



Precious Metals

Retailers' Reference Guide



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Introduction

A precious metal is a rare metallic chemical element which is of high economic value and emotional appeal. The precious metals are platinum, gold, silver and palladium in their pure state.

When discussing precious metals, an alloy is a mixture of metals. So for example, red gold is an alloy of gold and copper, which gives the gold its red hue. A precious metal alloy is a solid solution containing at least one precious metal.

Marking and Hallmarking

Because precious metals are extremely expensive, it is very important for members of the public and all those involved in the jewellery supply chain to know how much precious metal is contained in any precious metal alloy used for making jewellery.

It is impossible for anyone to know how much precious metal there is in a piece of jewellery simply by looking at it or touching it. The precious metal content must be declared in some meaningful way.

All jewellery should therefore be marked or hallmarked with a stamp so that consumers know what they are buying.

Marking

The CIBJO Precious Metals Blue Book stipulates that as an absolute minimum, all items of jewellery should be stamped with a 'fineness mark' declaring the content of precious metal in the alloy, and a registered 'responsibility mark' indicating the name of the trader (generally the manufacturer) who has first placed that piece of jewellery on the market.

This mark is not an independent third party guarantee of the content of the precious metal.

Hallmarking

Some countries have independent third party Assay Offices who test precious metal jewellery and then strike a 'Hallmark' on the article to guarantee its fineness.

A hallmark, is a mark or series of marks struck on items made of precious metals – platinum, gold, silver and, in some nations, palladium. Hallmarks are applied by an assay office and they guarantee a certain purity or fineness of the metal.

As a pre-requisite to official hallmarking, the maker or sponsor of a piece of jewellery must usually mark a responsibility mark and lodge a claim of fineness. The hallmarking by an assay office is to confirm this claim. "Assaying" is the term used to describe the testing and measurement of the precious metal content in an item such as jewellery.

National hallmarking systems differ from country to country. The *Vienna Convention*, signed in November 1972, standardised the hallmarks, legislation and inspection of precious metals in signatory countries to facilitate international trade. Because it is so widespread it is the best example to illustrate how an independent third party hallmarking system works.

Articles which are assayed and found to be in conformity by the qualifying office of a member country receive a hallmark, known as the *Common Control Mark*, and can be exported and immediately sold in any of the Convention countries without further testing.

Common Control Mark

The Common Control Mark is a balance scales symbol superimposed on:



Platinum:
A diamond shape



Gold:
Two intersecting circles



Silver:
The letter "M"



Palladium:
A badge shape

The countries that have signed up to the Vienna Convention have done so to facilitate international trade in precious metals. It does not mean they have compulsory hallmarking in their domestic market. Some have compulsory hallmarking, such as the Czech Republic, Ireland, Netherlands, Poland, Switzerland and UK, while others have a voluntary system allowing jewellery to be sold either with or without hallmarks, for example Austria, Denmark, Finland and Sweden.

RESPONSIBILITY MARK	COMMON CONTROL MARK				FINENESS (PURITY) MARK			
	Platinum	Gold	Palladium	Silver	Platinum	Gold	Palladium	Silver
A B					850	375	500	800
					900	585	950	830
					950	750	999	925
					999	916		999
						999		
ASSAY OFFICE MARK								

The chart illustrates the 20 countries that have signed up to the Vienna Convention.

Furthermore, 4 countries – Italy, Serbia, Sri Lanka and Ukraine – are presently in the process of acceding while others have shown interest

© HALLMARKING CONVENTION



Platinum



Platinum is the rarest of the precious metals, found in only a few places worldwide – principally South Africa and Russia. Naturally white; platinum will not fade or tarnish – keeping its natural white colour forever. Most platinum jewellery does not need rhodium plating and being hypoallergenic, will not cause an allergic reaction. The high density of platinum gives it a heft and its ductile nature allows craftsmen to create the most intricate of jewellery and its physical properties ensure that precious gemstones are held securely. These intrinsic qualities explain why platinum is so popular for bridal diamond jewellery and still is the metal of reference for high Jewellery with important precious stones.

