



Thank you for your purchase of *Deker* Damascus. Your steel has been painstakingly hand crafted from the finest materials available and with proper finishing and care will create a beautiful piece that will last for generations. Over the years I have experimented with many methods of finishing pattern welded steel, and I would like to share the methods that I have found to produce the best results in finishing.

After you have finished shaping/grinding/machining your steel, you will need to properly finish it in order to bring out its true beauty. This is simply the way I do this. It may not be the best way, it's definitely not the only way, but it works for me.

What reveals the patterns in pattern welded steel is etching the surface with a mild acid. What causes the pattern to appear is the difference in the way the constituent steels respond to the acid etch. Plain high carbon steels will etch more quickly than steels containing nickel. Other alloying elements can also affect the etch. Manganese for instance will create a darker color in the etch.

What you need:

There are a few things you will need in order to finish your steel properly. Here is a list and a little information on each item.

- Fine grit sandpaper – I usually sand to 400-600 grit before etching. Some 1000-2000 grit paper will also come in handy for the final step in finishing a deep etch.
- A hard sanding block – I use a piece of wood with leather glued to one side
- Ferric Chloride – This is your etchant. I used to get mine from my local Radio Shack, which is sadly gone. If you are lucky enough to still have a Radio Shack near you, it's part number 276-1535. You will have to get it from your local store as they cannot ship it. You can also purchase ferric chloride as a powder online. You will need to dilute your etchant with distilled water (if you are using the powder, perform this dilution after you have mixed per the instructions included with your ferric chloride powder). Use 3 parts distilled water to each part of ferric chloride. Even though it is a dilute acid, ferric chloride **IS** an acid, so follow safe procedures when using it and always add acid to water when diluting, **NEVER** add water to acid.
- Original Windex – This serves to neutralize the Ferric Chloride. Any Window cleaner with ammonia will do. As an alternative neutralizer, you can also use a mixture of sodium bicarbonate (baking soda) and water as described below, or a trisodium phosphate (TSP) solution. If using TSP, follow all of the precautions listed on the manufacturer's packaging.
- A baking soda and water mixture – This should be in a container where you can bring the mixture to a boil. Proportions here are relatively unimportant, just add ¼ – ½ cup of baking soda per gallon of water. This will be used after the final etching to neutralize.
- 000 or 0000 Steel Wool – This is used for cleaning
- Acetone – Also used for cleaning, as well as setting the black etch of a pattern. More on this later.
- Paper towels – More cleaning supplies.

- Nitrile rubber gloves. Not latex gloves. Latex gloves may degrade if they come into contact with acetone.
- A container to hold your etchant. It should be large enough that you can suspend the workpiece in it without touching the sides of the container. For most of my work, I use a piece of 4" PVC pipe with an end cap glued on the bottom and a threaded cap fitting on the top. This allows me to screw on a cap to keep my etchant clean when it is not in use.
- Steel (or stainless steel) wire to suspend the workpiece in the etchant. DO NOT use copper or brass wire for this. They will contaminate the etchant and leave a coppery or brassy "tinge" on your etched steel. (Note: I have run across some folks who add copper or bronze to their etchant on purpose. There's nothing wrong with it, but your "highs" will end up copper or bronze colored if you do. As with any undertaking as an artist, the end result is up to you.)

Surface Preparation

As I've already stated, I hand sand to 400-600 grit before etching. I do not buff the blade prior to etching. I know of some folks that do and have no issues, but in my experience, if you buff prior to etching you run the risk of "smearing" the pattern. I had a problem of "streaking" on a few pieces and I believe I've narrowed it down to this. It does not always happen, but sometimes it does.

After all surfaces are brought to final finish, the entire piece should be wiped with a clean rag or paper towel soaked with acetone. The purpose of this is to get any oils or other contaminants off of the surface of the metal. This includes finger oils, so after you wipe the workpiece down with acetone, you should not touch it with bare fingers. Wearing a pair of nitrile rubber gloves while etching will not only keep you from putting fingerprints on your steel (which can lead to a blotchy etch) but will also keep you from staining your hands with the ferric chloride.

The Etching Process

In order to get the best etch on your steel, you will need to devote a bit of time to it. If you etch slowly, in a controlled fashion, your etch will be more precise and the final product will be of higher quality. The process described below should be repeated until you are happy with the depth of the etch on your workpiece. I usually repeat the etching process between 3 and 10 times depending on how deeply I want to etch a given piece. I personally prefer a deeper etch in general. I believe that the element of texture that can be brought out in patterned steel is an important facet of its overall beauty.

