



LIVER OF SULFUR

Beauty and the Beastly Smell
by Holly Gage

My husband wanders into my work space. “Wow, what died in here!” he says. Even with the ventilation fan at full blast, it’s hard to mistaken the smell of rotten eggs produced by Liver of Sulfur. But don’t let the smell scare you off, because nothing can achieve the most eye catching colors on the surface of fine silver metal clay than this mysterious solution. It can achieve colors as dark as night or as beautiful as an iridescent rainbow. From subtle gold to magenta to purple and everything in between.

For some it is not just the smell that scares them off though, they are often intimidated and baffled by the

surprising results they achieve. Liver of Sulfur (LOS) can be fun and spontaneous on one hand and unpredictable on the other, so I’ve done quite a bit of research and a number of bench experiments to bring to you solutions, recipes and answers to some of the most frequently asked questions people have about using LOS. With a bit of knowledge under your belt, you will feel much less intimidated to use LOS, and once you realize that a LOS patinas CAN be removed, you will feel more free to experiment without the worry of ruining a piece you spent hours to create.

Just the Basics

LOS is a chemical known as potassium sulfide. It is a coloring agent used to put a patina on a metal. In this case, fired and finished Precious Metal Clay. It comes in a liquid and in solid form. The liquid can be used straight from the bottle. The solid comes in small broken up pieces, and then mixed with water. LOS has a shelf life of a day to 6 months, if you are lucky. For this reason I prefer to buy the solid and mix my own, only making what I can use in a single sitting. I store it in a dark air tight container and mark "Liver of Sulfur" very clearly on the container. If you are doing 1 – 10 items you can mix about a cup of the solution, increase proportionately as needed. If you come back to a prepared batch of LOS and it is a milky clear color, your LOS is no longer effective for applying a patina to the metal clay, and it is safe to say that it is time to mix up a new batch. LOS in all forms should be stored in a dry, dark place since air or light will weaken the formula.

Here is the basic recipe, the proportions are general guidelines.

What you need:

- 1 cup of Water
- Spoon for mixing
- A pea size of Liver of Sulfur
- Glass or plastic air tight container

To mix your own LOS, put a pea sized piece of LOS in a container of water. (I prefer distilled water, whenever water is mentioned in the processes to follow, because it assures me there are no other chemicals in the water which may cause problems with application of the LOS. Of course, if distilled water is not available and you have never had problems with your water source, don't worry.) The color should be a very pale yellow. At this strength you have better control of your results. A solution that is too strong will probably "develop" too quickly taking the control out of your hands. This means it will move through the various shades of color before you have a chance to stop the "developing process". More on this below, but first lets get set up.

Getting Set Up

LOS is a chemical that will effect jewelry that you don't want a patina on, as well as the pieces you do if residue from your brushes and containers comes in contact with it. I've even had jewelry prematurely tarnish overtime that was stored in the same room as my work area, so I suggest keeping those two areas separate as well.

Although you don't need special tools and equipment not already around your studio, you may want to establish logical studio rules that prevent contamination of other items and projects.

Most of the tools I use are exclusively used for LOS only. This includes paint brushes, containers, and wire scratch brushes. I mark everything clearly with a permanent marker, so I don't accidentally use it for something else. Since I often tumble pieces in my tumbler that have a LOS patina on the surface, I make sure I tumble it alone or with other items that have LOS on it. I then use fresh tumbling solution for my next usage. Afterwards, I scrub the tumbling container well with soap and water and soak my STAINLESS STEEL SHOT in soapy water and use a small mesh plastic strainer to rinse the shot well. I've never had a contamination problem with the stainless steel shot, but others have reported problems with Carbon shot.

Your basic work station

What you need:

- A heat source, for example a cup warmer or bowl of very hot water
- Container of prepared Liver of Sulfur
- Bowl of cold water
- Spoon for mixing and/or dipping
- Tweezers or stringing material optional for dipping.
- Soapy rinse water
- Rag
- Baking soda

Set up your work station so that you can move from one stage to the next. It is best to line up in a row, first your heat source, then LOS, then a bowl of ice cold water. There are several ways to work but remember this — The secret to controlling the whole process is the TEMPERATURE at which



Mark LOS on the tools you'll need for your work station. Shown is a hot plate, liver of sulfur, small paint brush, scratch brush, Rag, Ammonia (for Iridescent finish), Cold rinse water. (Not shown baking soda, spoon)

