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# Avoiding Metal Mistakes

*How to work with a supplier to get the right alloy for your needs*

BY SHARON ELAINE THOMPSON

**IF YOU'VE EVER WORKED WITH A METAL** that was too hard or too soft, or that oxidized, pitted, or didn't flow, you probably blamed the metal. And you may have been right; perhaps it *was* the wrong metal alloy for the job. The chances are also good, however, that you may not have asked the supplier for the *right* metal alloy.

There are hundreds of alloy formulations—each supplier has many proprietary master alloys—and finding the right one for your new process or new product will take time, testing, and trust. To help with that process, below are a few suggestions from industry suppliers on how you can avoid “metal mistakes.”

## Do Your Research

“The biggest issue people have [when purchasing an alloy] is understanding the metals' properties, what the alloys do,” says Michael Henning, vice president of marketing at Belmont Metals Inc. in Brooklyn, New York. There are various books and online resources available to serve as quick primers on metal properties, including *Introduction to Precious Metals* (Brynmorgen Press) and the MJSA Press book *Jewelry Metals: A Guide to Working with Common Alloys*. (See sidebar, “MJSA Metal Resources,” on page 22 for a list of articles and publications that focus on metalworking.)

You can also ask your metal supplier about how an alloy behaves. Some com-



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panies have active R&D departments and metallurgists on staff. Use that expertise: Usually you can talk to someone who has a deep understanding of the way the metal melts, flows, and solidifies—and why it behaves the way it does.

And don't be afraid to tap into your own pool of expertise. “The buyer [should have] at least a certain level of technical experience, or have access to that kind of information, when discussing something like a master alloy, [which] has an impact on virtually all the aspects of a jewelry manufacturing process,” says Andrea Friso, division product manager for the master alloy division at Legor Group S.p.A. in

Vicenza, Italy. Involving the right person on your staff—whether it is from the casting, the finishing, or the design departments—will make addressing tech issues simpler and finding the right answers go more quickly.

## Give Your Supplier All the Details

You also need to ask yourself a few questions about what you want and you need, as well as how you plan to work with the metal—and then pass that information on to your supplier.

“We need to know all the facts,” says Rafael Amador, marketing director at

*Telling your alloy supplier how the alloy will be used is crucial if you want to avoid surprises. “We need to know all the facts,” says Rafael Amador.*

United Precious Metal Refining (UPMR) in Alden, New York. “What karat do you want? Do you want a fabrication [or a casting] alloy? Are you using an open system [i.e., torch melting] or a closed system [induction or resistance melting]? Does hardness matter, or softness? Are you going to cast with stones in the wax, or set stones in the finished piece? We have hundreds of alloys, and they’re all catered to meet specific needs.” (To help its customers with this process, UPMR has on its website a downloadable app that walks buyers through the alloy selection process.)

Jean Poole, national sales manager at Umicore Precious Metals USA in Attleboro, Massachusetts, offers a few more points to cover: “What are your requirements for temper or tensile strength [for wire]? Do you need wire spooled, or have a coil inside diameter [ID] requirement?” Your choices, she says, depend on the application and how you intend to use the metal.

Telling your supplier how the alloy will be used is crucial if you want to avoid unpleasant surprises. For instance, “if you order grain, you should specify whether you plan to use it for investment casting or to create wrought items,” says Grigory Raykhtsaum, director of metallurgy at LeachGarner in Attleboro, Massachusetts. Casting grain typically contains additives that improve metal flow and surface quality, but also reduce the metal’s ductility, he explains: “If you try to use casting grain to fabricate wire or

tubing, the metal might crack.”

Ed Rigano, senior vice president of jewelry sales at LeachGarner, offers another scenario: “Customers may order a dead-soft metal to better form parts, but that could lead to orange peel if they manipulate it too much, since the softness of the metal also contributes to grain growth. If you describe how you intend to use the metal, your supplier might be able to formulate a soft alloy with a smaller grain size, or suggest a slightly harder alloy” that better fits the application.

Also tell your supplier about the equipment you’re using, says Friso. “What was working well 10 years back might be outdated today,” he says, adding that if customers tell him what equipment they’re employing, he can help them to use it correctly. “Most of the time this does not require purchasing new machines or new materials,” he explains, “just using those currently available in another manner.