Although platinum may scratch like other precious metals, minimal metal is lost. Platinum's density results in the surface metal merely being displaced, so a platinum piece will retain its integrity and volume for generations making it the heirloom metal of choice.

Platinum has a number of other properties that make it an excellent catalyst and extremely resistant to corrosion from most chemicals, which means that platinum is the only metal suitable for a number of industrial and medical applications ranging from catalytic converters to pacemakers. It is so ductile that one ounce of platinum can produce a wire over a mile long. Platinum is also the only precious metal in jewellery that is hypoallergenic.

Fineness: The CIBJO fineness standards recognised in the Precious Metals Blue Book are 850, 900 and 950. However, the fineness of most platinum jewellery is 95%, indicating that a very small percentage of alloy shall be used. These properties mean that platinum is the purest of precious white metals available for jewellery manufacture.

Colour and Finish: Platinum is used mainly in its natural white colour and can be combined with other elements including precious metals, enamels, ceramics and wood for novelty. Furthermore, platinum Jewellery is available in a range of different finishes:

- Mirror-like polish
- Satin-finish or “brush”
- Matte-finish
- Hammered-finish
- Diamond-cut (tiny reflective facets)
- Diamond-laser (adding extra brightness)
- Filigree

Platinum

The platinum group

Platinum group metals (PGMs) comprise six metallic elements clustered together in the periodic table: ruthenium, rhodium, palladium, osmium, iridium and platinum.

They are grouped together because they have similar chemical properties. For example, they are all of white colour and all have catalytic properties however their density and mechanical properties differ greatly. These metals tend to occur together in the same mineral deposits.

Assaying

The usual method for assaying platinum is known as inductively coupled plasma-optical emission spectrometry. A sample of platinum is scraped from the item to be tested, and then weighed on a highly sensitive balance. The next stage is to dissolve the sample in the appropriate acid matrix.

This solution is then passed through the spectrometer, which determines the amount of platinum present in the solution as compared to the mass of the original sample taken.

Once the purity of the platinum is determined, the item will be stamped with a hallmark to certify this.



Domino

Gold



Gold is a rare metallic element. Its chemical symbol, Au, is short for the Latin word for gold, "Aurum", which literally means "Glowing Dawn". It has several properties that have made it very useful to mankind over the years:

- Pure gold does not rust, tarnish or corrode.
- Gold can be melted or shaped into almost any design.
- Pure gold has a naturally warm yellow colour and is one of only two coloured metal elements, the other being copper. All other metals are white, silver or grey.
- Gold can be alloyed with a number of other metals to increase its strength and create different colours.

Caratage

Gold jewellery is usually described in terms of "caratage" ("karatage" in the U.S.) to indicate its gold content. This can also be described as fineness which refers to the parts of gold per thousand by weight. 750 fineness, the measure for 18K gold, indicates that there are 750 parts of gold per thousand. 24K gold, which is described as "pure gold", "fine gold" or "Chuk Kam" in Chinese, must contain a minimum of 99.0% gold.

A caratage value below 24K will indicate how much gold there is in the gold jewellery alloy. For instance, 18K is 18/24ths of 100% gold or 75% gold. Many countries only allow certain caratages of gold jewellery to be sold. For example, in the United Kingdom one can make and sell 9, 14, 18 and 22 carat gold jewellery, but not 12 carat gold. In some countries, jewellery lower than 12 carats (50% gold or 500 fineness) cannot be described as gold. The price of gold jewellery is based, in part, on its gold content. Consequently, most gold jewellery worldwide is marked with its caratage or fineness, often as part of the hallmark.

Gold

The following table shows some of the various caratages with their equivalent gold content in percentage and fineness terms, as recognised by law in some countries.

The CIBJO fineness standards recognised in the Precious Metals Blue Book are 999; 986; 916; 750; 585; 416; 375; 333.

Negative tolerances are not recognised by CIBJO.



