# And Furthermore: More Info about Argentium Silver

**What is germanium?**
Germanium (Ge) is an element similar to tin and silicon. It is a metalloid-- not quite a metal. (Don't worry; I didn't remember it from science classes, either!)

**Why does germanium enable Argentium® Sterling silver to be hardened?**
The differing crystalline structures of germanium and silver/copper crystal interlock, making the metal harder.

**How did germanium come to be alloyed with silver?**
A company named Metaleurop, whose primary product was zinc, found that they had a lot of germanium as a by-product of refining zinc ore. In hopes of finding a market for germanium, Metaleurop sent samples and inquiries to people in many different areas of expertise, including Peter Johns at Middlesex University in the United Kingdom.

**Firescale---what it is, and why it occurs**
Silver is one of the few metals that allow oxygen to penetrate the surface. During annealing or soldering, oxygen attaches to the copper under the surface of traditional sterling silver--- this is firescale—also known as firestain (Cu2O, or cuprous oxide). This dark layer is under the surface of regular sterling silver, and does not come off in pickle. Firescale can be *removed* by polishing, strong acid, or electro-stripping. Firescale is often *covered* by plating or by depleting the copper from the surface through repeated heating and pickling (often called "depletion gilding" or "bringing up the fine silver").

**How does germanium prevent firescale?**
Germanium is an "oxygen grabber". Ge is more aggressive about grabbing oxygen than copper. The germanium combines with oxygen, to make Germanium oxide, $GeO_2$. The germanium oxide prevents oxygen from penetrating the surface of the metal. Since oxygen cannot get inside the metal, Cu2O (firescale) cannot form. Argentium may discolor from soldering or annealing, but the discoloration is only on the surface, and it comes off in pickle.

**I'm not sure if this piece of metal is traditional SS, or if it is AS. How can I tell which it is?**
Here is how I test a piece of metal to find out if it truly is AS: first sand, scrape, tripoli, or otherwise abrade the surface to make sure there isn't a fine-silver or germanium oxide surface coating. Then heat the metal with a SMALL torch flame, being sure to take the flame off the metal occasionally to let oxygen at it. If the metal is traditional sterling, it will turn black and stay black. If the metal is Argentium, it may turn black, but as you keep heating, the germanium and germanium oxide do their thing, and the metal will turn whitish again. Traditional sterling stays black. It can be helpful to test a known piece of each alloy at the same time, to compare results.

**Hallmarking & Trademarks**
Argentium® Sterling silver is a registered trademark. When marking a piece made with Argentium, the only legal requirement is to stamp it as "925" or "sterling silver," since Argentium is sterling silver. In the near future, Argentium suppliers and manufacturers will supply stamps with the Argentium® Sterling mark or the artwork necessary to make tags or stamps.

**Scrap**
You don't need to separate AS scrap from traditional SS scrap. It is all sterling.
If anything, the Ge will improve the SS.

**I've fallen in love with AS! What do I do with all the traditional Sterling that I already have?**
*Option A:* Combine it with AS, to use it up. Many people simply solder them together. There will be differences in tarnish resistance, and it could be a little tricky to deal with they way they conduct heat differently, but many people have told me they have no problem with combining the two alloys.
*Option B:* Sell your traditional SS to someone who does not like AS at a price that is between scrap value and retail. This can make both parties to the deal happy.