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Piercer Periodical

December, 2021

Materials: Metal heads

This month's deep dive

Safety and verification of the materials used in the body piercing industry.

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A brief history of piercing materials

While the history of body jewellery in Western society is seen as relatively new, the traditions and cultural importance of adorning one's body with jewellery dates back over 2000 years across various civilisations[1]. It is believed that man's first attempt at body piercing was the ear lobes, including stretching with hanging ornaments made from gold, silver, brass, and steel. These materials have a long and extensive history with body jewellery all the way through to the present day.

Gold was seen in many ancient civilisations to be the height of sophistication and status. Worn most often by nobility and rulers, gold was believed to harness higher knowledge of the gods and display opulence to the rest of society. Early examples of this include the Aztec Empire, in which gold was seen as an excrement or skin of the gods, and was closely associated with the spiritual power of the sun. Jewellery was intricately sculpted to represent powerful animals such as eagles and lions. This snake labret piece with a moving tongue (c. 1300-1521 AD)[2] was sent as a gift to the Holy Roman Emperor, Charles V.

Silver has one of the longest histories in body jewellery, with its origin dating back to the Bronze Age in ancient civilizations such as Mesopotamia (c. 4000 BC). While very few pieces from this era still exist, historians are able to theorise the capabilities of blacksmiths at this time, extracting silver from lead through a process called cupellation. Silver was used as currency and jewellery such as rings and arm cuffs, and this trend followed throughout early eras, including Ancient Greece and Rome, Medieval Europe, and traditional Celtic societies[3]. Julius Caesar even had both nipples pierced[4] with silver as a display of strength and unity with his soldiers.

Brass, an alloy of copper and zinc, in history as jewellery dates back to Ancient China (c. 500 BC), though it is believed to be unintentional and due to natural alloys as the artefacts aged over time. After the Industrial Revolution (1760-1840), the use of brass for everyday items such as buttons, ammunition, and common jewellery exploded in Western countries. Brass became a popular choice for jewellery castings, though it is no longer used or deemed safe for body piercing. This brass ear ornament[5] from the early 19th Century was located in Kenya and used in women's lobes for tribal celebrations.

[1] https://www.achadirect.com/en/the-history-of-body-jewelry
[2] https://www.metmuseum.org/art/collection/search/321343
[3] https://museumcrush.org/hack-silver-hoards-and-ancient-jewellery-unlocking-the-mysteries-of-scottish-silver/
[4] https://tribu.co.uk/blogs/tribu/history-of-body-piercing
[5] https://www.britishmuseum.org/collection/object/A_As1900-959

Steel is believed by historians to be first used as early as the 16th Century, and most documented evidence shows the expansion of steel jewellery in France around 1780. Production was limited due to the French Revolutionary War of 1793, but came back into fashion shortly after across Europe.

Known for its capability to create intricate designs that included gems and diamonds among the nobility, the material was a popular choice for wearers such as the Swedish Royal Family (1840)[6]. Steel was further refined for use in surgical instruments in 1913 by Harry Brearley, and by 1926, the material was used in an implant operation[7].

The modernisation of body jewellery

Until the late 20th Century, body piercing in modern times was a practise for subcultures on the fringes of society. Along with creativity and lack of resources, individuals and groups began to experiment with the materials, locations, and symbolism of body piercing. In the late 60s and 70s, the punk scene in urban areas used piercings as statements to complement their shocking looks, though these practices followed a more DIY approach and used materials such as safety pins and gold rings.

Other subcultures were participating in this rising trend, especially the LGBT and BDSM scenes around San Francisco and Southern California. Large figures in the scene wanted to safely practise piercing in a space that was welcoming to all, and while body piercing had been advertised as an available service in many tattoo studios prior to the late 70s, the first dedicated piercing studio 'Gauntlet' was opened in 1976 by Jim Ward. Ward, Fakir Musafar, and Doug Malloy, among others, are considered responsible for the progressive advancements in safety and materials used for body piercing, This time period became known as 'the body piercing renaissance'.[8]

It was in the early 1990s that current day staple brands for high quality body jewellery were founded. Barry Blanchard speaks of 1991, the year he founded Anatometal, and he was shocked to find out people were making rings out of 308 Stainless Steel (used for bicycle spokes) and welding wire (which contained known carcinogens). With his history working with medical implants, he began making barbells and captive bead rings from ASTM F138 Implant Grade Steel, and then later he also introduced ASTM F136 Implant Grade Titanium. Anatometal was making jewellery for Gauntlet, and in 1994 when the APP came together, Barry was able to teach others about the importance of following those who made medical implants and was able to help introduce minimum metal standards, which also helped to legitimise the industry.

[6] https://www.britishmuseum.org/collection/object/H_1978-1002-604
[7] https://www.azom.com/article.aspx?ArticleID=8307
[8] https://www.bodyjewelleryshop.com/body_piercing_information/history_of_body_piercing.cfm

Body jewellery materials

Not all materials used in body jewellery go through the same thorough testing to ensure safety, like the technical standards published by ISO[9] and ASTM International[10]. This means that a vast amount of body jewellery sold has not been verified to meet certification of biocompatibility.

Most materials we are accustomed to as piercers are selected for their safety, however some materials known for their biocompatibility can have impurities which will lead to issues with wearing.

This is the distinguishing factor between "surgical steel" and ASTM F138 certified implant grade steel, however there is a lot more to it than just checking for specific phrases in a manufacturer's catalog.

Refractory metals

Titanium

Niobium

Steel

Gold

Platinum

Polymers

PTFE and Delrin

Acrylic

Tygon

Silicone

Nitrile

Stone

Organics

Wood

Horn

Bone

Glass

Ear Weight Materials

Bronze

Silver

Copper

Brass

White Brass

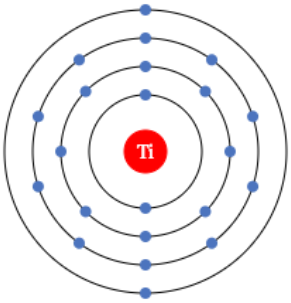
[9] https://www.iso.org/
[10] https://www.astm.org/

Refractory metals

Refractory metals are a group of highly heat and wear-resistant metallic elements,[11] which include Titanium, Niobium, Tungsten, and other dense metals with a melting point over 2000°C. They are commonly used in alloying other elements and super alloys, but are often used in a more pure form for implants due to their biocompatibility and osteoconductivity[12].

Furthermore, many of these metals have electrochemical oxidation, leading to the formation of a thin passive oxide layer[13] which provides better corrosion resistance, as well as the ability to be colored.

Titanium



Titanium is a biologically inert element that has a natural greyish appearance, which is mostly known for its light weight, low conductivity, and predictable biocompatibility[14].

Titanium is the ninth most abundant metal in the Earth's crust[15] and is most commonly made using the Kroll process where it is collected from titanium tetrachloride. From there, it is typically alloyed and refined to create the specific grade required. Typically, alloys will contain traces of aluminum, molybdenum, vanadium, niobium, tantalum, zirconium, manganese, iron, chromium, cobalt, nickel, and copper[16].

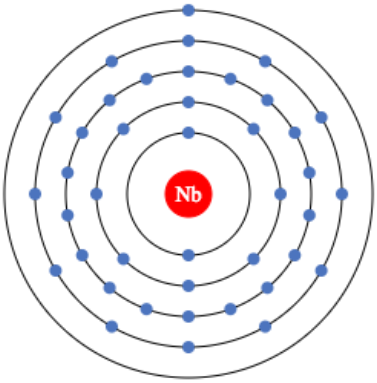
Commercial titanium alloys (such as Grade 5 or the more pure Grade 23) are not inert enough to be used for body jewellery as they do not comply with ISO 5832-3, ASTM F67 or ASTM F136 standards.

ASTM F136 is the most commonly used implant grade titanium for body jewellery, but we are seeing companies such as Industrial Strength begin to use ASTM F1295 titanium[17]. The main difference is the swapping of vanadium with the beta-stabilising element niobium making it even more biocompatible. Ti-6Al7Nb (ASTM F1295) therefore is an ideal alloy for medical, dental, and surgical applications[18].

Care needs to be taken when bending titanium as the modulus of elasticity is about half that of steel[19], which causes significant springback after forming, and must be compensated for by overbending and generally is not advised for use with genuine stones which can easily crack under pressure.

[11] https://www.metaltek.com/blog/refractory-metals/
[12] https://www.sciencedirect.com/science/article/abs/pii/S0142961200002751
[13] https://iopscience.iop.org/article/10.1149/1.2131295/meta
[14] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5456424/
[15] http://www.chemicool.com/elements/titanium.html
[16] https://titaniumprocessingcenter.com/the-element-titanium/
[17] https://www.astm.org/f1295-16.html
[18] https://www.sd-metals.com/en/s-d-materials/titanium-alloys/ti-6al7nb-astm-f1295/
[19] https://www.sciencedirect.com/science/article/pii/S1000936113001751

Niobium



Although very similar to titanium, niobium is significantly heavier and more malleable while still being able to be anodised different colors.

Unlike titanium, niobium can also be heat treated to turn a black, which can then be polished to give a smooth surface finish safe for initial piercings.

