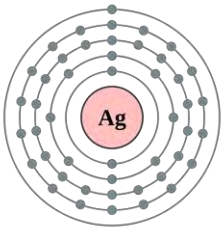
Fabricated vs Sintered Silver

By Pam East



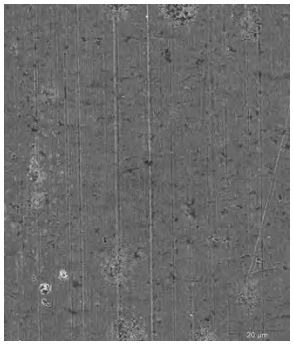
Silver Atom

As you deepen your journey into jewelry making, understanding some of the physical properties, strengths and limitations of metal will help you make better choices and increase your success.

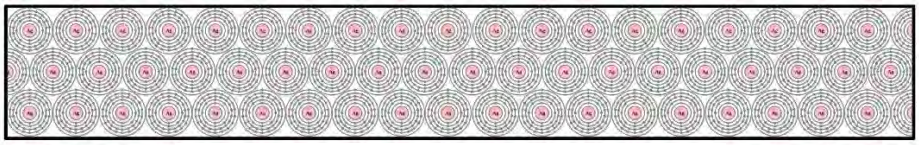
While these concepts apply to all metals, I'll be focusing this article on Fine Silver, which is a single element rather than an alloy.

What is Fabricated Metal?

Fabricated metal is melted, poured into ingots, and then passed through rolling mills to create sheets or wire. This process creates a dense, cohesive piece of metal without breaks or gaps. The fusing of the atoms to one another is complete. It's this long, unbroken chain of silver atoms that gives it flexibility. It can be folded and hammered many times without breaking. The chains may get kinked up and stiff (work hardened), but the atoms are still linked. This work hardening, or stiffness, can be eased by annealing, which involves heating the metal to relax the kinks allowing the metal to be worked further.



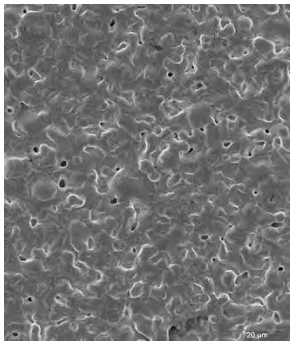
Fabricated Fine Silver
SEM 20um



Fabricated Fine Silver. All atoms fully fused

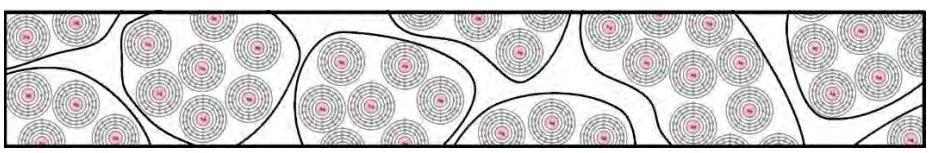
What is Sintered Metal?

Sintered metal is made by powdering the silver. The resulting powder can be packed tightly into molds for commercial tooling, but for hobbyists the most common use is metal clay. To make metal clay, the powder is mixed with organic binders and water to create a workable clay-like substance. Whether packed or clay, it is then fired at high heat nearing, but not reaching the melting point of the metal. With time and heat the binders burn away completely, the powder particles form bonds to each other and compact, creating a solid, but porous, metal piece.



Sintered Silver Clay
SEM 20um

Sintered metal is not flexible in the same way as fabricated metal. The silver atoms are fused within each particle, but the particles themselves only fuse where they touch, leaving gaps. Higher and longer firing will compact the metal and reduce these gaps, increasing flexibility to some extent; however, they can never be eliminated completely. The gaps create weak points where the particles may break apart from each other when bent.



Sintered Fine Silver. Atoms fused within particles, but particles only fused where they touch

Strengths and Weaknesses

Fabricated metal has greater tensile strength. It's more flexible and can be bent and folded easily. However, creating deep detailed textures requires more complex methods of engraving, etching, chasing and/or repousse. Joining pieces and creating hollow or other complex forms requires soldering and host of other costly and/or difficult techniques.

Sintered metal has less tensile strength, but it can be deeply textured with complex designs and cut out quickly and easily. It also lends itself well to sculptural forms. Joining parts can be done before firing with little more than water. The investment in time and equipment is low. However, it is only somewhat flexible and can only be worked a little after firing.

Why is all this important?

When you are planning a jewelry project, knowing how much the metal needs to bend after firing should play a role in your metal choice. When fired correctly sintered metal can easily be domed, and you can make minor shape adjustments. The trick is in knowing how much to ask of it. And more importantly, how much of a risk you are willing to take?

I recently did a couple casual polls on the MCN Facebook group. I am well aware the poll was not "scientific" and there are many factors that go into success and failure, but for the purpose of risk/benefit analysis it's still informative.

In the first poll I asked people who had made a cuff bracelet or adjustable ring with metal clay if it had broken after firing. I got 98 responses. 53% reported the bracelet or ring broke either immediately or after wearing for a bit. 47% reported their project hadn't broken and they still wore it.

As a control group, I did a second poll asking how many people had had earrings break after firing. I got 251 responses. 80% had never had a break. 17% had one or two break, but not a measurable percentage of all the earrings they'd made. Only 3% reported any measurable amount of breakage. I'd essentially call that a 97% success rate.

Here's where the risk/benefit analysis comes in. Are you willing to invest the time and materials into a project that may have only a 47% success rate?

Some will cite firing issues or other factors, and while these certainly contribute to success and failure, it's important to remember the issues created by the nature of sintered metal itself. An adjustable ring or cuff bracelet is designed to flex when taking it on and off. While that is not a problem for fully fused, cohesive fabricated metal, it puts significant strain on sintered metal. With continued flexing over time, the weaker bonds may start to fracture and break apart.

Moving Forward

Armed with this information you can better evaluate projects. For example, If you want something to be able to flex after firing, choose fabricated metal. That doesn't mean you can't make domed earrings, or complex forms with sintered metal. You absolutely can! Just remember what you're going to ask of it after firing.

Also, fabricated and sintered metal are not mutually exclusive. They are just different tools in your toolbox. You can create lovely deeply textured pieces and solder them to sheet metal for added flexibility.

It's all about choosing the right tool for the job.

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