

Fusing and Granulation with Argentium Silver By Cynthia Eid

Science

Argentium Sterling is wonderfully easy to fuse. My understanding of why AS is easier to fuse than Fine Silver is that because FS is a pure metal, it has a specific temperature point at which it melts and fuses. Alloys have ranges of melting temperatures, and AS has a very wide range of temperatures at which it melts and fuses. The large temperature range makes AS "forgiving" for fusing, compared to most other silver alloys.

Philosophy

I believe that there can be more than one "right way" to do something. The right way for you is the way that works for you. For instance, Ronda Coryell is an expert at fusing and granulation, yet I prefer to do some things differently from her. Though this handout should help with fusing Argentium Silver, I recommend Ronda Coryell's DVDs on this topic.

When to Fuse? When to Solder?

Since fusing melts the surface of the AS, and soldering occurs at lower temperatures without melting the surface, fusing is a higher risk process than soldering. I generally fuse early in the process of making a piece. The more time and material I have invested, the more likely I am to choose to solder.

Putting the Torch Heat on the Argentium Silver

Argentium Silver does not conduct heat in the way of traditional sterling alloys and copper alloys---the heat tends to stay where the torch has been. If you have experience with soldering gold or pewter, you will find that they conduct the heat similarly. So, whether I am fusing or soldering, I give the metal a bit of overall heat, and then focus on one area at a time. When that area fuses, I move the torch to an adjacent area. Put more heat on the largest piece of metal, since both the large and small pieces of metal need to reach the same temperature, in order to fuse.

Process

- Prepare the joint so that the metal is clean, and meets well.
 - The joint does not need to be "perfect", but the better the fit, the easier it is to make a nice smooth joint that does not show. Metal will not tend to jump across a gap. It is best if the two parts touch.
- Use a heat-reflective soldering surface.
 - My favorite is solderite; Ronda's favorite is charcoal. Find your favorite!
 - It is ideal to use a block that is used only for AS, to avoid contaminating the surface, thus preserving the tarnish-resistance.
 - Use a smooth surface, because it is common to have a bit of texture transfer from the soldering board, especially if the metal is over-heated.
- Flux
 - Flux the joint, only. For tarnish-resistance, allow oxygen access to the surface of the AS, except for the joint.
 - If you are using charcoal, which creates an oxygen-free atmosphere, flux the entire exposed surface; otherwise, firescale may occur.
 - When fusing granules to sheet, I usually cover the surface with flux, which is a good temperature indicator.
 - My favorite flux for AS is Rio Grande's My-T-Flux, but Battern's and Auflux also work well.
 - How to apply liquid flux so that the entire surface is covered:
 - Clean the metal. A greasy surface repels liquid. Metal that has been heated, pickled, and rinsed is clean. Heat burns up grease and finger oils. Pickle removes scale and oxides. Putting metal in the pickle without annealing or soldering will not clean the metal. Other ways to clean the surface include: scrub with a scotch brite pad; scrub with pumice and water; scrub with a brass brush and detergent. Metal is grease-free if water "sheets off" the surface, rather than beading up.
 - Apply the flux with a brush or sprayer, then heat the flux gently, with a soft flame, to dry it to a white powder. Use a smaller flame than you will use for fusing. If there are bare areas after the flux dries, lightly dab more flux on the bare areas, and gently heat again. Don't let the brush be *too* wet, or it can liquefy all the dried flux. Ideally, the metal is hot enough that the flux dries immediately upon touching the metal. Very brief applications of heat alternating with dabs of flux works best. If the metal discolors, that indicates that you are

overheating. Continue to alternate between applying flux and heat until the metal has a white coating. I like to use natural bristle brushes, which handle heat better than plastic.

- Though it is possible to fuse dirty metal that does not touch well, without flux, those are not ideal conditions for consistent success.
- Do what is necessary for you to see the joint well when the metal fuses.
 - I like to set things up so that the joint is near my eye level. I do this by raising the soldering surface, or lowering the chair, or both.
 - I like to wear a magnifier so that I can see the joint well. I have found that it is not always enough to see the surface liquefy. But, if I see the joint flow, then I KNOW that there is a strong fused joint.
 - I like lots of light, but Ronda likes to dim the lights. What is right for you is what works best for you.
- Heat the areas adjacent to the joint.
 - All the parts to be joined need to reach the same temperature, so put more heat on the large parts.
 - Avoid using a too-small flame for too long. The flux can break down, and the metal can oxidize, preventing fusion.
 - It is important to not try to “heat the whole thing” when working with AS. After a bit of overall heat, I start at one end and heat areas sequentially. Keep the torch moving in a back and forth or circular movement with the torch over a small area. When the metals fuse in that area, move the torch flame to the adjacent area and heat until that flows, then move to the next area, etc. The first area takes the most time, and then each subsequent area takes less time
 - Watch the flux—it is a good indicator of temperature.
 - When the flux separates into tiny droplets, then you know that the metal is almost at fusing temperature.
 - The surface of the silver melts and looks liquid. Some people say it looks like mercury.
 - If the wire or granule melts, but not the surface, that means that you need to move the torch around a larger area, and avoid putting the heat directly on the smaller part to be fused.
- When the metal fuses, the joint looks to me like it has been soldered---I see a “fillet” of molten metal at the joint. That is what I watch for, whether I am fusing a joint in a ring, or a granule to sheet.
- Do not be afraid to bring it back to fusing temperature, in order to be sure that you have a good joint. It is also perfectly ok to re-do the whole thing after pickling and rinsing well, if the joint did not fuse well.
- Remember that AS is fragile when red-hot. Let the metal cool a bit before touching or moving it. It is okay to quench at “black heat”, but quenching at red heat may result in cracking or breakage. In practice, it can be difficult to assess when black heat has been achieved. In my experience, it is okay if the water hisses and sizzles when the silver is quenched, but the piece was too hot if the water seems to boil or explode. As with all metals, I air-cool flat pieces completely because quenching warps flat metal. It helps prevent warpage of a flat piece to cool it on a flat surface.
 - Allow it to cool to at least black-heat before touching it with tweezers.
 - Both quenching and air-cooling are okay. See the Annealing & Quenching handout for more info.
- Surface discoloration is normal, and not to be concerned about. Argentium is HIGHLY tarnish-RESISTANT, when correct procedures are followed. That does NOT mean that there will never be any discoloration. If things have been done correctly, however, that is SURFACE discoloration, rather than firestain under the surface. The discoloration comes off in the pickle, just like with traditional SS and copper alloys. Even gold alloys get surface discoloration. After a few more heatings, the surface will be depleted of copper, which is what is darkening----just as with traditional SS.
- Pickle, rinse well, and finish the piece.
- Radial bristle discs are terrific for smoothing around granules without changing the forms.
 - Fusing usually leaves a slightly “frosty-looking” surface.
 - You can choose to enjoy the contrast between that surface and highlight the granules with a brass brush and soapy water, or a fine bristle wheel with polishing compound, or a fine radial bristle disc
 - If you want to have a smooth, polished surface all over, it is good practice to polish with a progression of radial bristle discs each time you fuse. Otherwise, the texture of the surface after multiple fusings can be very difficult to smooth.

(See other handouts and articles for finishing tips to maximize tarnish-resistance.)