Niobium is primarily obtained from the mineral pyrochlore, most of which is mined and processed in Brazil and Canada, to a lesser extent.[20]

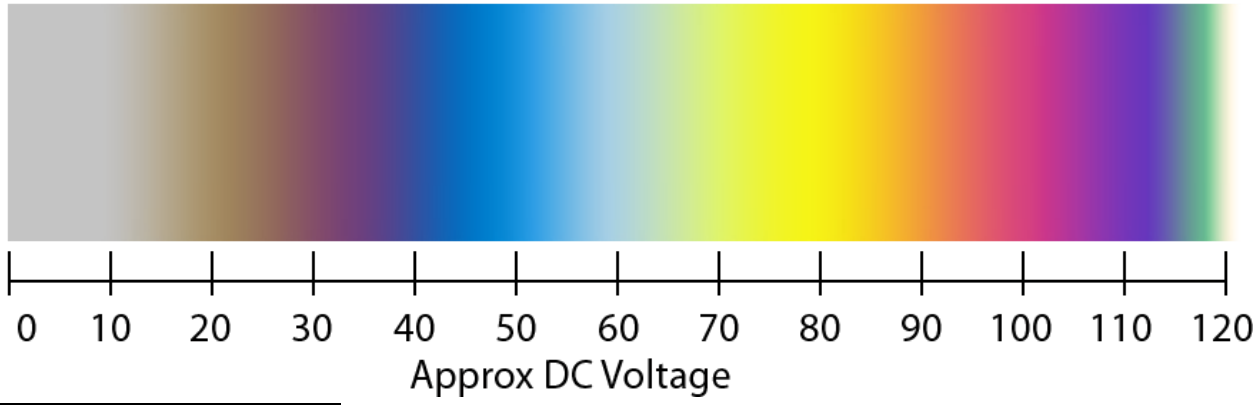
A number of manufacturers offer niobium barbells. However, like gold, its softness makes it difficult for threading and often steel or titanium is used for the male component.

Anodisation

For titanium and niobium, anodising builds a coating of titanium dioxide (aka titanium oxide) which occurs naturally on the surface[21]. This coating changes the way the light reflects off the metal, causing its color to change depending on the density.

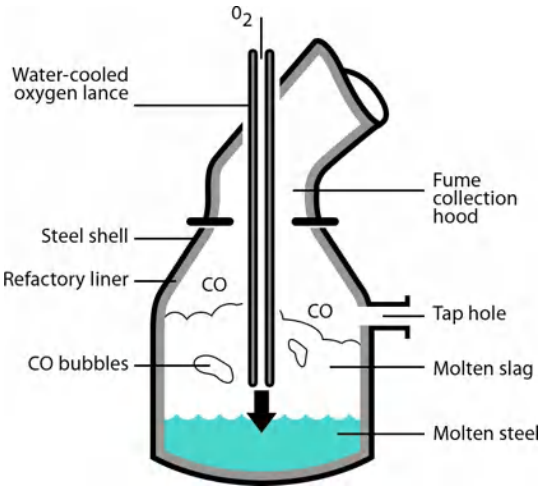
An added bonus of anodisation is that it removes microscopic debris from the surface via passivation and is commonly done on metallic surgical implants[22].

Anodisation, or more technically the titanium or niobium oxide, will generally thin and fade over time of wearing and begin to appear lower on the voltage scale (so yellow would become blue then bronze over time). This discoloration is totally safe to the body and the jewellery can easily be re-anodised back to its original or higher voltage in a single-use set-up.



[20] https://www.avalonadvancedmaterials.com/rare_metals/niobium/
[21] https://brnskll.com/shares/anodizing/Anodization-c967106
[22] https://www.astm.org/Standards/F86.htm

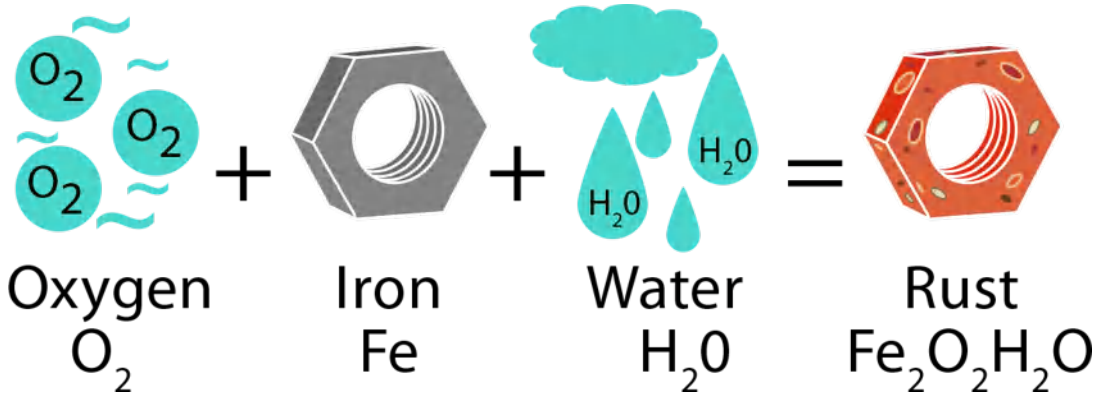
Steel



Steel is a very important material in engineering and construction due to its strength and ease of fabrication, which lends its use in many aspects of our lives. Iron is first created by removing impurities from iron ore. Steel is made when iron is annealed with carbon and other elements[23].

At its core, steel is an alloy of mostly iron with less than 2% carbon and 1% manganese, with trace amounts of silicone, phosphorus, sulphur and oxygen. It is made by mixing carbon and iron at very high temperatures, resulting in the impurities separating to the top as molten slag.

Corrosion naturally occurs as metal components deteriorate in reaction to the environment, which can lead to surface pitting and discolouration. When acidic substrates, such as water and blood, come in contact with iron, rust can begin to form. Rust is the result of corroding steel after the iron particles have been exposed to oxygen and moisture and they become oxidized. [24]



202 Grade (Austenitic) steel has 16-18% chromium and 0.5-4.0% nickel, which can make it slightly magnetic when cold-worked, as well as being one of the most widely used precipitation-hardening grades, with good corrosion resistance, toughness, hardness, and strength.

202 grade steel is most commonly used for cooking utensils, sinks, automotive trim, as well as many non-structural indoor applications, such as window and door trims.

[23] https://www.worldsteel.org/about-steel/about-steel.html
[24] https://www.cslsilicones.com/en/about/blog/item/what-causes-corrosion.html

304 Grade steel is a versatile alloy used mostly in outdoor applications, automotive use, electrical enclosures, and kitchen appliances. By combining 18% chromium and 8% nickel, it provides good resistance to caustic and acidic solutions, making it ideal for kitchens and food preparation environments. Although often called 'marine grade', 304 grade steel is still susceptible to corrosion from salt water in the form of pitting or discolouration known as 'tea staining'[25].

Surgical steel is a blanket term for any corrosion-resistant steel that is used in medical procedures. The problem with this terminology is that it gives the illusion of being used for implantation during surgery, when in fact it's more accurately a metal alloy that may be used in an operating theater due to its ability to be easily cleaned, and is in fact not safe for implantation.

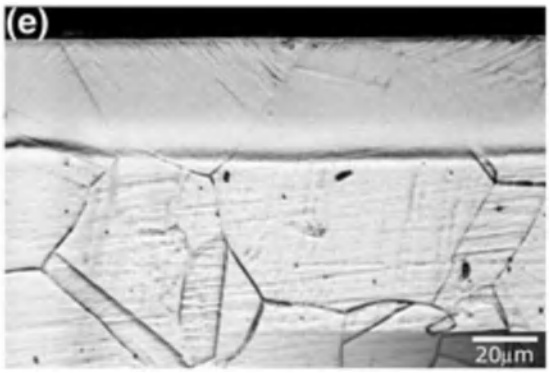
316 Stainless steel is very similar to 304 grade steel, except it also contains 2-3% molybdenum which gives it a tougher and more corrosion-resistance nature[26]. Its resistance to sulfuric acid, chlorides, bromides, iodines, and fatty acids at high temperatures makes it ideal for use in industrial applications, especially those involving chemicals.

ASTM F138 316-LVM steel is very common in professional grade body jewellery due to its ease of manufacturing, bright surface finish, and its certification of implant grade as stated by the ASTM.

The "F" specification dictates metals used for medical applications.

The "VM" specification means "vacuum-melted," which not only improves the surface finish, but also removes impurities and creates a surface layer which can prevent nickel from entering the body.[27]

Although containing traces of nickel, the incredibly smooth surface layer prevents leaching into the body[28].



[25] https://www.assda.asn.au/technical-info/technical-faqs/preventing-coastal-corrosion-tea-staining
[26]https://www.commandex.com.au/blog/whats-the-difference-between-316-marine-grade-and-304-grade-stainless-steel-mesh/
[27] https://link.springer.com/article/10.1007/s10856-011-4298-3
[28] https://vincentmetals.com/Implant_Grade_Stainless_Steel_Being_Used_by_Jewelers.html

Gold

The word "gold" most likely has its origins in the Indo-European word ghel, meaning "yellow." The chemical symbol of gold, Au, is short for the Latin word for gold, aurum, meaning "glowing dawn"[29]. Gold has a density of 19.32 g/cm3 (grams per cubic centimeter), making it weigh about 19 times as much as water at room temperature (20°c). This density makes gold opaque to X-rays.

White gold still usually has a hue of gold to it, unless it is rhodium treated or alloyed with platinum or palladium to give a whiter appearance similar to silver. Although commonly used in the body piercing industry, colored golds (such as rose and less commonly green and purple) are often alloyed with various other materials to achieve the desired colour, and may lead to an increased chance of reaction with initial piercings.

