



Xerography in Glass for Jacks*

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This paper describes a pair of new techniques by which monochrome laserprinted images from computer-generated art or “xerox” photocopies from any source are fused into, or onto, glass. It is primarily a “fusing” technique, although in collaborative work we have embedded pre-fired disks into furnace paperweights.



Yes, xerography is actually a word. My copy of *The American Heritage College dic.tion.ar.y* includes the following:

xe•rog•ra•phy (zĭ-rŏg' rə-fĕ) *n.* A dry photographic or photocopying process in which a negative image formed by a resinous powder on an electrically charged plate is electrically transferred to and thermally fixed as positive on a paper or other copying surface.

There are other ways to transfer monochrome images to glass. These typically require a darkroom, involvement in chemistry, or are time consuming and are not good for one-of-a-kind objects. This process is “immediate” and “personal,” assuming you have a computer with laser printer or a toner-based copier. Once you have completed the original art and cut your glass, the transfer process only takes a few minutes, and costs only pennies per square inch.

* In many trades, a Master is a worker who is so highly specialized he can only do one thing - period. As I see it, a Jack is a Renaissance Man of the craft world. It is the Jacks who can take methods developed in one area and apply them in another. On the whole, Jacks have a tradition of sharing techniques, and of teaching ‘outsiders.’ Masters, on the other hand, have a tradition of protecting secrets, and forming guilds of exclusion. Jacks are often concerned with ‘good enough,’ while Masters focus on ‘the best.’ This applies to tools and equipment, as well as techniques and results.

The process is basically one of transferring the print from a “Xerox copy,” or laser printed sheet to glass, removing the paper, then fusing it. The black changes to brown in the process. I am putting “xerox copies” into or onto glass.

I began my experiments with two bits of knowledge. First, that electronics experimenters used a hot transfer of Xerox copies to copper, and second, I guessed that Xerox toner was a metal oxide from a statement that my father-in-law made about buying a lot of metal oxides while working at Xerox in purchasing. I later found statements that toner is about 30% iron. I presume it is in the chemical form of black iron oxide, and is transformed to red iron oxide when heated in an oxidizing atmosphere. Perhaps we should say the color change is from black to rust. The other major component of toner is a resin or polymer which acts as an insulator and binder.

In the electronics world, Xerox copies of mirror imaged printed circuit layouts are ironed on to blank printed circuit boards. The toner acts as a resist in etching the board. The blank boards and etching solution are locally available at Radio Shack, so the process is readily available, although the quality often leaves something to be desired. Patterns for custom boards are often printed in magazines for radio amateurs and electronics hobbyists. I actually used this technique to etch a small copper stencil for sand blasting glass. It worked, but not so well that I thought the experience was worth repeating.

The electronics people typically use plain paper for transfer, and remove much of the paper with water.

For my first experiments I decided to try to find a “transfer paper,” and use techniques similar to those used to make T-shirts from inkjet points. I got lucky on my first try.

I used label backing as a release paper. I simply printed the images on the paper backing for laser printer labels. All of the brands I have tried have worked. The image is printed using normal print settings on the side from which the labels have been peeled.

I transfer the image to sheet glass by pressing the back of the paper with a household iron. I use about two layers of cloth between the iron and paper to assure good contact. I have found that the “cotton” and “linen” settings work best. Measurements with my multi-meter with a thermocouple show that these correspond to temperatures of about 280°F to 360°F or 140° to 180°C. With a household iron, size is limited to about 3 by 3 inches, or perhaps a bit larger. Recently I dug out an ancient Kodak photo mounting hot press, and transferred a 5 inch circular design on the first try. The press operates at a temperature of about 375°F or 190°C, and can handle full 8 ½ by 11 inch sheets.

One of my first experiments with the technique was to produce some plates for inclusion in paperweights. The weights are about 3 inches in diameter, with 2 inch photo/text disks. They



were made by the Gentile Glass Company of Star City, West Virginia as family mementos.

