Hallmark of
The Goldsmiths' Company
since 1300

The
GOLDSMITHS'
Company

ASSAY OFFICE

The Hallmarking Process

A process honed over 700 years

When a packet containing articles for hallmarking arrives at the Goldsmiths' Company Assay Office, it is weighed and the contents are checked to ensure that the number and weights of the enclosed articles correspond with the hallnote, which should accompany the packet. The articles are then sampled and assayed before hallmarking is carried out.

In recent years, the Goldsmiths' Company Assay Office has received over 67,000 packets containing over 3 million articles per year. The Goldsmiths' Company Assay Office is certified to ISO 9001:2008.

Sampling

Assaying

Hallmarking

The hallmarking process

Cup by Clive Burr

Image on cover: Pair of napkin rings, 2003, by Rauni Higson
The Goldsmiths' Company Collection

Sampling

Traditional sampling is the removal and testing of a representative quantity of material from the articles contained in the packet. It is a requirement that all articles contained in the packet should be grouped according to fineness. This homogeneity is checked by carrying out a series of '**touch tests**' on the articles.

The touch test

Cutting

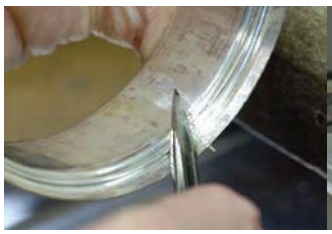
In the touch testing process, the articles are lightly rubbed onto a 'touchstone', leaving a thin smear of material on the stone. Chemicals are applied to the smear and from the reaction that takes place, an initial indication of the fineness is determined.

Once a sampler is satisfied that the articles in the packet are the same, a small quantity of material is removed. This can be achieved by **cutting**, eg, by removal of a casting sprue, or by '**drawing**' (scraping).

The material removed is collected into one or more 'assay papers' and sent to the laboratory for assaying.

In addition to the touch test, the modern sampler can also use an **X-ray fluorescence (XRF) spectrometer** to determine the fineness of an article. The machine works by firing an X-ray beam at the article. The beam interacts with the article which gives out its own characteristic X-rays. These can be detected and used to determine the composition of the article. The technique is very accurate and non-destructive, making it useful for finished articles.

Today, this is the preferred method and is used where possible, thus eliminating the need to physically remove a sample from the article.



Drawing

X-ray fluorescence (XRF) spectrometer

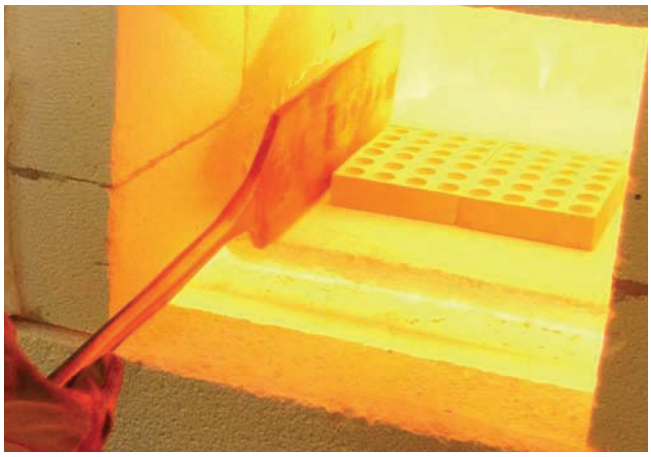
Assaying

Assaying is the accurate determination of the precious metal content in an alloy. There are three main methods of assaying: cupellation for gold, titration for silver and inductively coupled plasma optical emission spectrometry (ICP OES) for platinum and palladium.

Cupellation

This process can be traced to pre-Roman times. The gold sample is weighed very accurately. A known amount of silver is added in a process called 'inquartation'. The gold and silver mixture is wrapped in lead foil and shaped into a ball. The ball is placed in a 'cupel', a porous refractory material.

The cupel is placed in a furnace at 1100°C and left for 20 minutes. In the furnace, the lead ball and all of its contents melt. All metals except the gold and silver, are absorbed into the material of the cupel. When the cupel is removed from the furnace, all that remains is a sphere of gold and silver. The sphere is removed, rolled into a cornet shape and placed into nitric acid where the silver is dissolved out from the gold in a process known as 'parting'. A sample of pure gold is created which is reweighed to allow the fineness of the alloy to be determined. Cupellation produces an accuracy of about 1 part per thousand.