Gold casting [30]

Most gold body jewellery starts life off as a wax pattern which is either cast, hand made, or even 3D printed. Multiple wax patterns are then joined to a stem to create a wax “tree”. This tree is then submerged in plaster and placed into an oven where the plaster sets and hardens. The wax then melts out, leaving behind a hollow cavity of the original tree. Molten gold is then poured into the void, and after a short time, it is quenched in a bucket of cold water, which causes the plaster to dissipate. The gold is retrieved in the exact replica of the original wax tree. This method is referred to as “lost wax casting” because the wax is always “lost” as part of the process.

Threaded and threadless ends

Due to its soft and malleable nature, some attachments such as threaded ends or threadless pins are commonly made with harder metals to allow for a more robust product less likely to break.

Manufacturers will generally use stronger and more robust alloys such as ASTM F138 steel for these components as they can be soldered to gold for a secure bond. Those that choose to use gold for the pins may use a lower karat white gold for increased strength, however most will choose to use the same karat. A more recent trend has seen titanium pins being inserted into the wax prior to casting, eliminating the need for welding, in a process called “cast in place”.

[29] https://www.amnh.org/exhibitions/gold/incomparable-gold/gold-properties
[30] https://makersrow.com/blog/2016/06/5-steps-to-jewelry-casting/

Hallmarks and surface markings

Jewellery for the home market is often marked with numbers, known as Hallmarks, to easily identify the purity of the piece and even the manufacturer and date[31]. It is not legally required in all countries to hallmark gold.

Although commonplace in costume jewellery such as watches and necklaces, it should be avoided near healing wearing surfaces for body jewellery, as it increases the chance of bioburden collection and irritation of the wound.

Types of gold coating

Assuming the gold coating used for jewellery is a safe, biocompatible alloy, the wearer is inevitably exposed to other non biocompatible, and even toxic materials as the surface coating breaks down.

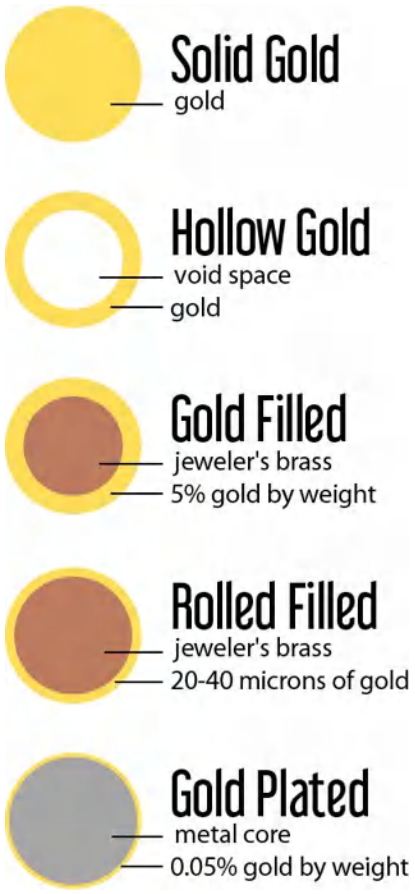
Gold plated body jewellery is not only potentially harmful to the wearer, the process often requires the use of very toxic and carcinogenic chemicals and should never be used under any circumstances in a fresh or healing body piercing, and should be avoided for long term wear in healed piercings.

Gold plated: An electroplating where a thin layer of gold is deposited onto the surface of another metal substrate, usually with a strike layer of nickel in between to improve the bond. Vermeil is a form of gold plating which uses pure or sterling silver as the base metal.

Hollow gold: Created as a hollow shell of gold, commonly 14-18kt, with an empty space inside. It is most common with larger necklaces and bracelets due to the reduced cost. However, it is very susceptible to denting and scratching, so it should never be used in body jewellery.

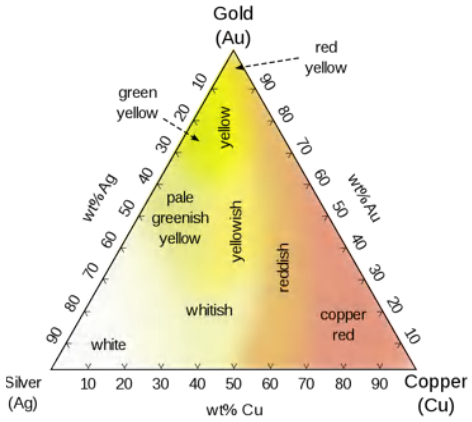
Gold filled: A layer of solid gold is mechanically bonded to jeweller's brass (an alloy of copper and zinc). This "gold sandwich" is rolled under very high pressure until it generally reaches 80-120 microns thick. The end result is a thicker coating than plating and must be no less than 1/20th[32] of the total metal content.

Rolled Gold: Similar to gold filled, but around ¼ the amount of gold (usually 20-40 microns thick).



[31] https://www.gold.org/about-gold/about-gold-jewellery/gold-hallmarks
[32] https://www.ecfr.gov/current/title-16/chapter-I/subchapter-B/part-23

Safe gold for body jewellery



Pure gold is an incredibly soft and malleable material. One ounce of gold may be hammered thin enough to cover more than 9 square meters of a surface[33]. \ Due to its softness, gold is alloyed with other metals to increase its strength and durability. Precious metal alloys are defined by karats ranging from 0 to 24, and are used to measure metal purity.

Gold is one of the most biocompatible metals that won't create toxic reactions when in contact with skin and tissue[34]. Alloyed gold has been used successfully for body piercing for thousands of years.

Eighteen karat gold is the most commonly used alloy for jewellery in Europe and Asia[35], whereas 14kt is more commonly used in the USA due to its cheaper price, strength, and preferred colour tone.

A number of medical procedures use gold implants with sound medical results, including middle ear reconstruction, upper lid closure implants, drug delivery microchips, antitumor treatment, arthritis treatments, and more[36]. Compared to other biomaterials, gold doesn't go through the same ISO 10993 tests for biological evaluation of medical devices and is commonly made from proprietary alloys[37].

Although rare, clients may experience sensitivity to the higher copper content in rose gold or the nickel content in non-palladium alloyed white gold in the form of dermatitis. Although it is commonly agreed that 18kt is better than its 14kt counterpart as it contains less of these impurities, there has been no medical studies conducted to prove a considerable biological advantage to 18kt.

Number of Karats	Parts of Gold	Purity of Gold (%)	Millesimal Fineness	Safe for Body Jewellery
9K	9/24	37.5	375	No (too impure)
10K	10/24	41.7	416/417	No (too impure)
12K	12/24	50.0	500	No (too impure)
14K	14/24	58.3	583/585	Yes
18K	18/24	75.0	750	Yes
22K	22/24	91.7	916/917	No (too soft)
24K	24/24	99.9	999	No (too soft)

Millesimal fineness is the purity by parts per thousand. ie: 75% gold (18kt) is denoted as "750".

[33] https://www.amnh.org/exhibitions/gold/incomparable-gold/gold-properties
[34] https://www.sharrettsplating.com/blog/purpose-gold-plating-medical-devices/
[35] https://www.timelessweddingbands.com/blog/Different-Standards-of-Karats-Based-by-Country-or-Region-Pt1
[36] https://pubmed.ncbi.nlm.nih.gov/16393135/
[37] https://brnskll.com/shares/biomaterials-and-trustworthy-sources/

Rhodium treatment of gold

Rhodium plating on jewellery is used to add colour, higher lustre, and surface durability to jewellery[38]. It is often used to add a brighter, whiter finish to gold and gemstones, or to give the jewellery a blackened finish. Ideally, rhodium plating is between 0.75 to 1.0 microns (1/1000th of a mm) thick. Rhodium is both a platinum metal and a noble metal, giving it favourable surface hardness and corrosion resistance, and it does not oxidise.

Rhodium plating will add shine and durability to jewellery, but it's important to note that it will suffer from wear and tear and therefore is not permanent. Rhodium plating often needs to be replated every 12-18mths on wearing surfaces in order to maintain the finish.

Tarnishing of Gold

Corrosion of gold often appears as spots darker than the rest of the piece, and is much more common in moist areas of the body, such as the nose, mouth, and genitals. This can occur when mixed metals are present, such as a steel threading joined to a gold top.

Tarnishing can be significantly accelerated with the introduction of lotions, hairsprays, detergents, perfume, and even sweat.[39]

As gold is an alloy of various materials, the higher the karat of gold, the fewer impurities are present, and therefore the less chance of tarnishing during normal wear, generally speaking.

This discoloration is usually easily removed by hand by lightly polishing with an iron oxide impregnated rouge cloth. These cloths should be single-use for worn jewellery in a studio setting, but more commonly suggested for clients to purchase their own for personal use.

Although some jewelers will suggest using a soft toothbrush and toothpaste, often this can be too abrasive for finer pieces and may result in scratches on the wearing surface. This is not required or recommended for high quality body jewellery.

Generally tarnishing will occur on the wearing surface and is easily reached, however in the event that the tarnishing is behind a gem or in a position that is not accessible to polish, you should contact the manufacturer for warranty assistance.