“As a master alloys supplier, we must have deep knowledge about the customer’s production process and methodologies used,” he continues. “The kind of machine used, their expertise in model making, and the expectations of final quality are just a few examples of what we need to know to give them the correct product. We [also] have to be aware of the final market to where the jewelry is supplied.” The details you hold back may be the ones that are causing problems.

And don’t stop at the production methods and the equipment; you also should

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## AVOIDING METAL MISTAKES

tell your supplier about the type of jewelry you intend to make, right down to the design. “If you’re casting filigree rings with small cross-sections, you’ll need an alloy with greater fluidity,” says Raykhtsaum. Knowing the design’s specifics can help a supplier determine the best alloy formula.



## Ordering Custom Alloys

The development of a custom alloy typically requires a great deal of conversation, testing, and tweaking before large-scale production begins. “On a custom alloy,” says Poole, “we would need a complete analysis or at least some guidelines as to what the customer is looking for. Not all custom alloys will be able to attain the temper or working capabilities needed for what the customer is trying to do. Palladium, for example, is a very soft alloy; you cannot attain the same hardness [with it] as with other metals.”

The key here is testing—in actual working conditions. “Any new product under development must always be tested in a small batch at the jewelry manufacturer’s

# Metal Resources Available from MJSA

MJSA offers numerous resources to help jewelry makers and designers better understand the properties of precious and non-precious metals. The following selection of books and articles can be ordered through the MJSA Bookstore at [bookstore.mjsa.org](http://bookstore.mjsa.org) or by calling 1-800-444-MJSA (6572). MJSA members can order articles for free and books at a 15 percent discount.

## BOOKS

### Jewelry Metals:

#### A Guide to Working with Common Alloys

Technical Editor: James Binnion

MJSA Press; 150 pages. Price: \$29.50 for MJSA members; \$34.95 for non-members. Publication Date: 2015

This practical guide offers expert insights into all aspects of working with precious and non-precious jewelry metals. It includes:

- General characteristics of common alloying metals.
- Insights into casting gold, silver, platinum, and palladium, including issues with gas porosity, fluidity, shrinkage porosity, and quenching.
- Guidelines for fabricating jewelry from the four precious metals, including issues with malleability and ductility, annealing, hot and cold joining, setting, and finishing.
- An overview of how to best work with commonly used non-precious jewelry metals: brass, bronze, cobalt-chrome, niobium, stainless steel, titanium, and tungsten carbide.
- Step-by-step demonstrations of the following metal techniques: anodizing, anticlastic forming, chasing and repoussé, granulation, keum-boo, mokumé gane, and silver oxidation.
- Tips for collecting waste metal and maximizing refining returns.
- Federal Trade Commission guidelines for marking, stamping, and promoting alloys, and an overview of legal regulations addressing the use of lead, cadmium, and nickel in jewelry.

#### Introduction to Precious Metals

By Mark Grimwade

Brynmorgen Press; 232 pages. Price: \$29.75 for MJSA members; \$35 for non-members. Publication Date: 2009

As a consultant to the Worshipful Company of Goldsmiths and the World Gold Council, among others, Mark Grimwade has been at the forefront of technical developments in metals. As a professor at London University, he has honed his skills of making complicated phenomena accessible to non-scientists. In this impressive expanded edition of his groundbreaking 1985 book, students and professional artists working in metal will find answers to questions that have plagued them for years. Available to MJSA members at a 15 percent discount when ordered through the MJSA Bookstore.

## ARTICLES

### Metallic Matters

Compiled by Shawna Kulpa, John Shanahan, and Tina Wojtkielo Snyder. Working with silver, gold, and platinum: A troubleshooting and reference guide. Publication Date: July 2005

### Going the White Way

By John Shanahan. A guide to manufacturing issues related to casting or fabricating white gold. Publication Date: May 2005

### Silver Bullet

By Shawna Kulpa and Tina Wojtkielo Snyder. Working with tarnish-resistant silver alloys, and tips for blackening silver. Publication Date: May 2011

### Palladium Premieres

By Bill Libby. Casting, machining, and fabricating palladium. Publication Date: March 2006

### Karat Kings

By Tina Wojtkielo Snyder. Metal suppliers answer common FAQs. Publication Date: July 2006

### Alternative Alloys: A Primer

By Shannon L. Brown. A guide to common non-precious metals being used in jewelry making: stainless steel, tungsten carbide, cobalt-chrome, titanium, niobium, brass and bronze, gold-filled, and silver-filled. Publication Date: January 2011

### Layered Looks

By Shannon L. Brown. Working with gold-filled metals. Publication Date: July 2013

### Reactive Hues

By Kirk Lang. Designing with and anodizing titanium and niobium. Publication Date: September 2013

### Strong Suit

By Suzanne Wade. Working with stainless steel. Publication Date: January 2007

end,” says Friso. Suppliers develop products metallurgically so they can make a reliable alloy, he explains, but lab conditions are a far cry from production conditions. It’s only when the metal is tested in the shop that “we can understand if the material is working well, and if we have correctly translated the customer’s expectations into a formulation,” he says.