Elite Designs

Carats / Karats	Fineness	Gold content (%)	Comments
24	999	99.9	Gold bullion
24	990	99.0	Minimum allowed for 24K gold
22	916	91.6	Indian subcontinent
21	875	87.5	Arabic countries
19.2	800	80.0	Standard in Portugal
18	750	75.0	Standard caratage
14	585	58.5	583/58.3%
9	375	37.5	UK standard
8	333	33.3	Minimum in Germany
			No minimum in USA

Gold

Colour and finish

Gold jewellery can be produced in a range of colours – ranging from white, yellow and red, through to blue, green, black and purple. These variations are achieved by mixing (alloying) pure gold with other metals to obtain different hues.

White gold is produced by alloying pure gold with a family of white metals, most commonly nickel, palladium and zinc. To achieve the desired white finish white gold requires plating with a flash coating of rhodium a PGM that gives a platinum-like finish. In the US the FTC requires this plating to be fully disclosed to customers. Nickel however has properties that cause sensitivity and allergies, and needs to be used with great care. Consequently, in many countries around the world, there are health laws relating to nickel release from jewellery and Palladium has become the most used metal alloy. Rose gold is produced by raising the ratio of copper to silver while green gold is made by adding a combination of silver, palladium and copper to the pure gold. Variations in colour affect other properties of gold such as its hardness and strength.

In addition to different colours, gold jewellery is available in a range of different finishes:

- High-polish
- Satin-finish or “brushed”
- Matte-finish
- Hammered-finish
- Diamond-cut (featuring tiny, reflective facets)
- Diamond-laser (which adds extra brightness)
- Filigree (a traditional, intricate appearance)

Assaying

There are numerous methods for measuring gold content and the choice of method will depend on a number of factors including the accuracy of measurement needed and the speed and ease of measurement. The cost of the equipment (instrument) will also influence the decision. However, the referee method is a process known as cupellation.

A sample weighing between 50 - 500 milligrams will be scraped from the item to be tested. Highly-sensitive balances are used to measure the weight of the sample, which is then bound in lead foil with some silver. This helps to separate out the base metals in the firing stage.

For this stage, the samples are placed on special blocks known as “cupels”. When heated in a furnace, the cupels absorb all of the base metals and the sample is left as just silver and gold. Nitric acid is then used to dissolve away the silver and the result is a sample of pure gold. This is then measured and compared to the original weight of the sample. The purity can then be determined from these two measurements.



Cheri Dori

Silver



Silver has long been valued as a precious metal and used in currency, ornaments and jewellery, as well as flatware and hollow-ware. It is a soft, white, lustrous transition metal and it has the highest electrical and thermal conductivity for a metal.

Sterling silver is an alloy of silver containing 92.5% pure silver and 7.5% other metals, usually copper.

Britannia silver is an alternative hallmark-quality standard containing 95.8% silver, often used to make silver tableware and wrought plate.

In the USA, there is no minimum caratage, however sterling silver remains 925 and Coins mean 500.

Hippocrates, the father of modern medicine, wrote that silver had beneficial healing and anti-disease properties, and the Phoenicians used to store water, wine, and vinegar in silver bottles to prevent spoiling.

Assaying

Unlike gold, the usual referee method for assaying silver is a process known as "potentiometric titration". A sample will be scraped from the item to be assayed which weighs between 50 and 250 milligrams. The sample is then weighed using a highly accurate balance and dissolved in nitric acid.

In order to determine the silver content, potassium chloride is added to the sample and the electrical conductivity of the solution is tested until the point that the "titration" is complete and all of the silver has become silver chloride. The amount of potassium chloride needed to get to this point indicates the amount of silver that was in the original sample.



Palladium

Palladium, chemical symbol Pd, is a metal within the platinum group metals, and considered a precious metal in its own right. As a naturally white precious metal, palladium is primarily used in jewellery as an alloy for whitening gold.

Finished jewellery applications are primarily in wedding bands and larger necklaces and bracelets that make use of palladium's lightness, nearly half the weight of platinum. Although naturally white like its sister platinum, palladium is not hypoallergenic.

Assaying

The usual referee method for assaying palladium is inductively coupled plasma-optical emission spectrometry, the same as for platinum.