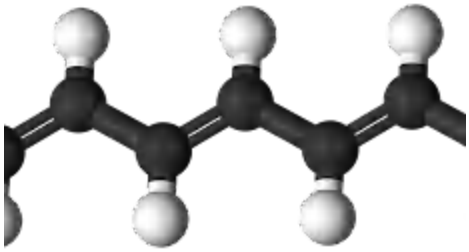
[38] https://www.jewelryshoppingguide.com/everything-about-rhodium-plating/
[39] https://learnaboutgold.com/blog/how-to-clean-tarnished-gold/

Platinum

One of the world's rarest materials, Platinum is a naturally white, hypoallergenic, and pure metal, which can be cast and worked similarly to gold. However, platinum is rarer and more durable than gold.

As it is mostly free of alloys, it generally will not tarnish nor develop a patina over time, making it a great alternative for nickel-based white gold. 95% (950) with 5% Os or Ru are the most common Platinum alloys.

Polymers



The word polymer comes from the Greek words for "many parts." Polymers are large molecules made by chemically linking (bonding) a series of building blocks. Think of it like a chain, each link can be a simple atom or complicated ring-shaped structures with dozens of atoms.

PTFE (Teflon) and POM (Delrin)

PTFE, sometimes known by the brand name Teflon, is an abbreviation for the word polytetrafluoroethylene. PTFE has dielectric properties and is used in electrical circuits. It is resistant to heat and radiation and the coefficient friction is very low. It is not reactive to chemical solutions.

POM, sometimes known by the brand name Delrin, is an abbreviation of the word polyoxyethylene. POM is a thermoplastic material[40], and it is not hydrophobic. It's used in many industries as a replacement for metals.

Although virgin-grade, correctly made PTFE to ASTM F754 is considered safe for initial piercings, Delrin is usually colored with a carbon-based dye and could cause irritation[41] to fresh or new piercings.

It is commonly used for large gauge oral piercings due to its soft nature, ease of production, and ability to be easily modified to suit the client's gum curvature, and as well as it being easily adjusted after the initial inflammatory period.

[40] https://homearise.com/delrin-teflon/
[41] https://stonewolf.co.uk/delrin

Tygon

Tygon® is a brand name silicone tubing made by Saint-Gobain Performance Plastics[42]. It is a highly bioinert and extremely flexible plastic tubing used for surface and other piercings. It usually has to be replaced every 3-12 months, if not sooner.

There are many forms of silicone tubing, so the client and piercer must be fully understanding of the type of material and quality they are using when in relation to body piercing procedures. The brand name, "Tygon®", has only a few forms that meet biocompatibility standards, wherein the manufacturer states the product adheres to ISO 10993 and FDA guidelines. Piercers and clients should investigate exactly what form of silicone tubing they are obtaining and to make sure it meets these standards and guidelines before using it or having it used in relation to body piercing procedures.

Over the years, as piercers have experimented with surface piercings, one of the solutions was flexible jewelry—either Tygon® tubing or PTFE. However, there are various issues with this approach, such as Tygon® needing to be replaced in a piercing every few months. Today most piercers prefer surface bars, as they put less pressure on the exit points of the piercing and therefore have a lower chance of rejection[43].

Bioplastics

Bioplast® is a proprietary flexible synthetic material that does not contain any nickel and is quite flexible and easy to thread. It is generally not used in a professional studios because it's predominantly externally threaded, and its biocompatibility certificate[44] is a letter from a testing facility stating that the "current state of knowledge" makes it "safe for the production of piercing jewellery", and no actual records of biocompatibility tests or safety data sheets are present.

Similar to Tygon, Bioplastics require periodical changing due to them becoming porous and discoloured, especially in fresh and oral piercings.

[42] https://wiki.bme.com/index.php?title=Tygon
[43] https://infinitebody.com/pages/surface-piercing-faq
[44] http://www.bioplast.com/certificate

Silicone

Silicone is a soft, flexible, rubbery, and light material. Silicone tunnels are designed to be worn in healed, large gauge piercings for sleeping, sports, and general comfort. Wearing silicone while stretching has been reported to produce severe negative reactions[45], and prolonged wearing of silicone can also cause irritation or allergies[46].

It's important to keep the plugs and your ears clean to avoid this, ensuring to only use a mild soap and water to clean, and using jojoba or coconut oil if the area feels dry. Implant grade silicone is biocompatible and is the highest grade available for plugs. However, few companies actually use implant grade silicone and often opt for non-bioinert rubbers instead. Silicone can be safely autoclaved and o-rings are also commonly found on single-flared plugs and eyelets to allow them to be easily inserted while retaining security once installed, and are commonly translucent or black. They should not be allowed to enter a healing wound as they can cause irritation.

Nitrile

Acrylonitrile-butadiene, commonly known as nitrile[47], is a flexible material that has excellent chemical resistance, similar to silicone. However, nitrile has better abrasion resistance and also exhibits poor resistance to weathering, UV and ozone. Rubber accelerators are commonly used to speed up the manufacturing of rubber and can cause allergic reactions[48] so should not be allowed in contact with a healing wound.

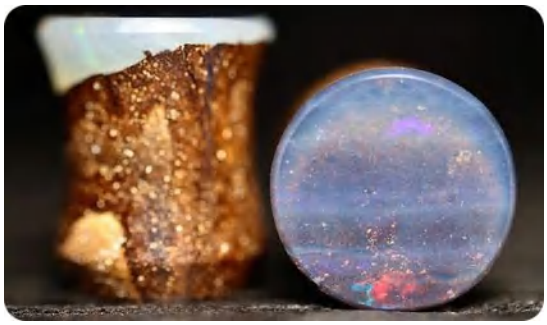
Acrylic

Acrylic body jewellery has many traits that make it unsafe to wear inside the body. Although ASTM F3087 PMMA has been used in the dental industry, as well as corneal implants and bone cement, it has never been proven safe for long term wear in piercings and is rated as slightly toxic on the Material Safety Data Sheet. One of the effects noted with low quality polymer body jewellery are sores that appear on the piercing after prolonged exposure.[49].

When worn inside the body and warmed to the body's temperature, acrylic will emit monomer vapours, which can cause adverse skin reactions. The highest risk is when it is worn inside the mouth, mucous-membrane and genitalia. It also contains chemicals which are known to cause cancer, and when worn inside the body it will break down and even crack. This causes the surface of the jewellery to become rough or porous and irritate the inside of the piercing[50].

[45] https://www.urbanbodyjewelry.com/pages/why-you-should-never-stretch-your-ears-with-silicone-plugs
[46] https://www.urbanbodyjewelry.com/pages/body-jewelry-material-guide-for-plugs
[47] https://jehbco.com.au/silicone-vs-nitrile/
[48] https://dermnetnz.org/topics/allergy-to-rubber-accelerators
[49] https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3177373/
[50] https://brnskll.com/shares/why-not-acrylic-body-jewelry/

Stone[51]



Stone jewellery can be crafted from materials such as naturally-occurring obsidian; common minerals like jasper; and semi-precious stones like amethyst, opal or jade. While some types are okay for stretching, not all are. Material with a score of five or higher on the Mohs scale (the rating system for mineral hardness and density) is suitable for stretching.[52]

Many naturally occurring stones contain hazardous trace elements[53]. The dust created during production of toxic stones is usually more dangerous to the carver than to the wearer of the piece, as a well-finished stone piece's wearing surface should be smooth, glossy, highly reflective, and free of blemishes, therefore reducing the chance of any toxic exposure.

It should be noted that some stones, such as hematite, have mild magnetic properties, and wearers should be careful around strong medical equipment such as MRI machines.

During production, the silica dust produced from stone have been known to be toxic[54]. Although trace elements are negligible to the wearer, extra care should be taken when making the following stones:

Aluminum:
- Aquamarine
- Black Tourmaline
- Lolite
- Labradorite
- Lepidolite
- Moonstone
- Moldavite (aluminum oxide)
- Prehnite
- Sodalite
- Sugilite
- Sunstone
- Variscite
- Zoisite
- Ruby

Mercury:
- Bumblebee Jasper

Sulfur:
- Pyrite
- Marcasite

Copper:
- Amazonite
- Azurite
- Chrysocolla
- Gem Silica
- Malachite
- Turquoise (contains aluminum as well)

Asbestos:
- Pietersite (in fibrous blue form)
- Serpentine (in fibrous form)
- Blue Tigers Eye
- Selenite (not toxic but is water soluble)

[51] https://www.gritlapidary.com/
[52] https://infinitebody.com/pages/jewelry-materials
[53]https://nj.gov/health/workplacehealthandsafety/documents/occupational-health-surveillance/dry_cutting.pdf
[54] https://www.cancer.org.au/cancer-information/causes-and-prevention/workplace-cancer/silica-dust

Organics

Jewellery made from organic materials requires special care as it is semi-porous and sensitive to moisture. Due to this, and the fact that they usually can not be safely autoclaved without significant damage to the surface finish, organic materials should not be used for healing piercings.

Wood

Wood jewelry comes in a wide range of shades, is sustainable, and will last years if properly cared for. It gives a natural look and can be decorated with inlays, engravings, or laser cuttings, and can be carved into designs that can not be achieved with other materials. An extra advantage of wood is its use in low temperature climates where it tends to keep warm.

Wood should be periodically oiled to seal and prevent cracking, especially in colder, drier climates. Prolonged exposure to water can warp and crack the grain, so removal during swimming and showering is recommended. Regular treatment with a light coating of coconut or jojoba oil is encouraged, especially if the plugs are new or have not been worn for a period of time.

The natural grain in wood may rise if not properly finished and can change the texture dramatically. The inability to be properly sterilised renders wood inappropriate for use in fresh or healing wounds.