As a safety conscious instructor, I find it important to note some handling and safety issues before we begin the really fun stuff. It is a good idea to wear protective clothing, eye wear, and have good ventilation while using LOS. According to the MSDS Safety Data Sheet available, LOS can cause irritation, so avoid contact with your eyes, skin and clothing. Since LOS is a chemical, accidental swallowing will cause problems, so you should call a physician and immediately induce vomiting. LOS is completely soluble in water. If you spill some in your work area flush spilled area with water. Disposal should be in accordance with all applicable federal, state and local environmental regulations.

you work, and the strength of the LOS. As mentioned above, the LOS should be a pale yellow for better control. The temperature will depend on how fast you want the colors to “develop”. The hotter you work the more quickly the colors will go from shade to shade. The progress is roughly as follows: gold, pink, magenta, blues, purples, bronze, gray, and black.

Here is the basic process:

Before you begin, your metal clay piece should be SQUEAKY CLEAN and free from dirt or oils from your hands. Your piece can be fresh from the kiln or torch, scratch brushed or finished with a high mirror finish. In the case of any handling, scrub with a soft brush and soap and water. Once clean, pick up your piece with tweezers, a spoon, suspended from a string or if you must, handle by the edges only.

LOS is always “active” meaning the second you put a piece of metal into it, it will start to develop the color. To accelerate the LOS either the LOS needs to be heated or the metal clay piece you are working on needs to be heated. I like to heat the piece versus the LOS solution because it gives me more control. Heat the metal clay piece until it is warm to hot. Next, submerge it into the LOS solution and let the color develop for a couple of seconds. Remove it and put it in the cold water to retard the developing. You will repeat this progression until you reach the desired color. Finally, rinse the piece in soapy water with diluted baking soda to remove any LOS residue that may allow it to continue developing. (Please note: Do not RUB your piece with a soapy baking soda paste or thick mixture, as the abrasiveness will remove some of the patina.)

Another method is to heat the LOS on the cup warmer, dip the metal clay piece, and finish with the cold water bath and soapy water rinse. I use this method to achieve more even coverage on pieces with varied, high-low or surfaces with multiple levels because they tend to heat up unevenly on a cup warmer, since portions of the piece may be touching the warming plate, while other surfaces may not have full contact.

You can vary this process as long as you latch onto the basic concept that heat helps develop the color and the cold water retards development. For instance, I often use my heat creatively by dipping my piece in the LOS, putting it on my cup warmer to develop, and then proceeding to the cold water bath and soapy rinse. Watching the piece develop this way right before your eyes is just so exciting!



Patina Sampler

Here are a couple of helpful hints before you begin.

Don't try to develop the color in one big jump or it may flake off.

When your hot water cools off replace it.

When your cold rinse water warms up or gets yellowish from the LOS, replace it too.

If you have glass, stones or delicate includes, do not use the cup warmer, just use warm water. Inclusions may crack from thermal shock if the water is too hot or if it heats up too quickly, so be patient and work up the color slowly.

For subtle coloring, work warm, not hot. Make sure to stop the developing process, when you like the color — even if you let a piece sit for a couple of minutes, it will continue to develop, possibly past your intended color.

On to the Fun Stuff

I encourage you to experiment with the techniques and recipes below. Vary them and combine them for different effects because this is the only way you will understand the dynamics of what LOS can do. Make a sample set for yourself and label the process, so you know what you did. For your samples, make pieces with textured surfaces and mirror finished surfaces. My “Patina Sampler” has the texture of sandpaper on the front and a mirror finish on the back. (“Back of Patina Sampler”). Use any texture or finish you’d like, this will give you a chance to see how a patina and the color will develop and how it is effected by each. If expense is an issue, reuse the same piece over and over again by choosing one of several methods listed below for “Removing a Patina”. I also keep a “test” piece handy so I can test the patina solution I made that day before proceeding to my “good” piece. Please be aware that on any given day your mixture and heat source may be slightly different which may alter your results, but experimenting should certainly help take some of the guess work out. Also keep in mind that you can alter your solution or heat along the way, as mentioned above. So be brave, and enjoy the unexpected journey of discovery!