Discuss with your supplier how much material you need to make an appropriate test sample, says Henning. Try it. Keep close records of what you do, then talk to the supplier. Tell him exactly what’s happening—if there is cracking, casting, flow, porosity, or oxidation difficulties—so the alloy can be adjusted. Finding the perfect product may take several attempts.

*“Any new product under development must always be tested in a small batch at the jewelry manufacturer’s end,” says Andrea Friso; lab conditions are a far cry from production conditions.*

**Don’t Substitute Products**

As noted, there are almost countless alloy varieties, and each has its own formula created for specific purposes: A grain that contains deoxidizers for casting, for instance, can embrittle metal if used for fabrication. Even the “all-purpose” alloys are not really “all purpose”: They are used to create a particular product, such as a specific karat of gold. “Some

customers [take] an all-purpose master alloy [designed] for 18k” and try to use it on everything from 9k to 14k, says Amador; in the end, they have nothing but problems. If you respect the alloy’s formula—and have done the work necessary to get the right one for your needs—you won’t have to worry about “metal mistakes” leading to poor products and unhappy customers. ♦

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# Metal Questions

*What you should ask yourself and your supplier before placing an order*

- Do you want a fabrication or a casting alloy? The difference can be crucial: Additives in casting grains may improve metal flow and surface quality, but could make the metal less ductile and lead to cracking during fabrication.



- What type of jewelry are you making? What design characteristics might require specific alloy properties?

- If you are ordering gold, have you indicated the karat and color you want? Yellow? Rose? Green? White? Should the hues be rich, medium, soft?

- Have you considered the technical considerations of the various gold alloys? If ordering a white gold alloy, for example, have you weighed the advantages and disadvantages of nickel-white versus nickel-free alloys? Nickel alloys offer a brighter white and greater strength and hardness, but they can pose manufacturing challenges: They are less malleable, and nickel can make the alloy more susceptible to fire or quench cracking, as well as stress corrosion. Also, nickel-white golds could prompt allergic reactions among wearers. (About a tenth of the world's population suffers from nickel sensitivity.)

- Where will you sell your jewelry? If you are selling 14k product, does it need to meet the 58.5 standard of some European countries and elsewhere around the world? Does your jewelry need to meet the EU Nickel Directive, which regulates nickel release limits? According to the directive, items worn against the skin can release up to 0.5 microgram of nickel per square centimeter per week, although recent changes to the testing effectively drop the compliance level to less than or equal to 0.28 microgram.

- If ordering a silver alloy, should it be tarnish resistant or a standard sterling alloy?

- What are your tolerance requirements?

- What type of equipment are you using? If casting, are you using an open system (torch melting) or closed (induction or resistance melting)?

- Are you going to cast with stones in the wax, or set stones in the finished piece?

- What temper is needed—hard, soft, somewhere in between?

- If ordering wire, what is your required tensile strength? Do you need it in straight foot pieces, spooled, or coiled?

- When ordering sheet, what type of finish is required, polished mirror or a standard rolled finish?

- Is matching solder needed and available? If so what grades are needed, and in what form—sheet, chip, wire, paste?

- Do you need an alloy that can be age-hardened to improve its wear resistance?

- Are there cost considerations? ♦

*Contributors: Rafael Amador, marketing director, United Precious Metal Refining, Alden, New York; Andrea Friso, division product manager for the master alloy division, Legor Group, Vicenza, Italy; Stewart Grice, director of mill and refining, Hoover & Strong, North Chesterfield, Virginia; Michael Henning, vice president of marketing, Belmont Metals Inc., Brooklyn, New York; Jean Poole, national sales manager, Umicore Precious Metals USA, Attleboro, Massachusetts; Grigory Raykhtsaum, director of metallurgy, LeachGarner, Attleboro, Massachusetts; Ed Rigano, senior vice president of jewelry sales, LeachGarner, Attleboro, Massachusetts.*