Although some types of wood can cause irritation when in contact with skin, others can be toxic[55] if inhaled during manufacturing. Most common woods on the market are considered safe, including: black wood, coconut wood, ebony wood, bloodwood, cherry wood, sawo wood, iron wood, crocodile wood, palm wood, olive wood, and sono wood.

As an extra bonus, wood allows the piercing area to “breathe” so it is less likely to overproduce sebum and smell, unlike other materials[56].

Wood will naturally darken in colour over time, especially after oil treatments and prolonged wear. Wood should never be never dyed or chemically stabilised.

Wood jewellery should be finished with a natural, non-toxic wax, such as carnauba and never with paint or varnish as they are known to be toxic[57].

[55] https://www.woodworkerssource.com/blog/wood-conversations/wood-toxicity-and-how-to-protect-yourself/
[56] https://twofeatherplugs.com/blogs/two-feather-plugs-blog/smelly-ears
[57] https://ecospaints.net/varnish-vs-polyurethane

Bamboo

Often included with wood jewellery, bamboo is technically a grass. It's a lightweight, low-cost alternative to wood jewellery. One main difference in the use of bamboo for jewellery is that it is not made to size.

The wearable thickness of bamboo jewellery is cut from the section of the stalk the jewellery is made from and can lead to variations and inconsistencies in sizing.

Horn, bone, and ivory

As with all organic materials, variances in colour do occur. Horn is typically dark brown to black; bone presents in creamy yellowish-white tones; and ivory is, as its name would suggest, ivory-coloured. The main identifying difference between ivory and bone is the cross-hatched surface patterns present on the surface of ivory.

Like wood, horn and bone should be periodically oiled to prevent cracking, especially in colder, drier climates. The sale of elephant ivory is prohibited in many countries under the CITES treaty.

Amber

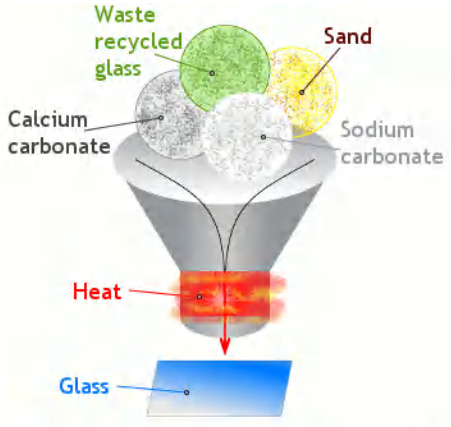
Amber is fossilised tree resin and comes in a variety of hues, ranging from light yellow to deep brownish-orange. It is quite soft when compared to other organic materials like bone or wood, and is more easily scratched and damaged. Amber is also more susceptible to heat than other organic materials. It is recommended to not expose the jewellery to heat where possible. Be careful wearing amber on extremely hot days or in extended exposure to direct sunlight.

Unfortunately, a lot of amber jewellery sold is actually plastic resin, so ensure you are purchasing from reputable manufacturers.

The density of amber, according to sources[58] is – 1.05 – 1.09, maximum 1.3 g / cm^3. The maximum density of salty water is 1.1972, so genuine amber in most cases floats in salty water and sinks in freshwater[59].

[58] https://www.scienceinschool.org/article/2011/amber/
[59] https://nammu.com/eng/fake-amber/#Method_5_Salty_Water_Test

Glass [60]



Glass is made by heating ordinary sand, which is mostly composed of silicon dioxide, to 1700°C until it melts and turns into a liquid. When the molten sand cools, it undergoes a complete transformation and becomes an amorphous solid[61], which is a type of frozen liquid.

Like metal alloys, different combinations of elements are used to create different types of glass. When we speak of glass, we are actually referring to an array of different materials which are combined together differently depending on the technique and application they are used for.

At an atomic level, glass is rigid and its bonds are reinforced by poorly-ordered molecules[62], so any microscopic crack, scratch, or impurity in the glass becomes the weakest point. This can be seen when dropping glass jewellery, as even though it is very strong, it can break or chip quite easily.

Borosilicate and soda-lime glass are generally full of tiny bubbles and impurities, therefore are physically flawed and any stress along these flaws can cause chipping or potential breakage.

Regardless of fragility, if made correctly, the surface finish of glass is considered incredibly smooth and generally safe for use in initial body piercings. Fused quartz glass, lead-free borosilicate, and lead-free soda-lime glass are inert and considered safe for initial piercings[63], and can also be autoclaved safely.

Flame-Sculpted Borosilicate Glass, most commonly referred to by the brand name “Pyrex”, is defined as any glass type with at least 5% boric oxide in its composition. For body jewellery, it is most commonly made up of approximately 80% silica, 13% boric oxide, 4% sodium oxide, and 2-3% aluminium oxide. Borosilicate glass is often used in the scientific industry because it has excellent resistance to chemical corrosion and thermal shock. This makes it an excellent material for body jewellery as it can safely withstand sterilisation as well as the temperature of the human body when worn. It also has a very tough surface which is resistant to scratching, and creates a very smooth surface finish.

[60] https://www.getgorilla.com/faq#source
[61] https://www.explainthatstuff.com/glass.html
[62] https://blog.cmog.org/2015/06/03/part-2-why-does-glass-break/
[63] https://safepiercing.org/jewelry-for-initial-piercings/

Soda-Lime Glass is most commonly used in food and beverage containers, windows, and arts. It is made up of three major compounds in varying proportions - usually 60-75% silica, 12-18% soda and 5-12% lime. It is used in body jewellery for its range of pure and transparent colours.

Soda-lime glass can be worked in different ways. It can be flame-sculpted by reheating glass rods over a torch, fused, or carved. Carving is the most traditional way of glass making, which dates back as far as the beginning of the craft. Today, computer-controlled kilns are utilised in this technique to eliminate thermal stresses to the material. This process fuses the glass designs together before they are cooled to room temperature. After cooling, the blocks are carved into their final form using diamond-coated tools.

Barium Crystal is a high-end glass that is generally used in the cosmetics and beverage industry. Crystal is a type of glass that is made in the same way, but has slightly different properties. Barium crystal is a lead-free type of crystal, and is used in only a small handful of decorative body jewellery applications. This material is similar to soda-lime glass in composition, and includes a small amount of barium during the melt process to increase the density and transparency, making it more brilliant in finish.

Blown Barium Crystal is the same material as regular barium crystal, but differs in its procedures. Hot glass in a molten state is wound around a steel “blowpipe” before being blown into a large bubble by a specialized team of glass workers. The bubble is drawn into a long cylinder of glass, then cut into sections and cooled slowly to room temperature in computer-controlled ovens to remove thermal stress. Afterwards, a second team of glass workers take the glass tubes and cut, grind, and polish them into ear plugs and hoops in the “Cold Shop”.

Obsidian is a naturally-occurring volcanic glass. The composition of obsidian is similar to soda-lime glass, though also silica-rich (around 65-80%). Obsidian has the longest history of use by humans of any glass type, being shaped into arrowheads and spear points since prehistoric times. Ancient Mesoamerican civilizations used obsidian extensively, and Mesoamerican artisans developed an incredible degree of skill in glass carving and polishing to create delicate ear spools, plugs, and labrets for priests and warriors. Obsidian comes in a range of colors including black, gray, green, silver, gold, snowflake, and rainbow hues. Obsidian sometimes has air bubbles and inclusions of other materials, as is to be expected of naturally occuring materials.

Ear Weight Materials

There are a handful of metals which are easy to work into beautiful and intricate designs, and are more cost effective than gold. These metals do however contain some impurities that make them unsuitable for most people's piercings, especially in fresh and healing wounds, or for any extended period of time.

Large, heavy jewellery or weighted objects have historically been used[64] to stretch piercings, however this method is advised against in modern-day piercing as it will cause migration.

Clients with sensitive skin or those who want to keep the natural patina may add a layer of protection by wrapping the wearing surface of their jewellery with cotton thread. They will need to occasionally rewrap them[65] due to the porous nature of cotton and the body's natural oils causing discolouration.

Bronze

Bronze is an alloy mostly of copper with tin as the main additive, although commercial and architectural bronzes may use zinc instead. Generally bronze will oxidize, giving it a brown, black, red, blue, or green coating or patina. This is only superficial and the underlying metal is protected from further corrosion.

Bronze is a diverse and tough material that has been used for ship propellers and submerged bearings, as well as cast sculptures for centuries and continues to be used today

Many bronze alloys also expand slightly before setting, which gives a very fine detail when molded, making it perfect for sculptures.

We even find bronze as inlays in eyelets and larger body jewellery, as well as being the predominant metal of choice for ear weight manufacturers due to its similar color to gold, but much lower cost.

Bronze jewellery may be worn polished or with a natural patina, but care should be taken to remove and clean the oxidation periodically as to avoid irritation to the skin from prolonged use.

[64] https://www.michaelbackmanltd.com/dayak-ear-weights/
[65] https://dendritelab.com/blogs/content/44056961-learn-to-wrap-your-ear-weights-for-comfort-and-safety

Silver

A soft, white, lustrous transition metal, silver has the highest electrical conductivity and highest thermal conductivity of any metal. Most silver is produced as a by-product of copper, gold, lead, and zinc refining.

Silver has long been valued as a precious metal, and is considered an investment. It is used to make ornaments, jewellery, high-value tableware, utensils, and currency coins. Today, silver is also used in electrical contacts and conductors, in mirrors, and in catalysis of chemical reactions.