Traditional Antiquing

(i.e. black crevices, bright highlights)

What you need:

- basic process
- polishing cloth

Start with a metal clay piece that has been polished to a mirror finish. If you scratch brush your piece then burnish it or put it in a tumbler for 45 minutes or more, that should work. Use the basic process to patina the whole piece until it reaches a nice dark black. For faster results work with hotter temperatures, and longer LOS soaking. Again, build up the color gradually verses doing it in one big jump. After the final soapy rinse, dry the piece and rub the “highlights” off with a polishing cloth. See the drama and depth that you have created!

The look of Hematite

What you need:

- Traditional antiqued method
- Tumbler with stainless steel shot
- Non abrasive hand soap or burnishing solution.
- Polishing cloth (optional)

Let’s try something slightly different with the “Traditional Antiqued” method to get the metal to look like a reflective deep gray to black that is very similar to the look of the mineral hematite. After you apply the patina, you may choose to remove or not to remove the highlights with the polishing cloth. Put the piece in the tumbler, add a 1 - 2 tablespoons of hand soap or, the recommended amount of burnishing solution and fill the tumbler with water about an inch above the steel shot. Close and tumbler for 20 - 30 minutes or so. Wow what a sheen!

Steely Gray/ Steely Blue-Gray Brushed Finish

What you need:

- Basic process
- Stainless steel or brass brush
- non abrasive hand soap

Let your metal clay piece progress through the steps until you reach a gray or blue-gray color. Use a steel or brass brush and a bit of hand soap to scratch brush the surface to get a steely effect. Notice the more you brush the lighter the color. A stiff brush will have a more aggressive effect than a soft brush. This is a nice soft and subtle patina that can have a sophisticated look!

Iridescent Effects

What you need:

- Basic Process
- Ammonia

Adding a tablespoon of ammonia turns the basic process up a notch. All the basic colors are intensified and have a stunning iridescent effect. The golds are brighter, the blues are more saturated, and the purples pop. Ammonia in my opinion, adds an additional element of wonder because it seems to make the LOS mixture be more sensitive. You are likely to get a tonal range verses a flat color. For instance, a pink area may have a subtle pink to bright magenta. If you are particularly interested in a very specific effect, a test piece may be the answer. Be adventurous



Antiqued/Mirror Finish



The look of hematite



Steely Gray Brushed Finish

and watch how a kick of color can change your whole piece!

Layering color

What you need:

- Basic Process
- With or without Ammonia
- Scratch brush
- Polishing cloth
- Small brush

Try dipping your piece in any recipe of LOS and letting it develop to one or two shades past gold or light brown. Put in the cold water bath as usual. In one area of the piece try brushing or selectively removing the LOS with a polishing cloth, wash in soapy water to remove hand grease and polish, then dip it back in the LOS. You'll notice the patina that was NOT removed initially will continue to develop to a darker shade, while the lightened area where the LOS was brushed or polished off a bit becomes gold.

Also try applying LOS to selected areas with a small brush. If you have small details or a small spot you want to be darker, you can put the piece on a cup warmer and apply with a small brush saturated with LOS. Make sure the other areas have no LOS residue on them or they will get darker as well, so wash in the sudsy, baking soda water mix first.

Resists and Developing Color on Portions of the Metal Clay

What you need:

- Resist
- Resist remover
- Basic Process, plus any recipe of LOS

Resists prevent the LOS patina from penetrating in a specific area and preserves the metal underneath the resist. This technique can create some very interesting patterns or it can be an easy way to preserve small areas of the piece. Double check that your resist coverage is solid or your results will look streaky due to uneven application. If while applying your resist you make a mistake, use the solution that accompanies that particular resist below to remove it. Continue with the "basic process" and let the color develop to the desired color. Darker patinas create the best contrast. You can also achieve other more subtle effects with lighter patinas.

Sharpie® Pen Resist

What you need:

- BLACK Sharpie® Pen
- Alcohol

Use a fine point or broad head BLACK Sharpie® marker and apply it to the areas you DO NOT want the patina. Don't make the mistake I did and use another color Sharpie®, black is the only color that works. Remove the marker by soaking the piece in alcohol for a couple of minutes. Rub the alcohol off GENTLY with a q-tip. The alcohol alone will not remove the patina, but aggressive rubbing will if not careful.

