

The 'alloyed' truth

A trio of arabesque pearl and diamond pendants showing complementary gold colours with pearls: rose gold with pink Chinese freshwater, yellow with pistachio South Sea pearl, and white gold with black South Sea pearl.




Using the right mix for the job

By Llyn L. Strelau

Gold and silver have been used to make jewellery for adornment for more than 5000 years. Early jewellers hammered alluvial nuggets of gold and silver found in stream beds into sheets before cutting them into wires and fabricating. For its part, platinum was thought to be a nuisance, as it requires a much higher melting temperature. That said, early South American cultures did hammer alluvial platinum into sheets, incorporating it into jewels a century or more before Europeans discovered how to work with it.

Photos courtesy Llyn L. Strelau



 A bead-blasted green and rose gold ring, with a polished platinum round wire accent.

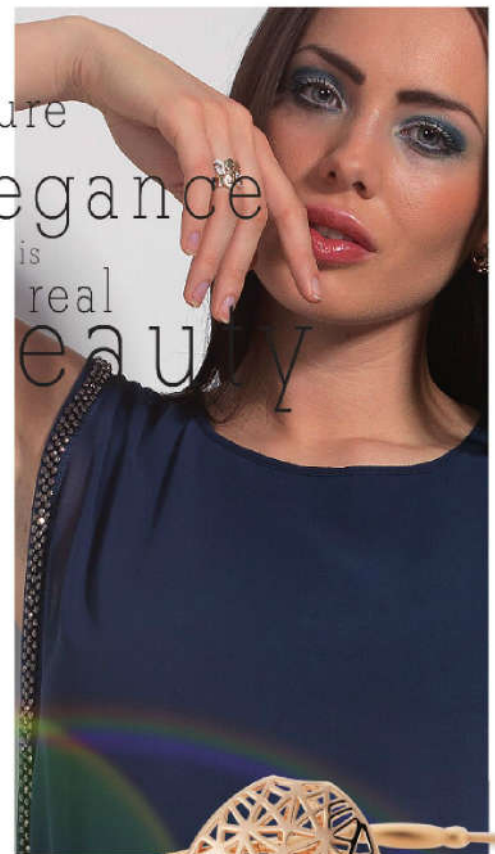
In ancient times, there were only two colour choices where metal was concerned: yellow and white, which back then referred to silver. Before anyone developed refining techniques, metals were used as found, in varying degrees of purity. Jewellery makers worked occasionally with another 'metal,' which they called electrum. This was the first (albeit naturally occurring) gold-silver alloy to be used. Early jewellers soon began mixing their own alloys by varying the combination of the two metals.

Refining the art of alloying

Pure gold and silver are generally too soft for most jewellery applications. As such, alloying gold with silver and silver with copper proved to create harder and more durable blends.

Sterling silver—which is 92.5 per cent pure silver and 7.5 per cent copper—has been the defacto standard alloy for centuries for use in currency, jewellery, and hollowware. It is a lustrous white metal, but tarnishes due to sulfur compounds in the environment. This can be used to advantage when silver items are patinated to add depth and interest to a complex design, but it is less desirable if you wish the metal to remain white. Sterling is also prone to firescale when being soldered—unless care is taken to prevent this, finishing silver pieces can be a lot of work. New alloys of sterling and others of higher purity have been on the market for a few years. These propriety patented alloys combine good workability with superior white colour, along with the great benefit of reduced firescale and a high degree of anti-tarnish properties. The 'secret' ingredients

pure
elegance
is
real
beauty



pure elegance
BREUNING
since 1927

Nouvo Mode

416-477-2895 · info@nouvomode.com



18-karat rose gold clasp pendant with 19-karat white gold and diamond accents set with tanzanite and metallic freshwater pearl on a rose gold chain.



'Tierra' pendant clasp in 18-karat green gold set with green tourmaline, golden beryl, and accented with a yellow diamond and golden green South Sea pearl drop.

in these alloys are small percentages of elements, such as germanium, platinum, and palladium.

For many centuries, jewellers had only gold and silver with which to work. By the mid- to late-18th century, platinum began to replace silver in the crafting of fine jewellery, as methods for working with it were developed. It wasn't until 1815 that Russian metallurgist/jewellers mixed 75 per cent gold with 25 per cent copper to make 18-karat rose gold, while it took another 100 years for jewellers in Pforzheim, Germany, to develop the first commercially produced white gold alloys.