Jewellery and silverware are traditionally made from sterling silver, also known as standard silver, and is an alloy of 92.5% silver with 7.5% copper. Sterling silver, which is stamped 925, is harder than pure silver, and has a lower melting point than either pure silver or pure copper.

Copper

Copper is a base metal and holds a place on the periodic table of elements. It is a well-known element because of its distinctive reddish metallic color.

Due to its high level of conductivity and malleability, it is most commonly used in electrical environments. This makes it ideal for use in electric power distribution and other electrical devices.

Although uncommon in its pure form due to the fact it turns skin green[66] from natural skin acids, it is commonly used in alloys to create a rich colour.

Brass

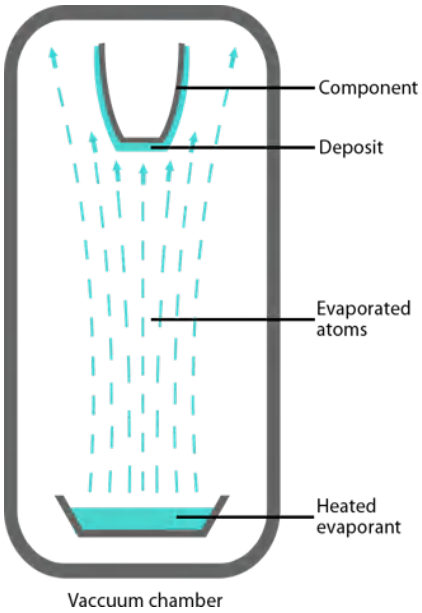
Brass can take on a yellowish hue. While most people think of brass as a gold color, it can also be yellowish which is due to the zinc that is present in the alloy. Like bronze, brass consists mostly of copper. However, zinc is used in the alloy which is what gives brass its corrosion resistance and low friction features.

White Brass

White brass is an alloy often mistaken for bronze, though it differs greatly in its makeup. White brass contains copper and zinc with smaller amounts of magnesium, aluminium and lead, contributing to its more silver appearance. This material is very resistant to corrosion and tears, making it less prone to damage and surface impurities with wear.

[66] https://sciencing.com/arm-turn-green-copper-bracelet-6465806.html

Metal Coatings

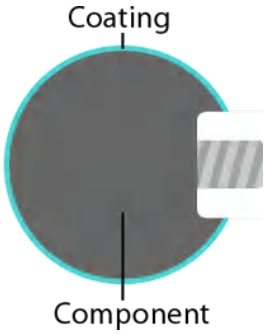


Physical Vapor Deposition (PVD) coating refers to a variety of thin film deposition techniques where a solid material is vaporised within a vacuum environment and deposited onto a surface or substrate. The issue with PVD-coated jewellery lies in the added complexity of the jewellery material composition. While the deposited material may be biocompatible, coatings can and inevitably do wear down, exposing the wearer to the substrate and any base coats that may have been applied. In order to fully guarantee the biocompatibility and therefore safety of PVD-coated jewellery, material testing and certification from a verifiable source would need to be conducted for each surface material.

Diamond Like Coating (DLC) is often interspersed with PVD coating process. DLC is similar to PVD in that the deposition material is vaporised and deposited onto the substrate in a vacuum environment. The deposition material for DLC is a black carbon and requires the substrate fixed to a cathode in the vacuum chamber, while PVD is a metal deposition material and can in some cases require the substrate to be attached to a cathode.

Ceramic Coating is a multi-stage process that uses a non-metallic, inorganic material to create a high hardness and illustrating cover[67]. The ceramic coating chemically bonds to the substrate to provide a highly adhesive layer[68] and is available in a number of vibrant colors and shades. Although used for dental implants[69]ceramic coatings are not used in body jewellery due to the lack of known biocompatibility and adhesion failure when attempting to mask wearing surfaces.

Silver Coating is used to reduce tarnishing. Most silver platings or coatings contain either silver nitrate or silver chloride, helping to reduce irritation. The main toxic effect of silver nitrate in topical exposure is argyria, a permanent bluish grey discolouration when silver builds up in the surrounding tissue. Silver nitrate is also considered poisonous when ingested due to the corrosive nature of the compound. These factors, when considered with the inherent non biocompatibility and cytotoxicity of silver as a material adding tarnish resistant coatings to silver body jewellery, makes them less safe for wear and should be avoided.



[67] https://www.thomasnet.com/articles/chemicals/ceramic-coating-metals/
[68] https://www.coating.com.au/all-about-ceramic-coating/
[69] https://pubmed.ncbi.nlm.nih.gov/10196808/

Verification of materials

There are two main international organisations that test materials for a variety of uses. These organisations are ASTM International, formerly known as American Society for Testing and Materials, and the ISO, the International Organization for Standardization.

The ASTM and ISO develop standards regarding the use and safety of materials for a variety of purposes and many industries rely on these standards for quality and safety guidance. The ASTM alone has over 12,000 standards, 30,000 volunteers, and 140 participating countries.

Piercing industry professionals should select jewellery which meets minimum quality standards to be used in studios, whether for initial, healing or healed piercings. For metal materials such as steel or titanium, standards are defined with terms including 'mill certificate' and 'implant grade', as specified in the associated standards for implantation from ASTM and ISO.

There are a variety of body jewellery companies on the market, many advertising the same standards, offering different types of documentation in support. Learning more about these standards and how materials are verified can help us make better, more informed decisions about what jewellery we use.

Mill Certificates[70]

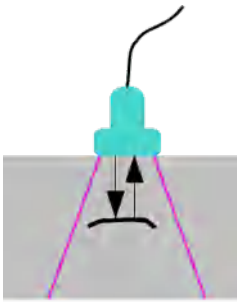
'Mill' certificates come from the melter, "mill," or foundry where raw biomaterials, such as steel or titanium, are produced. These documents have information about the material and the mill, including;

- Name and location of the mill
- ASTM and or ISO standards the material is specified to comply with
- Quantity of material purchased
- Form of the material i.e. rods, balls, sheets etc.
- Heat code for tracking products made from each melt

Manufacturers purchase materials in forms produced by a mill and receive a mill certificate with every purchase. Mill certificates can typically be requested from jewelry manufacturers if not readily available. A mill must comply with the ASTM or ISO quality control measures in their facilities in order for the materials produced to be verifiable as meeting the ASTM or ISO specifications. The country of the melter will indicate if the mill certificate is verifiable or not. The countries that participate in this mutual international agreement for quality control measures, inspection and consequences for substandard and falsified materials are listed on the DFARS 225.003(10).

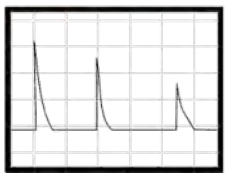
[70] https://www.monicasabin.com/

Destructive and non-destructive Material Testing



Non-destructive testing uses a variety of electromagnetic, imaging, and measurement techniques to determine what a particular material contains[71]. Due to its nature, this method can only test parts open to the surface and can not necessarily detect defects inside.

Destructive testing (DT) is an object analysis that breaks down a particular material to determine its physical properties. It is most commonly done with mass-produced items where destroying a small sample set is economically feasible.



Laboratory Testing[72]

Material tests are NOT the same as mill certificates. Independent third party testing such as Chemical Composition Analysis does not provide the quality of information needed to determine if a material meets a particular ASTM or ISO standard for implantation. These tests can be used to reassure that the finished product has the desired chemistry which matches a validated mill certificate, for international import purposes.

This type of testing can take place after the melt and milling process, and or after the material has been manufactured into body jewellery. The results will show what the material is made of, but not how it was made.

How the raw materials are melted is just as important in ensuring the material meets the standards. You can use the analogy of making a cake: you can have all the right ingredients, but they must be combined correctly in order to end up with a cake.

Also missing from chemical composition testing is a heat code. As mentioned before, the heat code is a number assigned to a particular lot of materials and is used for quality control purposes to track batches of materials from the melter. This is required for accountability for the melter, mill and materials distributor records, to ensure traceability for all batches of material sold to manufacturers.

Material Data Safety Sheet for Gold

Unlike other materials, gold body jewellery is often cast, forged or worked with hand tools rather than machined. Due to this reason, test certificates are rarely issued as the material's state has changed from the original casting grain. Instead, chemical test reports and Material Data Safety Sheets are supplied from reputable manufacturers stating exactly what percentages of each element is present. It should show that it is nickel and cadmium free as well as being 58.3% (14kt) to 75.0% (18kt) pure gold.

[71] https://www.safeopedia.com/definition/5717/destructive-testing-dt
[72] https://www.monicasabin.com/

Spotting "Fake" Mill Certificates

Although at first look, they may seem very technical and you may become easily overwhelmed, a meaningless or fraudulent certificate can be easily identified if you know what to look for.

Jewellery manufacturers who are listed as either AUPP[73] or APP[74] corporate sponsors have undergone thorough testing by the associations to confirm the material compliance.

We also have a list of verified certificates, which is regularly on our website.

https://safepiercing.org.au/certs

Red Flags

Many unscrupulous manufacturers will attempt to trick you into thinking that their product is of higher quality than it actually is. Some things to look out for include, but are't limited to:

- The certificates are self issued or self signed
- They will only supply "Test Certificates" instead of actual Mill Certificates for the melt
- They state that their certificates are "proprietary", "trade secret" or otherwise not available
- Their certificate is not issued by a DFARS agreement country[75] (specifically East Asia countries)

Spotting a fake

Do a google search on the name of the melter. If it is a stockholder, manufacturer or other company rather than an actual melter, it is almost certainly fake[76]. Compare a certificate you know to be authentic.