Nail Polish Resist

What you need:

- Nail polish (an easy to see contrasting color)
- Nail polish remover (acetone)
- Fine brush

Follow the steps above replacing the marker with the nail polish and the alcohol with the nail polish remover. You will find when working with paint that you can get a nice fluid line enabling you to vary the quality of the lines width to add additional interest.



Layering Color

Wax Resist

What you need:

- Bees Wax
- Small brush or kistka
- boiling hot water

To apply wax with a brush, heat the wax on a cup warmer to make it molten and paint the design on with a brush as if it were thick paint. You can also use a kistka which is used in Ukrainian egg decorating. They can be purchased at a hobby store and come in several sizes which allows you to draw thick and thinner lines. They come in electric and manual models. For the manual ones: (a) Heat the bowl of the kistka with the flame of a candle. (b) Use the hot bowl to scoop up the bees wax. (c) The wax will stay in the bowl until you touch the tip down onto the metal surface. (e) The wax is usually a white or yellow color, after it gets hot from the bowl of the kistka the wax will turn black.

I have never tried the electric model, but it is reported that the electric ones keep the wax hot in the bowl for the duration of your work session and create a nice fluid line. To check your lines before you apply wax to your work, experiment on a piece of paper. You can get very intricate detail with a bit of practice, a steady hand and the use of a kistka.

To remove the wax submerge in boiling hot water. If you have stones or sensitive inclusions be careful with the temperature of your water. If it is too hot, you will cause thermal shock, so either use another resist method or be prepared to remove the wax more slowly with warmer water.

Contact Paper or Tape Resist

What you need:

- Use Contact paper or tape with a good adhesive that does not leave a residue behind, but lies flat from edge to edge. Packing tape, electrical tape, or good contact paper are several options.
- Exacto® knife
- Punches
- Scissors

Cut or punch out different shapes and apply them to the metal surface. Make sure you burnish them down flat with a burnisher or the back of your finger nail, so the LOS will not seep under the edges giving you less than a crisp, clean look.

To remove the tape, carefully lift the corner of the tape with your finger nail or an exacto knife and peel back the tape. Be careful not to scratch the metal if using a knife. You can get some nice hard edged or precision shapes while creating interesting patterns with this technique!

Protecting the finish

LOS is a patina and in general patinas are not permanent. If not treated or finished, the surface effects over time will rub off. You should not have a problem in the crevices of your piece, but the "high" areas are more prone to being brushed against or rubbed off. There is however, a couple recipes that can help the patina to stay on longer.

Beeswax and Naptha

What you need:

- 1 part beeswax
- 1 part naptha
- Air tight storage jar
- Cotton swab
- Soft cloth

Use small beads of beeswax and naptha mixing one to one. I obtain the naptha from a drug store or cigar shop since naptha is essentially lighter fluid. Mix the beeswax with the naptha until it is the consistency of cake icing. It does have a slight smell from the naptha, but it will not remain on the jewelry. (This was of course my first concern.) Put on a THIN layer with a cotton swab, let dry, and buff lightly with a clean cotton swab or soft cloth. If you apply too much wax, you will need to be more aggressive removing the wax and possibly some of the patina, but if applied in a THIN layer, you should have no problem preserving the finish as intended. If the mixture thickens over time add more naptha to thin it out. Obviously, please don't use this mixture near a flame.

*Applying Wax
with a Kistka*



a



b



c



d



Back of Patina Sampler- Mirror finish with wax resist

Renaissance Wax

What you need:

- Renaissance Wax
- Soft cloth

Warm up the wax a bit between your fingers and apply a THIN layer of the wax with your fingertip, then follow the directions as with “Beeswax and Naptha”. Some people report that during the buffing stage you may inadvertently remove some of the intensity of the patina. In addition, hand oils can dull the finish a bit, but if you gently buff, you should be able to restore the nice sheen.

Lacquer

What you need:

- A good quality clear wood lacquer
- String to suspend your piece
- Clear air, wind free spraying area
- Newspaper

Buy your lacquer at a hardware store that sells wood stains and lacquers. They come in high gloss, satin sheen, to matte finishes. Lacquer will give your piece the most protection over a period of time, if you desire that type of finish. When I use lacquer, I like the satin finish best because it gives the piece a protective coating and a nice sheen without being “artificially” too shiny. If you use a quality lacquer finish, it should thin overtime, instead of chip or flake off and it should not turn yellow.

