

Platinum jewellery is rarely manufactured from 100 per cent platinum because the pure metal is too soft to withstand the rigours of daily wear. Most is typically produced using platinum of 85 to 95 per cent purity, alloyed with small amounts of other metals to increase its hardness. The platinum purity or “fineness” is nearly always measured in parts per thousand (ppt). A hallmark showing “Pt950” certifies that the metal is composed of 950 ppt (95 per cent) platinum and 50 ppt (5 per cent) other metals.

As well as determining how well a piece of jewellery will resist scratching in use, the hardness of a platinum alloy also affects how easily a piece of jewellery can be shaped and finished by hand. It is also important in the automated manufacture of products such as chains because softer alloys place less wear on the forming machinery. Components such as spring catches, however, have to be made from harder alloys that can withstand the stresses placed upon them in use.

In addition to hardness, the choice of alloy for a particular application depends on several other factors that are influenced by the alloying metal, including purity, melting range and casting behaviour, reactivity, and workability (the ability of the platinum alloy to be shaped, rolled or drawn without becoming brittle and cracking). Cost and appearance are also key considerations but, in general, particular alloy types have tended to dominate in different countries due to manufacturers’ long-standing familiarity with their individual characteristics.

Platinum-palladium alloys are widely used in Japan and China. The most common alloys are Pt900/Pd (100 ppt palladium) Pt850/Pd and Pt950/Pd. Pt900/Pd is the general purpose alloy of choice in Japan, offering a good combination of hardness, workability, and suitability for casting, welding and soldering. Chain manufacturers prefer Pt850 because its softness and ductility minimise tool wear and are also very well suited to the chain making process.

The alloy compositions used by Chinese manufacturers tend to vary considerably. Diamond set jewellery is typically produced in Pt900/Pd but other platinum jewellery is produced from alloys containing copper, cobalt or nickel. Pt950/Pd is sometimes used in Europe and Asia for castings requiring fine detail.

Platinum alloys containing up to 5 per cent **cobalt** (particularly Pt950/Co) are extensively used in Europe and Japan, and have gained popularity in the USA. The



addition of cobalt produces a fluid alloy that is well suited to the casting process, that can reproduce very fine detail, and which produces hard, durable jewellery.

The alloy Pt900/Ir, containing 10 per cent **iridium**, has very good all round manufacturing characteristics: it can be cast, welded, machined and stamped; it is ductile and malleable; can be hardened through working; and does not readily oxidise. Because of these advantages, Pt900/Ir has traditionally been one of the most important jewellery alloys used in the USA, although there has recently been a swing toward alloys of 950 fineness. Some manufacturers in Germany and Japan also prefer this alloy. Pt800/Ir is very hard and dense, and is used in Germany for the production of fine wirework.

Platinum-copper alloy systems offer several general purpose jewellery alloys for machining and hand-working applications. Casting, however, can be difficult with some copper-containing alloys. The most common compositions contain 30 or 50 ppt copper, sometimes in combination with 50 to 100 ppt palladium.

Ruthenium is used to produce a Pt950/Ru alloy that has good all-round machining properties and is well suited to high volume manufacturing processes. It is widely used for the manufacture of wedding bands, particularly in the USA. Platinum-ruthenium alloys are also commonly used by Swiss watch manufacturers.

Other platinum alloys containing metals such as tungsten, gold and gallium are also produced for the jewellery industry, and can offer advantages for specific applications. Speciality alloys, however, only account for a very small proportion of those used – the great majority of platinum jewellery is manufactured from platinum alloyed with a combination of palladium, iridium, ruthenium, cobalt or copper.

Hallmarking

Jewellery is usually marked to record the platinum content of individual pieces. When backed by consumer protection laws, a hallmark (or assay or standard mark) is a guarantee that the article contains the specified minimum purity of platinum. Some countries permit the composition of the alloy to fall below the standard by a set amount, for example 0.5 per cent, which is known as negative tolerance.