After I had been using the iron-on method for a while, I received a copy of the Micro-Mark catalog. They listed "water slide" decal paper for both laser and inkjet printers, primarily for decorating model railroad cars. I ordered five sheets to test, and found it worked more easily than the hot transfer, particularly for larger images. As I neared the end of my initial supply, I looked for other sources on the Internet. (Search Google for "laser decal paper") My second purchase was 100 sheets from BEL INC. Decal paper consists of a sheet of paper which is coated with water soluble glue, then topped with a layer of lacquer or similar substance. The use is straight forward. You simply print on the shiny side, then cut out your image, soak it briefly in water, and slide the image onto your glass.

The self-portrait shown at the top of the first page was done with a decal transfer. The portrait is on the front surface of two fused layers of Bullseye glass, with setting and fusing done in a single operation.

I haven't actually used a Xerox copier, but work from computer graphics programs. I print with an HP LaserJet 4P, and use the auxiliary feed. I use Paint Shop Pro - a \$99 Photo Shop clone, and Micrografx Designer - an Illustrator clone - to do the graphics work.

Using easily available equipment and supplies, the size of any one image is limited to 8.5 by 11 inch standard paper, although the availability of 11 by 17 decal paper and large copiers and printers may make larger sizes available to some workers. The size of a composite panel is limited only by kiln size, or the size of a fabricated "stained glass" panel. In my own work, size has been limited to 8 by 8 inches because I use a 9 inch square kiln.

I have referred to the process as involving "fusing," in order to distinguish it from cold-work, flamework, and furnace blowing. I often fix designs to single layers of glass by "firing" at 1200° to 1250°F. That works, too. It can therefore be considered as part of the painters' or enamellers' tool kit.

The small plate shown at the top of the first is a single layer of old window glass. I have fired and slumped single layers of window glass in one operation. I have also done some "stained glass" panels. I have colored a few of these with "GlassLine" ceramic colors for glass from Clay Art Center, and with enamels.

The photos here are not very detailed. When this was written in October 2003, larger versions of them were accessible through www2.cemr.wvu.edu/~venable/xerog If you click on any thumbnail image on that page it will take you a larger version and some explanation.

There are other Jacks documents at www2.cemr.wvu.edu/~venable/rmi

Some notes on photo transfer to Ceramics

Since devising my own methods, I've done some quick searches on the Internet looking for information on transfer of monochrome art to ceramics. In summary, I found:

Fred Paget, Marin County, California, has made numerous postings describing his experiments. In his first experiments with his HP laser printer he relied on pulling the paper from the printer before it went through the fuser. Later he independently discovered the technique of using label backing as release paper. He did not use the "hot transfer" method, but used "gold sizing" on glazed ceramic surfaces as an adhesive. He has worked with a variety of target objects, including cheap glazed tiles.

M.S. Davis reported some success in transferring HP Deskjet ink to porcelain.

George Mackie has reported that Ricoh toner burns out at temperatures above cone 06, and uses a bisque firing. He also reports that he has heard of others using Citra-Solv in a transfer process, but that he was unsuccessful with that.

Carrie Shields reports that at SDSU people have been using “xylene from a printmaking blender pen” on the back of unfused laser images, placed face down on clay. Dana Carlson reports that lighter fluid also works in this process.

I’ve made a few unsuccessful experiments at using adhesives in the transfer process. There is, of course, a major surface difference between unglazed ceramics and glass.

Micro-Mark, 800-225-1066, 340 Snyder Avenue, Berkley Heights, NJ 07922-1595,
www.micromark.com Primarily a vendor of small machine tools for model makers. Clear
Laser Decal Paper -

Item #82370 - 5 sheets - \$5.95

Item #82371 - 25 sheets - \$25.95

Item #82372 - 100 sheets - \$95.95

BEL INC, 10913 N.W. 30 Street, Suite 103, Miami, FL 33172, (305) 593-0911,
www.beldecal.com/laser_paper.html Primarily a vendor of pre-printed decals for ceramics.

Clear Laser Decal Paper -

8.5x11 - 30 sheets - \$25.00

8.5x11 - 100 sheets - \$60.00

11x17 - 30 sheets - \$50.00

11x17 - 100 sheets - \$120.00