Before applying, it is imperative that you have a piece that is squeaky clean and free of wax or oils of any kind. The soap and baking soda solution should do the trick. Suspend your piece over an area covered with newspaper. Apply two coats to each side of the piece letting it dry in between layers.

In the event you have used a wax resist technique, you will want to be sure all wax residue is gone. To insure this, double rinse your piece in boiling water, first by dipping in a container of boiling water and then by pouring fresh boiling water over both sides of the piece. Since the wax will rise like scum to the top of the water, residue may still remain on the piece after dipping, therefore the second rinse is necessary. Finally, clean your piece with denatured alcohol and the sudsy water baking soda bath.

Removing the patina

Ok, you did some experimentation and you hate the way some of your samples came out or things didn’t go quite as planned, so now you want to know how to remove the patina. Well, there are a couple of things you can do to “save” your hard work. When selecting a method consider this basic rule. If you have heat sensitive stones, glass, or other sensitive inclusions, any method using extreme heat or boiling water is a no no and you may ruin your piece by causing the inclusions to crack or fracture. I recommend you try the tarnish remover method listed below instead.

Heat from a Torch or Kiln

Heat from a torch or Kiln will remove the patina and restore it back to its original state before you applied the LOS. After using heat, you will need to take steps to restore a mirror finish if you have one.

Using a Torch

What you need:

- Torch
- Solder block
- Long handle tweezers
- Eye protection
- Ventilation

Place your piece on a fireproof solder block, holding the torch several inches from the piece apply heat in a circular motion. Be careful not to over heat or you may risk melting your piece. You will soon start to see the patina disappear. Use the tweezers to flip the piece over and repeat on the other side. Always use protective eye wear and good ventilation when using a torch.

Using a Kiln

What you need:

- Kiln
- Kiln shelf
- Kiln gloves

Place your piece on your kiln shelf and turn on the kiln. As the piece heats up the patina will soon disappear. Remember to wear your kiln gloves to remove the piece and use good ventilation.

Tarnish remover

What you need:

- Bowl
- Spoon, tweezers or string

A tarnish remover will remove a patina as well as tarnish. Some solutions are toxic, so use proper ventilation, gloves, and eye protection. Simply follow the directions on the bottle which are slightly different for each brand. In general, you will simply dip your piece in the solution and the patina will instantly be removed. After dipping scrub any residue left by the tarnish remover with sudsy water and baking soda, then rinse well.

Tarnish Remover Home Recipe

What you need:

- Plastic or heat resistant glass bowl
- Aluminum foil
- Boiling water

Line the bowl with the aluminum foil, add jewelry, cover with **BOILING HOT** water, and sprinkle with baking soda over all. The baking soda should start to bubble and the tarnish will settle on the aluminum. When the water cools a bit and the bubbling stops your piece should be shiny. For deep crevices, I've had to repeat the process. When finished rinse your piece well.

A Final Note About Coverage

A couple factors can effect the coverage you will achieve. Some finishes as stated above have a varied tonal quality, others more consistent and flat. Dirt, wax, skin oils and even chemicals in your water will resist even coverage. It is important to start out with a **SQUEAKY CLEAN** piece of fired and finished metal clay for the best results. If you must handle your piece use tweezers or hold it on the edges.

Different finishes will develop differently. A piece fresh from the kiln will be take a different patina than a piece with a mirror finish. Varied finishes on one piece can result in very interesting visual effects, however a piece that has an inconsistent finish due to poor craftsmanship may look spotty.

I hope that any intimidation you may have experienced in the past has turned into an overwhelming excitement to experiment. Your curiosity and enthusiasm should soar you past the unpleasant smell of Liver of Sulfur allowing you to open up a whole world of possibility, extending your visual and creative pallet to where it has never gone before.

Holly Gage of Gage Designs creates original jewelry designs with a gentle blend of art and soul. Holly will be presenting, "Everything You Ever Wanted to Know About Liver of Sulfur at the 2006 PMC Guild Conference in July at Purdue University in Indiana. Her jewelry and articles on Metal Clay techniques have appeared in several national and regional publications. As a certified instructor, she hopes to inspire her students to create from the heart, believe in what they create, and take their talents to the next level. Holly can be reached through her websites at, www.HollyGage.com and www.WhenPeaceTalks.com