In many countries, platinum is identified by the accepted international abbreviations of "Pt" or "Plat", either preceded or followed by the fineness number. In the USA, alloys of 950 fineness or above may be marked with the word "platinum". In the UK, platinum is identified by a 5-sided shape (a rectangle surmounted by a triangle) within which the fineness number is stamped. In 1975, the European Hallmarking Convention introduced a "Common Control Mark" for platinum that is recognised by each of the signatory countries. This is a diamond shape containing a balance, which in turn surrounds the fineness number.

Europe: for platinum, the finenesses set under the Hallmark Convention are 999, 950, 900, and 850. No negative tolerance is accepted. The countries that have adopted the convention to date are Austria, the Czech Republic, Denmark, Finland, Ireland, the Netherlands, Norway, Portugal, Sweden, Switzerland and the UK.

Most other countries in Europe apply a single platinum 950 standard, with Italy permitting a small

negative tolerance. France, Spain and Italy also allow iridium to be counted as platinum. Germany permits use of alloys with 999, 960, 950, 900 and 800 fineness.

Japan: Japanese regulations cover the finenesses 1000, 950, 900, and 850, and permit a negative tolerance of up to 0.5 per cent. This enables manufacturers of 1000 alloy to add small quantities of other elements in order to increase the hardness of the pure platinum.

USA: products manufactured in the USA from platinum with a fineness of 950 or above may be marked "Platinum" or "PLAT". Alloys above 850 fineness can be marked with the abbreviations "Plat" or "Pt" as long as they are preceded by the fineness number. Alloys containing a minimum platinum content of 500 ppt are permitted if the total pgm content is at least 950 ppt. Hallmarks for these alloys have to state the fineness of each metal, for example: "650Plat300Irid".

China: the mainland Chinese jewellery industry has a national hallmarking standard that covers platinum articles, and this is policed by retailers who send incoming goods from manufacturers to approved testing centres. Most alloys used have a platinum fineness of 900 or 950 and are marked accordingly.

Platinum jewellery manufactured in Hong Kong is covered by trade descriptions orders, under which any product described as being "platinum" must have a fineness of at least 850. Similar to Europe and Japan, the hallmarks Pt850, Pt900, Pt950 and Pt990 are used to denote the platinum content of alloys used.

Outline Properties of Common Platinum Jewellery Alloys



| Composition % Alloying elements | Pt/pgm Fineness | Melt temp. °C | Hardness Hv | Applications/Notes | Countries of major use |
|------------------------------------|--------------------|------------------|--------------------|-------------------------------------|---------------------------|
| 5% Copper | 950 | 1,745 | 120 | General purpose | Europe |
| 5% Cobalt | 950 | 1,765 | 135 | Fluid for hard castings | Europe, USA |
| 3-5% Cobalt/ 5-10% Palladium | 850 – 950 | 1,730 – 1,765 | 125(C) – 150(C) | Hard castings | Japan |
| 5% Iridium | 950 | 1,790 | 80 | General purpose | Europe, Japan, USA |
| 10% Iridium | 900 | 1,800 | 110 | General purpose | USA |
| 15% Iridium | 850 | 1,820 | 160 | Catches, pins, springs | Japan |
| 20% Iridium | 800 | 1,830 | 200 | Spring applications & fine wirework | Germany |
| 5% Palladium | 950 | 1,765 | 60, 68(C) | Castings, delicate settings | Japan |
| 10% Palladium | 900 | 1,755 | 80, 72(C) | General purpose | China, Japan |
| 15% Palladium | 850 | 1,750 | 90, 64(C) | Chain making | Japan |
| 5% Ruthenium | 950 | 1,795 | 130 | Machining | Europe, USA |
| 5% Tungsten | 950 | 1,845 | 135 | Hard for springs | Europe |

NOTES: 1. Melt temperature is the liquidus value – the temperature at which the alloy becomes fully liquid 2. Hardness values are for the annealed state except those marked (C), which are for the as-cast state 3. Pt/pgm finenesses are in ppt.