With platinum's primary use as a strategic metal in industrial and military applications around the Second World War, white gold gained in popularity, taking its place in all but very high-end jewellery. Only the relatively recent demand achieved by the efforts of the Platinum Guild International (PGI)—and some would argue designer Scott Kay—has returned the metal to its rightful place.

It is not easy to 'bleach' the yellow colour from pure gold and still end up with an alloy approaching platinum's or silver's whiteness. The first (and still most common) method is to add nickel to gold. Unfortunately, these two metals are not particularly compatible and the first alloys, although much harder than platinum, were also extremely brittle. Adding small amounts of other metals to the mix improved workability, but the resulting colour was not very white. Brownish and yellowish 'warm' shades were not very attractive and the only real solution was to electroplate this not quite white gold with rhodium. Of course, electroplating is only skin deep; depending on the type of jewellery and frequency of wear, it needs to be re-applied periodically.

Another problem with nickel as a component of white gold alloys is a percentage of the population experiences a degree of allergic reaction to even trace amounts of it in a piece of jewellery. This is especially true for earrings or other jewellery that penetrate the body. The European Union (EU) has very strict limits for the amount of nickel that may be present in jewellery, determined by tests to measure how much of the metal leaches from an item. As such, white gold jewellery manufactured in the EU is predominately made from alloys containing palladium.

Although North America has not adopted standards for nickel content, palladium alloys are also increasingly used here. Their colour is generally greyer than 'silvery' white and some of them are rather soft, which limits their use for some purposes. That said, the relatively low price of palladium can make them attractive options. Some palladium alloys comprise metals that are added to increase hardness. Here, the colour tends to be greyish and the techniques for casting and annealing are specialized.



18-karat rose gold ring set with brown zircons centred with green tourmaline in 18-karat green gold.



Antique shell cameo with 18-karat yellow, rose, and green gold grape leaves and red gold grape cluster accents.

However, palladium alloys can offer a good alternative for some applications.

A jewellery colleague of mine in the United States has a patent pending for alloys combining palladium or platinum with small amounts of rhodium. They offer a very attractive white colour that does not require electroplating and has zero nickel content. The alloys also have improved hardness and durability compared to traditional platinum and palladium blends. Specialized techniques are required for producing the alloys and for their subsequent casting and manufacturing, but their development presents an exciting new frontier.


Made in the shade

Jewellery-specific technology and equipment have come a long way since the early 20th century. For instance, the development of induction melting furnaces using inert gas atmospheres has made it possible to combine metals in ways that were impossible previously. Preventing oxygen from contaminating these alloys is critical. Some blends are appropriate for cast pieces, but fabricating or repairing with a torch is not possible. They do respond well, however, to welding with laser machines.


Our industry lost a huge talent in the metallurgist/jeweller/chemist Stephen Kretchmer when he was tragically killed in a vehicle accident in 2006. In his all-too-short life, he developed many innovative alloys. His heat-treatable platinum—which incorporated special heating and cooling techniques post casting and finishing—vastly increased the metal's hardness and springiness to permit very secure tension setting of gemstones. Kretchmer also developed magnetic platinum alloys, which he used to create earrings with floating components suspended in magnetic fields. In addition, he came up with better purple and blue gold alloys, although gold mixed with aluminum or iron is extremely brittle and must be treated more like a gemstone than metal.

Rose gold has gained much popularity in recent years due to its use by larger commercial jewellery brands. Degrees of 'pinkness' can be achieved by varying the amounts of copper and silver in the alloy. Next to white gold, rose is the hardest of coloured alloys. It can also be more difficult to cast and fabricate when its components are not in the right proportions. That said, it combines well with pink, red, and earth-toned gemstones. I particularly like the combination of rose gold with white gold or platinum. The pink



 A green gold pendant featuring a bezel-set prehnite with demantoid garnets.



 Complementary offset wedding bands. The groom's features 19-karat white gold with 18-karat yellow rims, while the bride's comprises the opposite colours.

colour warms the white metal, while the white colour softens the intensity of the pink, creating good balance in a design.

