at maximum 100%; Speed at the rated value of the laser tube. (i.e. a 25 watt laser system should be set to 25% Speed, 50 watt laser should be set to 50% speed)

During the engraving process you will see the LMM 6000 coating turning a solid black color. The heat from the laser is causing a chemical transformation of the coating and it is bonding to the surface of the metal. The final stage of this process is to wash off the remaining un-engraved coating with tap water. The soft material washes off easily and can be helped along using a soft nylon scrub brush. The result is a durable black engraving mark that is bonded to the surface of the metal.

Just how durable is the Cermark© process on metals? Ferro has conducted extensive durability testing using controlled weatherometer systems and found long lasting results on stainless steel. The weatherometer subjects the material to an abusive test of water, salt and ultraviolet rays to simulate years of wear and tear.
Our customers have sent us very positive feedback on the marketability of the Cermark© process and continue to unlock new markets. Some of the applications for this process include knife blades, outdoor signage, custom motorcycle and auto parts, industrial valves, memorials with photos, pizza cutters, corporate premiums, tools, golf clubs, baggage tags, machine i.d. plates, tags for valves, electrical switch plates, boat components and so much more. Parts have even been marked that have been used in satellites and other space related projects!

**Photo-Reactive Coatings**

A new product line has recently been introduced by Horizon that uses a photo reactive coating applied to aluminum. Horizon is the company that brought us Metal Photo© several years ago and pioneered the development process for specialized coatings on aluminum. Metal Photo© has a proven history of outdoor durability and revolutionized the market upon its introduction. The newest offering is a very unique product is called AlumaMark and is designed specially for laser engraving.

AlumaMark is manufactured from an aluminum sheet that has a laser sensitive coating applied and a clear anodized top coat. The clear anodized coating resists weathering and allows the laser to pass through and change the chemical properties of the sensitized layer. The result is a subsurface mark with extraordinary detail.

Creating outstanding results with the AlumaMark product is easy to achieve keeping in mind it requires very low power settings to make a fine, black colored engraving mark. Typical settings for a 25 watt laser system would be 100% speed and 10% power. Care should be taken to not use too much power which would vaporize the clear anodic layer as well as the laser sensitive coating revealing the base aluminum color.

This product has several unique features that make it very desirable for numerous applications. First, we can create a solid black engraving against a gold finish. The look is elegant and classic and has a very upscale presentation. Laser engravers have struggled to create this effect on metal for years and have been limited to color filling which is time consuming and tedious.

The AlumaMark product is also a very high resolution substrate. Finely detailed photographs, bar codes, small text and thin lines look sharp and clear. Engraved images and text seem to jump out and impress you with contrast and clarity. High-end customers will be very impressed the engraving quality!

Also very important is the durability of this product and the engraving on it. The actual engraving is below the clear top anodized coating and protected from numerous hazards. AlumaMark resists moisture, salt, paint, chemicals, graffiti, heat and intense sunlight making it excellent for outdoor applications. During intense weatherometer tests the material excelled in durability under the most extreme conditions.

AlumaMark is new to the market and has undergone extensive testing and development. Sheet stock is available in several sizes and thicknesses including .005 in., .020 in. and .032 in. The thinnest size can be easily trimmed with scissors or a paper cutter and the thicker material can be cut to size or notched with conventional tools like a shear.
Applications for AlumaMark abound and include trophy plates, plaques, name badges, I.D. tags, baggage tags, memorials, exterior signs, architectural signage, electrical panel tags and dozens of other applications that require crystal clear and durable engraving qualities.

**Vaporizing Lacquer Coatings**

Laser engraving lacquer coated metal is a fast and easy way to create plaque plates and other decorative items. The development of these materials over the last few years has created some excellent products that produce quality engraving.

Lacquer coated plates start with a polished brass or brass plated steel. The base material is polished to a bright sheen and then coated with a clear coating. A top coat is applied over the clear coat and this is what the laser will vaporize to reveal the polished surface below. Manufacturers spray on the top coat color or silk screen on a marble-look painted surface. A rainbow of solid colors and marbled effects are available. Some of the plates are even cut to size with knurled borders ready for engraving and mounting.

Removing the colored top coat with your laser is a low power application and can easily be accomplished with a 25 watt system. Typical settings for a 25 watt laser system would be 100% speed and 30% power. Be sure to fine tune the power setting to achieve sharp edges on the engraving. Using too much power will create blurry engraving results. Try several power settings on a scrap piece of material to compare the results side by side.

And what effect will the Co2 laser have on the clear coat and polished brass under the top coat?? Absolutely nothing. The low power setting used to vaporize the top layer will pass through the clear coating and be diffused by the brass. There is no need to prove to yourself that your laser can actually engrave the metal underneath, however. Attempting to engrave polished brass at maximum power and slow speed has ruined more than one laser by reflecting back through the lens and mirror into the laser tube.

Laser engraving through lacquer coating is effective and can produce excellent results. Coated brass plates are excellent for trophies and plaques. Smaller sized plates can be attached to picture frames, desk accessories and corporate premiums.

**Laser Engraving Anodized Metals**

Anodizing is a special plating process that bonds to the top surface of the metal effectively sealing it and creating a smooth, rich coating. The process works excellent with aluminum which can be fabricated into sheets and extruded into shapes for bottle openers, key chains and business card cases.

Laser engraving on anodized metals has the effect of bleaching the colored coating and revealing the base color of the metal underneath. This is a very simple process that requires moderate power but is still very effective using a 25 watt laser system.
Using a 25 watt laser system, crisp and clear engraving results can be achieved using settings of 100% speed and 80% power. Engraving a test piece with several power settings will show you the optimum power for the quality engraving. Too much power can often lead to removal of the details in your text or graphic and should be avoided.

We receive many phone calls about anodized products that do not completely engrave and leave a slight colored haze in the engraved areas. Usually a second pass removes the last detail of color without harming the engraving quality. Using laser tested products will guarantee best results and complete customer satisfaction.

The engraving process removes the anodized coating and thus opens the metal up to degradation by the elements. This makes outdoor signage for this type of coated metal a questionable application. Indoor signage is a natural for anodized sheets and its high definition makes it excellent for engraving photographs and line drawings. With so many gift products made from anodized metals, they have become top sellers due to their rich colors and excellent engraving properties.

**Magical Profits**

Adding metal marking to your product line is a quick way to increase your engraving profits. Many times the laser provides the only solution so customers are willing to pay for this unique service. Take the time to learn about the different materials and marking processes to know which materials work and which do not.

Many customers tell us the biggest problem with metal marking is taking in unknown materials from customers. This can be trouble in the making so the best solution is to add products to your showroom that you have tested and know they work correctly.

Seeking out industrial marking business is also a natural fit because you may already be doing their awards or corporate premium business. Add some industrial looking samples to your showroom to let customers know you can mark on metal items. Local metal working and machine shops as well as anodize coating companies are great prospects for lucrative part marking contracts. Industrial accounts can also be a great way to stay busy in the slow season.

Make the move into metal marking and expand your business!