You can also contact the mill and ask for the chemical composition and test results of the heat number. If the information doesn't match, there is a good chance it's fake or has been tampered with.[77]

The origin of material is the important factor and It should be noted that just because manufacturing may occur outside a DFARMS agreement country, it doesn't necessarily mean the certificate is fraudulent.

[73] https://www.safepiercing.org.au/supporters/
[74] https://safepiercing.org/about2/corporate-sponsors/
[75] https://worldpopulationreview.com/country-rankings/dfars-countries
[76] https://steeltrace.co/5-ways-to-find-out-if-an-mtc-is-fake/
[77] https://steeltrace.co/5-ways-to-find-out-if-an-mtc-is-fake/

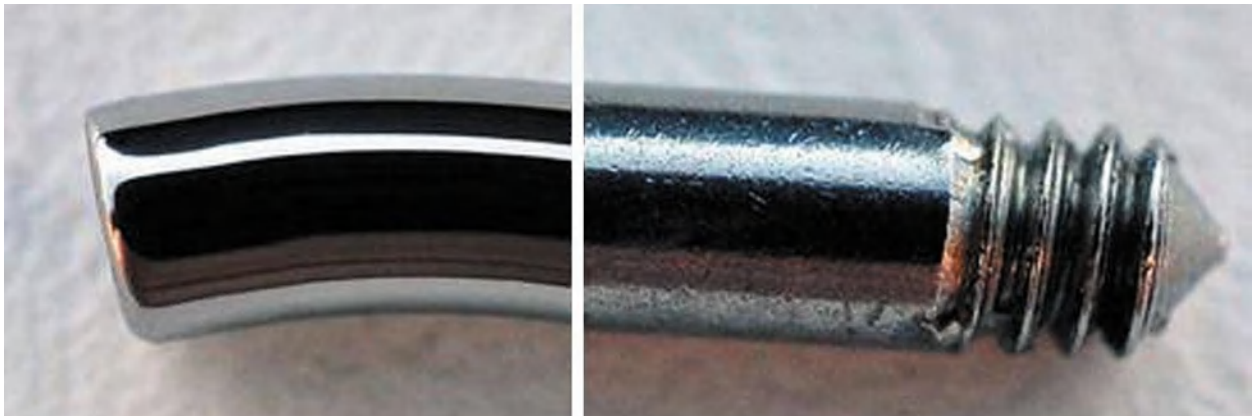
Quality of production

Internal vs External thread

The difference between internally and externally threaded jewellery is quite distinct. Although internally threaded jewellery generally tends to be of much higher quality with a smoother surface finish, it doesn't necessarily mean that it is good quality.

Externally threaded jewellery is threaded on the outside of the shaft and has serious disadvantages, including its propensity to easily tear and damage piercings when it is fitted and removed. This has also been suggested to introduce bacteria to the inside of the wound. The beads only tend to thread a limited amount of times, and the closure of the jewellery does not seal well, which is where biofilm and hardened plaque deposits accumulate. The undesirable mechanical closure design frequently results in loss of jewellery for the wearer. Externally threaded jewellery is cheap, due to its low quality materials, surface finish, and design.

Internally threaded jewellery is threaded on the inside of the shaft, which allows safe and smooth insertion without irritating the piercing channel. The bead has longer threading, which leaves a very minimal gap, thus ensuring a tighter seal which allows a much smaller area for biofilm and plaque to build. High quality manufacturers have also incorporated a self-locking mechanism. Both of these features minimise the loss of jewellery while also creating a seamless fit to the shaft.



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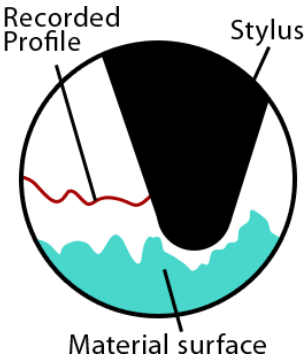
[78] Image courtesy of https://amatopiercing.com/

Surface finish



The polish, or more accurately the surface profile, can be checked using an eye-loop and manual visual comparison against a control that is known to be high quality.

Average roughness is typically measured in microns (µm). Ra (average roughness) measures the deviation of a surface from a mean height[79].

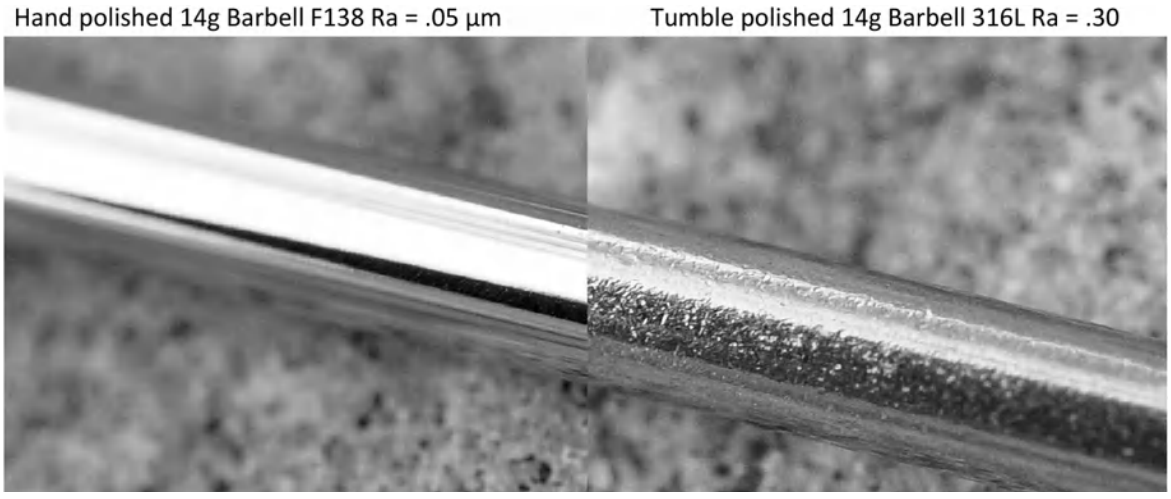
Measuring smoothness

Profilometer instruments can measure critical dimensions as step, curvature, and flatness, which are computed from the surface topography by running a stylus tip across the surface. Think of this like a needle along a record, reading the bumps to create audio.

Interferometry is a family of techniques used to measure small displacements and surface irregularities usually using electromagnetic waves and can be utilised to create both 2 and 3D.

Importance of smoothness

Not only does a smoother surface finish create a uniform oxide layer inhibiting corrosion and preventing allergic reaction, but it also reduces adhesion to the skin which can cause irritation during movement of jewellery in a healing wound. The term "mirror finish" is used to subjectively state a smooth surface, however using a standard measuring system we can determine that anything over Ra 0.10 µm is too rough[80] for jewellery use in a healing body piercing.

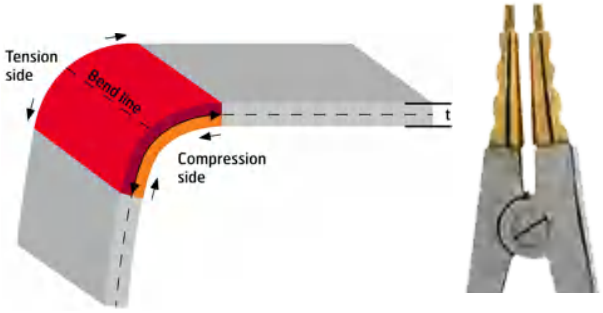


[79] https://michmet.com/surface-roughness-analysis-average-roughness-basics.htm
[80] "Scratching the Surface" - June 2017 APP by Rob Hill and Christina Bloosey

Tools for inserting and adjusting jewellery

Direct metal-to-metal contact can cause marring, gouges and scratches on the material's surface, even when utilising brass-lined tools. Padding your tools with gauze, silicone socks, or cohesive bandage will significantly help to reduce deformations or scratching during installation or removal of jewellery.

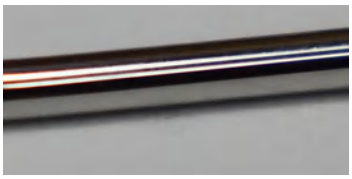
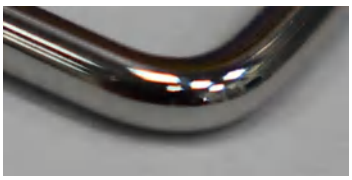
Bending metals (like creating a nostril screw or modifying an industrial barbell) will cause dislocation[81] of the surface finish walls. This creates a complex three-dimensional web of crystal defects in the metal, which can be seen as dulling with the naked eye, especially in harder materials like titanium.



Tension and compression will make the surface finish unacceptable for a piercing and requires hand polishing.

Re-polishing after bending jewellery

It is important to hand re-polish jewellery after it is bent to restore it to its original surface finish.

Image	Condition	Finish (Ra mμ)	Acceptable to use
	Factory hand polish	0.04	Yes
	Bent at 90° (no re-polish)	0.17	No
	Bent at 90° (re-polished by hand)	0.03	Yes

[81] https://piprocessinstrumentation.com/home/article/15551416/what-happens-to-metal-when-you-bend-it

Storage of jewellery

Maintaining the surface finish of your jewellery is important, even if you aren't modifying it prior to use. Ensure that jewellery is stored in a manner that will reduce the chance of friction between other pieces of jewellery. Manufacturers will often individually seal or package pieces so they won't touch.