Green gold is pure gold combined with pure silver. Both 14-karat and 18-karat alloys can offer a good green colour that is attractive when used to set green gemstones, especially those with a yellowish cast, such as some garnets and peridot. It is, however, the softest of the coloured alloys. Although it is easy to pavé- or bead-set gems in green gold, it is perhaps not the best material for delicate openwork designs that will be subjected to hard wear. It also combines well with rose gold for two-tone designs.

Yellow gold alloys offer a wide range of colour, achieved by varying the proportions of copper and silver. Adding more copper skews the colour to the rose end of the spectrum, while higher silver content makes it green. All yellow gold alloys contain trace elements of other metals to improve workability.

Switch and miss

I have a word of caution when it comes to white gold alloys—choose your preferred mix carefully and stay with it if possible and here's why. Thirty years ago, we made our own 18-karat white gold from a proprietary

base metal mixture that we combined with pure gold in the shop. It was a dream metal to work with—its ductility and ability to be re-used several times while retaining its working properties were amazing. While it had a pretty good white colour when freshly polished, after a relatively short period, it acquired surface oxidation, leaving it a rather unattractive brownish tone. When used in combination with yellow gold for a two-tone piece, there was almost no difference between the yellow and white colour, even when the surfaces were matte finish. We could have rhodium-plated this, but it didn't look very good and required periodical re-plating.

Twenty years ago, I switched exclusively to using a 19-karat white gold alloy. I buy this already mixed as casting grain from a Canadian supplier. It has its pros and cons. The colour is as close to platinum white as I have found. It neither changes colour with time nor does it require rhodium plating to look good. It provides excellent contrast when used in combination with yellow and rose gold. It also recasts well, provided some new material is added. Now for the cons—it contains nickel. It is also quite hard and requires some care in casting and annealing for fabrication. That said, it responds well to both soldering and especially laser welding.



A white gold setting for a white diamond may seem like a natural fit, but sometimes that's not entirely the case.

Being limited to one white gold alloy is problematic, as there is always the risk the supplier will change the blend or stop making it altogether. Therefore, over the years, I have experimented with white gold alloys from a variety of suppliers to see if there is a better alternative to my current standard 19-karat. Some were excellent products, but there was one major roadblock to switching from the metal we were using: consistency. I used one of the alternate 19-karat white gold alloys to make an engagement ring for a client. The metal cast, worked, and polished beautifully and had a nice white colour, albeit not exactly the same as our standard alloy. There were no compelling benefits to switching, however, and I decided to stick with the existing alloy going forward. This decision proved to be a good one because two years later, the client returned to have a matching wedding band made. I had not recorded the fact we had used the new alloy for the original ring, and we made the new band in our usual blend only to realize the two rings simply did not match. We had to buy gold from the other supplier and remake the band. Not a good financial situation!

Not set in stone

Custom work is usually dictated by a client's personal preference for metal colour and budget. I find younger clients may have only ever worn silver jewellery, more due to their financial situation than preference. When it comes time for a more valuable piece of jewellery, such as an engagement or wedding ring, they may just assume white gold or platinum is their best choice. This decision can also be influenced by current jewellery trends and mass advertising. However, I've found it can be useful to show them alternatives. Some skin tones and complexions are complemented by yellow metal rather than white, not to mention the fact some gemstones look better in one than the other.

White diamonds usually present better in white metal, although that's not always the case, as you can see in the photo to the left. I recently made this 18-karat yellow gold organic engagement ring with a tree branch and birch leaf design holding a large oval diamond. My initial inclination was to set the diamond (it was an E colour) in a white gold bezel, but the client really wanted an all-yellow gold ring. Although I had my doubts, I later had to agree that once the diamond was set in a yellow gold bezel, it was a much more attractive piece as a whole.

I encourage my fellow designers to explore the spectrum of coloured metals. Use them to complement coloured gemstones, contrast with each other, and add individuality to your creations. That said, when making multicoloured gold pieces, be aware the colour of polished metal is subtle. For maximum contrast, a matte or textured surface can be preferable. ♦



Llyn L. Strelau is the owner of Jewels by Design, a designer-goldsmith studio in Calgary established in 1984. His firm specializes in custom jewellery design for a local and international clientele. Strelau has received numerous design awards, including the American Gem Trade Association's (AGTA's) Spectrum Awards and De Beers' Beyond Tradition—A Celebration of Canadian Craft. His work has also been published in Masters: Gemstones, Major Works by Leading Jewelers. Strelau can be reached via e-mail at designer@jewelsbydesign.com.