To etch your piece you need to perform the following steps:

- Clean the surface of your workpiece with acetone as described above.
- Hang the workpiece on a hook bent into the end of the wire. On most knives there is a hole of some sort in the tang to use for this. If you're like me and drill the pin hole in hidden tangs after the blade is completely finished, drill a small hole at the tip of the tang to hang the blade from. On pieces without a hole, you may have to get creative and do some experimentation.
- Make sure there is nothing "extra" on the surface of your etchant. Lint, dust, bugs, etc. can be removed with a paper towel or clean rag.
- Completely submerge the workpiece into your etching tank. As you do this, it can be helpful to pull the piece in and out of the etchant 3-4 times. This will help to break the surface tension at the top of the etchant and disperse any oily surface contaminants. If there is even a slight bit of oily residue on the surface of the etchant it can cling to your workpiece and create an uneven

etch. Once you have the piece submerged, bend the end of your wire around a small stick , pencil, or something else handy that you can put across the top of the tank.

- Take a break. You've earned it. I run each etch for 10-15 minutes.
- Carefully remove the blade from the etchant.
- Spray the blade down with Windex over a container or trash can you don't care about. The ammonia in the Windex will neutralize the etchant and cease the etching process. The green mix of ferric chloride and Windex will make a mess if you let it.
- Rub the surface of the workpiece with steel wool. This will remove the surface oxides left behind by the etching process. If you leave these on the workpiece between etching passes, they actually protect the surface from further etching and can greatly slow the process as well as cause uneven etching.
- Clean the workpiece with soap and water.
- Re-clean with acetone before putting the workpiece back into the etch for the next pass
- Repeat the above steps until you have reached a depth of etch you are happy with. At this point, clean the workpiece very well with steel wool, soap and water, and acetone.
- Place the workpiece back into the etch (again dunking in and out to avoid surface contaminants) for 3-5 minutes. This will create the final dark oxide finish on the workpiece.
- When removing the workpiece from the final etch, **DO NOT TOUCH IT!** This can smudge the surface and cause an uneven finish.
- Immediately after removing the piece from the final etch, bathe or briefly submerge the workpiece into a bath of acetone (note: if you use an acetone bath, I would avoid using this as the acetone to clean the piece as it will be contaminated with ferric chloride). This acetone bath aids in "setting" the black oxides on the steel. Thanks to Delbert Ealy for this little trick. :-)
- Transfer the workpiece into the container of simmering baking soda and water. This will neutralize the acid, and also aids in "setting" the dark oxides on the lows of the pattern.
- **IMMEDIATELY** after removing the piece from the baking soda and water mixture, rinse with cool water and oil with a water-displacing oil such as WD-40. If you do not do this quickly, the surface will begin to flash rust VERY quickly.

Troubleshooting Etching Problems

Sometimes issues arise in getting the etching "just right". So, here are some common problems and solutions.

Blotchy or Streaked Etch

This is generally caused by surface contamination on some type or another. If you're certain that your workpiece was cleaned well before it went into the solution, and you didn't contaminate the surface after cleaning, there may be some other causes.

- **Surface contamination of your etching tank** – If your etchant has been around for a bit, look at the surface to make sure there is nothing floating on it. If there is, try to absorb it with a paper towel, etc and clean the surface. Then, when you etch, dunk the workpiece in and out several times when placing it into the tank. this will disrupt the surface tension that causes surface contaminants to stick to the workpiece.
- **Inconsistent heat treatment** – If your heat treatment was somewhat inconsistent, and some areas of the blade did not harden, those regions will etch differently than the hardened steel.

This is because of the fact that steel that has converted to a martensitic structure by hardening etches at a different rate than unhardened steel (pearlite). It is this phenomenon that allows us to see the beautiful hamon or “quench line” in Japanese styled blades. If this is the cause of your bad etching, you’re going to have to re-heat treat.

Etch With Too Little Contrast/Light Color After Etch

Many times this is due to incorrect or completely forgotten heat treatment. Since hardened steel will etch more darkly than non-hardened steel, if your heat treatment results in an improperly hardened blade, the contrast of your etch can also suffer. In addition, you may neglect to heat treat low carbon steels such as 1018 used for ornamental pieces, knife fittings, etc. You must remember that for your pattern welded steel to look it’s best, it must be heat treated. Period. You can temper your steel back significantly after hardening so that you can machine it, etc before etching and still get a nice, dark etch (as an example, I temper my 1018-based low carbon pattern welded steel to 500-600F), but you really do need to heat treat it. How high a temper can you get away with and keep contrast? That will be a matter of experimentation with your particular steel combination.