

Silver Soldering for Jewelry

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Silver Soldering is the process of joining two or more pieces of metal together by the use of an alloy called solder. The **flow point** of the solder should be lower than the **melting point** of the metal(s) being joined.

- *Melting Point - The point at which the metal, under heat, begins to lose its structural integrity, i.e.: the crystalline structure begins to break down.
- *Flow Point - The point at which the metal becomes liquid.

Steps for Successful Soldering

1. **Fitting** - The pieces to be soldered must fit together closely in a tight, even joint. When held together up to a light, little or no light should be visible through the crack. If fitting is done properly, this will result in a solder joint that is:

- *Stronger
- *Nicer looking
- *Easier to solder

2. **Cleaning** - Solder will **NOT** flow on dirty metal. The metal must be free of grease, oils (including finger oils), dirt, oxides, buffing compound, etc. Any of the following may be used to clean the metal:

- *Soap and water - for grease, oil, buffing compounds or light dirt.
- *Sandpaper, scotch pad, or file - for oxides or dirt.
- *Pickling acid - for oxides.

Avoid the use of steel wool to clean metal as it is often coated with a light layer of oil to keep it from rusting. Also, any steel wool particles left on the metal can be soldered in place, resulting in rusty spots.

3. **Fluxing** - There are many kinds of flux. They vary in the way they “wet” the solder when it flows and in their protective qualities for keeping firescale off the metal. For silver soldering, white paste flux is a good choice. It holds up well and will allow the solder to flow easily. White Paste Flux is a mixture of mostly borax and water. It protects the surface of the metal from oxidation during the heating process. **Flux must be used wherever solder is to flow.** Flux is also an indicator of temperature. The flux becomes glassy at approximately 1200°F. Flux should be “pasty” in consistency. If needed, add distilled or purified drinking water - but **do not** use tap water - the mineral content is too high and the flux will not keep the metal clean. Overheating or prolonged heating will make the flux breakdown. Flux can also serve as an “insulating” material - that needs to be taken into account when considering how the metal is heated.

4. Heating the Metal - The pieces of metal being joined should reach the flow point of the solder **at the same time**. Begin by using the "brushy" part of the flame to heat the areas adjacent to the joint. Once the flux becomes "glassy", center-in on the solder joint by moving the flame closer (approximately 1" from the light blue cone) and heating directly on the joint in addition to continuing to heat the surrounding metal. Be sure to take size, heat sinks, and metal alloy into consideration when deciding where to heat.

Solder will flow toward heat. On long solder joints, the solder can be drawn down a joint by heating the joint in front of it.

When soldering an enclosed hollow area, provide an escape for steam and gasses. These expand rapidly during the heating process, and if not vented, can cause the piece to "explode".

5. Pickling - Pickle is a chemical bath used to clean the oxides and flux from the metal after soldering. Once the metal has cooled after soldering, gently place the piece in the acid. Pickle will work at room temperature, but works faster when warmed. **Never** allow the pickle to boil. When mixing new pickling acid, **always add acid to water!** Baking soda will neutralize spills and should be kept nearby. Pickle can be stored in glass or plastic - but never metal.

Steel or iron of any sort should **never** come into contact with the pickle. Pickle is an acid and when used to clean sterling or karat golds, etches some of the copper molecules, which go into solution. If a steel item is used in the pickle, it creates a galvanic process, which deposits copper on any metal pieces in the acid. The thickness of the copper coating depends on the amount of copper in solution at the time. When the steel is removed, the pickle is "de-activated" and will no longer cause a plating reaction. In short: **If a magnet will stick to it, don't put it in the pickle.** This includes: tweezers, binding wire, cotter pins, pliers, "T"-pins, pin stems, springs (in spring rings), etc.

Solder

There are 5 grades of jeweler's silver solder. The differences in the alloys affect the melting point, the flow point, the color, and the working properties of the solder.

<u>Name</u>	<u>Ag</u>	<u>Cu</u>	<u>Zn</u>	<u>Cd</u>	<u>Flow Pt. F°</u>		
"IT"	80	16	4		1490		
Hard	76	21	3		1425	_____	□ #75
Medium	70	20	10		1390	_____	△ #70
Easy (Soft)	60	25	15		1325	_____	○ #65
Extra Easy	50	15	15	20	1270	_____	∩∩∩

Solder Hints

- Solder should be labeled by grade. If there are no markings, it is almost impossible to distinguish one from another or from sterling wire.
- Over heating solder can result in "boiling" -- and in solder pits.
- Each time a solder is flowed, its melting point is slightly raised (approximately 25°F). This can aid in multiple joint construction.
- **It is better to solder five times than to solder once with too much solder!**
- Lead Solder should never be used in the same working area as silver or gold. These solders will create pits in gold, silver, copper or brass when heated above 500° F.

The Torch

Many torches are available for jewelry making. In class, we use acetylene/air (San Diego) or natural gas/oxygen. Acetylene gas has the advantage of forming a clean, quick-heating flame, which can be used for large or small soldering purposes. There are several tips available in a range of sizes.

Torch Hints

- Hold the torch in your **left** hand (for right-handed people) and the solder pick or tweezers in your right hand.
- When soldering -- watch the **metal** -- **not** the fire!
- **Never** light a torch unless you understand how it works.
- Nothing combustible is allowed on the solder table.
- To ease strain on the regulator, bleed the torch hose at the end of the workday. Re-close the valve after bleeding the hose.
- Tie back long hair (or anything else which will catch on fire.)

A Final Note: When possible -- finish the metal (sand and polish) before soldering.