When two objects touch each other they cause friction[82], this coefficient becomes more severe[83] when the two materials are the same (like two barbells in the same bag).

Thread Patterns[84]

Although not standardised, most jewellery manufacturers adhere to basic thread patterns to ensure that their jewellery is cross compatible. The only main exception to this is some gold manufacturers who use proprietary thread styles to ensure they can only be used with their own shafts. This practice should be avoided as it not only limits clients being able to receive downsizing from other locations, but it also unnecessarily increases the cost associated with the client's selection.

Thread	Anatometal			Industrial Strength	Leroi	Body Circle
	Size	Counterbore	Colour Code			
18g	000-120	0.15"	Copper	000-120	000-120	000-120
16g	000-120	0.15"	Blue	000-120	000-120	000-120
14g	M1.2	0.15"	Yellow	M1.2	M1.2	M1.2
12g	M1.2	0.25"	Purple	M1.2	M1.2	M1.2
10g	0-80	0.25"	Green	0-80	0-80	M1.2
8g	0-80	0.035"	Copper	0-80	0-80	M1.2
6g	2-56	0.035"	Dark Purple	2-56	2-56	M1.2
4g	4-40	0.05"	Blue	2-56	2-56	2-56
2g	4-40	0.05"	Blue	5-40	2-56	2-56
0g	6-32	0.075"	Blue	6-32	2-56	2-56
00g	8-32	0.1"	Blue	8-32	4-40	2-56
Note: Counterbore is measured in depth. Eg: 14ga barbell is made .030" oversize						

[82] https://www.school-for-champions.com/science/friction_causes.htm
[83] https://www.intechopen.com/chapters/73471
[84] Data collected by Rick Frueh
https://www.facebook.com/notes/body-modification-learning-forum/thread-patterns/257238857695972/

Australasian Regulations

Most regulations are published guidelines or best practice suggestions rather than laws. They vary greatly from state to state, and are generally based on incomplete and or inaccurate information.

Western Australia[85]
Suggested materials include, but are not exclusive to:
(a) implant grade high quality stainless steel;
(b) solid 14 or 18 ct gold;
(c) niobium;
(d) titanium;
(e) platinum; or
(f) a dense low porosity plastic such as mono-filament nylon, acrylic or lucite.

Victoria[86]
Appropriate jewellery is well polished and specifically designed for body piercing, with no nicks, scratches or irregular surfaces. Metals are chosen for their biocompatibility (or body-friendly) quality. Some metals are more biocompatible than others due to their specific composition or alloys. Surgical stainless steel, niobium, titanium and platinum are common. The metals to which people are most sensitive are nickel, copper and chromium. Dense, low-porosity plastics such as monofilament nylon, acrylic or lucite are also used.

Tasmania[87]
Only the following instruments and jewellery should be used for ear and body piercing:
• pre-sterilised jewellery.

Queensland[88]
Use jewellery featuring low or non-allergenic qualities, of a grade suitable for piercing into the body. Some examples include high quality stainless steel, titanium, niobium, palladium and 18 carat gold

Use jewellery that is highly polished, smooth and free from surface imperfections such as pitting.

[85]https://ww2.health.wa.gov.au/-/media/Files/Corporate/general-documents/communicable-diseases/PDF/Code_of_Practice_for_Skin_Penetration.ashx
[86]https://www.bawbawshire.vic.gov.au/files/sharedassets/public/public-health/documents/tattooing-and-beauty-guidelines.pdf
[87] http://www.dhhs.tas.gov.au/__data/assets/pdf_file/0016/53323/pehguide_earandbodypiercing.pdf
[88] https://www.health.qld.gov.au/__data/assets/pdf_file/0019/430642/infectcontrolguide.pdf

New South Wales[89]
Jewellery used for body piercing should be highly polished, smooth and free from surface imperfections. It should also have low or nonallergenic qualities, i.e. high qualities of stainless steel, titanium, niobium, palladium or 18 carat gold.

Australian Capital Territory[90]
Suggested materials include but are not exclusive to:
(a) implant grade high quality stainless steel;
(b) solid 14 or 18ct gold;
(c) niobium;
(d) titanium;
(e) platinum; or
(f) a dense, low-porosity plastic such as monofilament nylon, acrylic, or lucite.

South Australia[91]
Materials suitable for body piercing include surgical implant grade stainless steel (316L), solid 14k or 18k white or yellow gold, niobium, titanium, or a dense, low-porosity plastic: • Jewellery used in new body piercing must be sterile, free of nicks, scratches and irregular surfaces • Jewellery selected must be suitable for the area to be pierced.

Northern Territory
"Public and Environmental Health Guidelines for Hairdressing, Beauty Therapy and Body Art" has no mention of materials for body piercing.

New Zealand[92]
Other materials suitable for body piercing include:
• niobium;
• titanium;
• platinum;
• a dense, low-porosity plastic such as monofilament nylon, acrylic, or lucite.

Appropriate jewellery is well polished, designed specifically for body piercing, with no nicks, scratches or irregular surfaces.

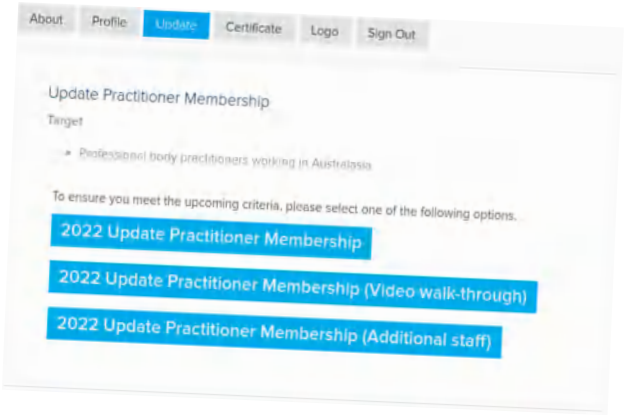
[89]https://www.greaterhume.nsw.gov.au/files/sharedassets/public/enviroment-and-planning/state-environmental-planning-policy-1-register-clause-4.6-of-the-greater-hume-local-environment-plan-ghlep/council-fact-sheet-body-piercing-and-tattooing.pdf
[90] https://www.legislation.act.gov.au/DownloadFile/di/1995-94/19950703-9930/PDF/1995-94.PDF
[91]https://www.sahealth.sa.gov.au/wps/wcm/connect/aee0a49c-1ab7-4702-849b-373311a300b0/skin-penetration-guide-10feb05.pdf
[92] https://www.health.govt.nz/system/files/documents/publications/skinp.pdf

AUPP Member Corner

Current members, time to update your membership!

With 2021 coming to an end, it's a great time to reflect on everything we have achieved and what our goals are for the coming year. For current AUPP members, that means updating your membership requirements before January 31st 2022 to ensure you remain in good standing.

We've added some new ways to update your membership or to gain membership to make it easier. Such as new forms, an option for a video walk through instead of photos, additional staff members etc. Simply go to the "update" tab in your member portal.



Starting in 2022 we will also be mailing out printed premium certificates to all members at no cost!

Changes to membership requirements

Late last year, we received a lot of awesome feedback from both current members and prospective members alike, and the board voted on some small (but important) alterations to our requirements.

Previously	Changed to
No piercing guns used by any staff member (including mechanical, spring loaded, or hand pressure systems)	No piercing guns used by any staff member at your location (including mechanical, spring loaded, or hand pressure systems)
Has submitted a video showing procedure set up, execution, and break down	Display and understands correct hand washing instructions
Submits weekly autoclave spore tests	Practices a minimum of one of the following tests for all actively used sterilisers: • Daily helix tests • Weekly in-house spore testing • Monthly third party spore testing

Meeting Membership Requirements

Ensuring that you meet or exceed the minimum AUPP member requirements is an important part of our association's and industry's growth moving forward.

2022 Requirements (previously 2021)

Ethical requirements

- Does not use external thread or step-down jewellery for initial or healing piercings
- Does not pierce with, or install in a healing wound, any jewellery in which a seam, hinge, join, or hallmark may pass through the piercing channel
- Pierces/installs in healing piercings only the following materials:
    - Titanium
    - Surgical Stainless Steel
    - Niobium
    - Glass
    - Solid Gold
    - Solid Platinum
    - Biocompatible polymers
- Does not sell or install acrylic/PMMA body jewellery

2023 Requirements (previously 2022)

Ethical requirements

- No acrylic/PMMA body jewellery sold by any staff member
- No external thread jewellery sold or used by any staff member
- Piercers/installs in healing piercings only the following materials:
    - ASTM F136 (Ti6Al4V ELI) Implant grade Titanium
    - ASTM F1295 (Ti6Al7Nb ELI) Implant grade Titanium
    - ASTM F138 (ISO 10993-6, 10993-10 and/or 10993-11) Implant grade Steel
    - ASTM B392 compliant Niobium (ie: Grade 2 Niobium, Grade 4 Niobium)
    - Glass that is lead free (ie: Fused quartz, Borosilicate, Soda-lime)
    - Solid 14kt+ gold (nickel and cadmium free)
    - Solid Platinum (cadmium, nickel, and lead free)
    - ASTM F754 Polytetrafluoroethylene (PTFE)
    - ISO 10993 compliant biocompatible polymers

Supporter Highlight