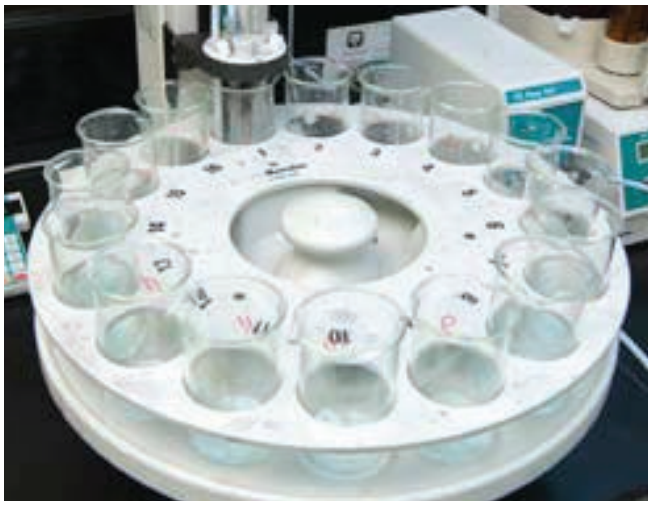


Cupellation furnace

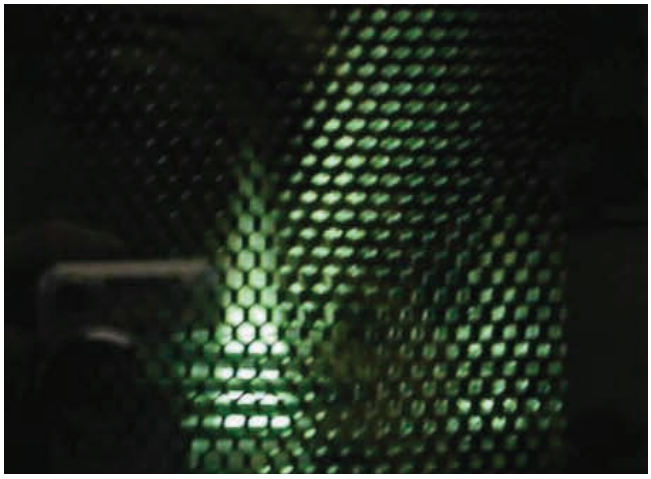
Titration

In this process a silver sample is weighed accurately, placed in a beaker and a fixed quantity of nitric acid is added to form silver nitrate solution. The beaker is placed into an autotitrator where sodium chloride (common salt) solution is added in known quantities.

The sodium chloride reacts with the silver nitrate solution to form silver chloride and the reaction is monitored using an electrode connected to a computer. From the electrode response, it is possible to tell when all of the silver has reacted and therefore how much of it must have been present. A weight of pure silver can then be calculated. Titration also produces an accuracy of about 1 part per thousand.



Titrator



ICP OES Technique

Inductively Coupled Plasma Optical Emission Spectometry (ICP OES)

A plasma is a high energy gas of ions and electrons, created by electrically vibrating the gas atoms using an alternating electric field. In the ICP OES technique, a controlled plasma flame from the gas argon is created. The temperature of the flame reaches up to 10,000°C. A platinum or palladium sample is weighed accurately, placed in a beaker and dissolved in aqua regia which is a mixture of hydrochloric and nitric acids. The solution is diluted and injected into the flame of an ICP spectrometer. The sample ionises and emits radiation which is analysed with a spectrometer. From the intensities of the radiation, the amount of platinum or palladium in the solution can be calculated. The technique produces an accuracy of about 10 parts per thousand.

Failure of Assay

If the initial assay of a packet of articles indicates that the fineness is not to the level indicated on the hallnote, a retest is carried out. If the same result occurs, the offending articles are usually marked at a lower standard. If this is not possible, then the customer is contacted to find a mutual way forward. As a last resort, the Assay Office is empowered to destroy the articles.

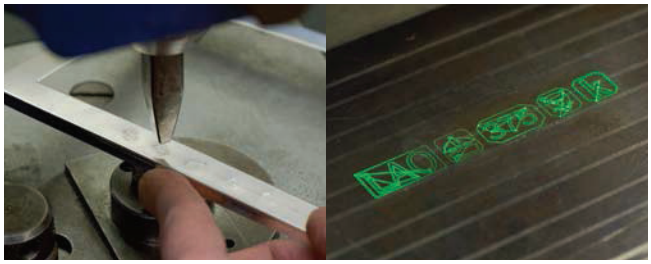
Hallmarking

Once the articles have been sampled and assayed successfully, they can be marked. There are three main methods of marking: handmarking, pressmarking and lasermarking. The selection of the method of marking used depends on the quantity and nature of the articles.

Handmarking

The most traditional method of marking is handmarking where the article is struck using a punch by a highly skilled operative. A key part of handmarking, and indeed pressmarking, is the support tool. This not only helps hold the article during marking but helps limit the amount of bruising and setting back required. Handmarking is used for low volume marking, display marking and when pressmarking is difficult.

Handmarking



Pressmarking Lasermarking

Pressmarking

This is essentially an automated version of handmarking. It is ideal for smaller articles such as chains and bracelets. It is also good for long runs of similar articles, such as rings.

Lasermarking

The most recent method of marking is lasermarking. In this process, material is etched away using a very fine but high powered laser beam. Because it is an etching process, it is ideal for use on delicate or hollow items. It is also useful for marking logos or signatures.

Packet tracking

As part of our comprehensive service, each packet is given a unique number when it arrives at the Goldsmiths' Company Assay Office. This means it can be tracked at any time on our secure website at www.assayofficelondon.co.uk.

For further information contact:

The Goldsmiths' Company Assay Office
Goldsmiths' Hall
Gutter Lane
London
EC2V 8AQ

T: 020 7606 8971
F: 020 7814 9353
info@assayofficelondon.co.uk
www.assayofficelondon.co.uk

Please refer to our Full Terms & Conditions which can be downloaded from our website at: www.assayofficelondon.co.uk

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Certificate Number 3344
ISO 9001

UKAS TESTING 0858

The Goldsmiths' Company Assay Office is accredited to international standard ISO 17025:2005 for a range of tests. The full schedule can be found in the Useful Downloads section of our website.