Casting with Argentium® Silver 935 Pro

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Introduction

Rio Grande regularly casts findings using Argentium® Pro 935 silver grain and we have enjoyed excellent results with this innovative metal. Here is a look at some of our methods and techniques for ensuring dependably good cast parts.

Quenching

After casting, we hold the cast flask for 15 minutes and then quench in water. The cast tree comes out of the investment nice and white. The as-cast hardness of the Argentium® Silver sterling is a little softer than traditional Ag-Cu sterling, which makes the parts easier to clip off the tree. We have found that, by quenching after 15 minutes, there are no difficulties such as cracking, and we can age-harden the metal without performing a solution anneal. The investment is still hot enough that devesting is easy.

Casting Parameters

We use the same casting parameters for traditional sterling and Argentium® Pro 935 (except for quenching time—traditional sterling flasks are quenched after only three minutes). Our casting temperatures are uniformly lower than those recommended for traditional sterling. I think alloy manufacturers fudge the recommended metal and flask temperatures to help compensate for inadequate sprue size; they get many complaints about incomplete filling from casters who followed the recommended temperatures but neglected to consider the influence of their sprue system. If a pattern does not fill completely in Rio Grande's processes, we adjust the feed sprue until we get the results we need rather than increasing casting temperatures for a surface to volume ratio category item. This give us the benefit of better as-cast surfaces and we can recycle the sprue metal easily because it does not become contaminated due to thermal investment reaction.

Recycling Argentium® Sprues and Trees

After casting, we cut the parts off the tree first, setting them aside for finishing. Then we clip the feed sprues as close to the main sprue as possible and set aside both feed and main sprues for recycling. To recycle the sprues, we tumble them in water and burnishing compound overnight. Tumbling is the only way we have found to reliably clean all the investment off the sprues. All sprue metal is granulated before it is used for casting again. By cleaning the metal thoroughly and controlling the atmosphere during melting, we are able to re-use Argentium sprues again and again.

Heat Treating Argentium®

We heat-treat all our silver (traditional and Argentium®) before finishing by heating it to 300°C (572°F) for one hour. (I notice that the latest recommendation says to heat-treat for two hours; we will try that to see if it improves the hardness.) After heat-treating, the Argentium comes out noticeably harder than traditional sterling. We find that the hardness can be further improved by solution-annealing the castings before the age-hardening heat treatment but,

Heat Treating Argentium® (continued)

from a practical point of view, we find that the extra step does not make enough difference to be worth doing. In mass finishing tests we see a vast difference between the finished products finished with just their as-cast hardness and those finished after age-hardening for both traditional sterling and Argentium sterling castings. The products finished with only as-cast hardness are not nearly as nice as the same products when finished after age-hardening (tested using the same finishing processes). We could not, however, see a difference in the finish quality of pieces that were hardened with both solution-annealing and age-hardening versus those that were only age-hardened.

Argentium® and Firescale

Argentium® Silver is very resistant to the deep firescale (fire-stain) that can form in traditional sterling. This resistance is due to the formation of an invisible surface film of germanium dioxide (GeO_2) that blocks oxygen when the metal is heated. The presence of this GeO_2 film also accounts for the bright whiteness of the as-cast tree when it emerges from the investment. It should be noted, however, that in the finishing process, the GeO_2 film is removed and the tarnish protection is gone. Therefore, after finishing and cleaning, it is advisable to help renew the tarnish resistance by performing a low-temperature heat treatment. This is done by placing the pieces in an oven at 100°C (212°F) for three hours. Note also that, over time, at room temperature, a new oxide film will self-generate on its own; this is a good feature because, just by being worn, the protective film on jewelry can be rubbed off, but will return by itself.

Conclusion

In production, we do not see any downside to Argentium® Silver. No special casting parameters are required, it recycles well, and it gets adequately hard when it is age-hardened without the need for solution-annealing. After age-hardening, the metal will take a beautiful finish. It has excellent fire-stain resistance and good tarnish resistance when the GeO_2 film is generated. And, the thing I like the most about Argentium Silver is the color; it is noticeably whiter than traditional sterling silver and just attracts my eye when it is next to darker or grayer sterling alloys. Both the attractive, bright-white color and the high resistance to tarnish are strong benefits for casters and, ultimately, strong selling points for customers.