liquid burnish gold

PG 677 B H for brush

Heraeus Precious Coatings is a global manufacturer of precious metal decoration products for ceramics and glass. Heraeus profits from over 100 years experience in ceramic and glass decoration designs, which has always made the department a pioneer in the development of precious metal colours. Modern precious metal preparations have to meet high demands on different types of substrates – such as on porcelain, tiles, drinking glasses, flacons and bottles. Decorations have to achieve good mechanical and chemical resistance such as dishwasher durability.The products supplied by Heraeus Precious Coatings include: Bright gold and platinum products, silk-matt gold and platinum products, burnish gold and platinum products, lusters and metallo-organic preparations for technical use.

1 General information

PG 677B H is a medium viskos yellow liquid burnish gold for the decoration of porcelain. The material has a moderate gold content, but nevertheless shows a good adhesion and abrasion resistance after firing and is typically used for dinnerware and giftware decoration.

2 Standard firing range

Substrate	Firing range [°C]
porcelain	780-880

The firing result depends on the firing temperature, the total cycle time, the soak time as well as of the glaze chemistry of the substrate decorated. To achieve an optimal firing result, we recommend firing tests under the users own individual conditions.

Directly to the product:

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3 Properties of the product

The major characteristics of a Heraeus precious metal preparation are determined by its production recipe. From each lot produced, we take a sample and check defined characteristics. In case of liquid burnish gold we check the viscosity and the application properties comparing them with the defined standard. After the firing, we check the optical appearance – glossiness and gold colour shade. Controlling each single production lot assures the highest product quality and lot-to-lot stability.

3.1 Processing

We deliver PG 677B H ready to use. The material can be applied without further thinning and distinguish themselves by its excellent application properties and a sharp outline.

3.2 Storage

Liquid burnish golds are subject to an ageing process. The viscosity increases during storage. Besides the materials contains gold powder which tends to settle in the bottle. Before usage, the material needs to be intensily shaken to homogenize and re-destribute to gold powder with the material. Besides, it is recommendable to put the stored bottles from time to time on a roller block to homogenize the material and to prevent a too strong clustering of the gold powder at the bottom of the bottle. The material should be stored at room temperature (20°C). We recommend using the material within 9 months time.

3.3 Consumption

The material consumption depends on the thickness of the applied precious metal layer. Under our conditions, the consumption is approx. 0,3 – 0,4g/100 cm².

4 Properties of finished decorations

The main properties of fired bright precious metal decorations comprise brilliance and precious metal tone, dishwasher resistance and resistance to mechanical and chemical attack.

These properties are influenced by a number of factors. The high quality of the preparation used is an absolute prerequisite for manufacturing high-quality decorations. The quality of a fired decoration, however, derives from the interplay of preparation, application, substrate surface and firing conditions. A variation in only one factor – for instance, the firing conditions, has an immediate influence that leads to altered properties of the fired decoration.

We have processed the bright precious metal preparations under defined conditions. Then we determined the properties of the finished decorations. The following data indicate achievable quality features for the finished decorations manufactured with bright precious metal preparations. They must, however, always be checked by the user under his own individual conditions.

4.1 Dishwasher resistance

All details as to whether decorations are dishwasher durable are to be regarded as approximate values, as test results vary widely according to the type of dishwasher, washing programme, washing-up detergent, water quality and firing conditions.

Heraeus tests whether finished decorations are dishwasher durable, roughly following the test-washing programme of the Technical Standards Committee for Material Testing (Fachnormenausschuss Materialprüfung) in a Miele continuous dishwasher. If a decoration withstands 500 washing cycles essentially without damage, we designate it as dishwasher durable. If it withstands 1000 washing cycles, we designate it as dishwasher resistant.

Test decorations prepared with PG 677B H proofed to be dishwasher durable.

4.2 Abrasion resistance

Gold decorations with PG 677B H showed a good scratch resistance.

4.3 Oxidation resistance

PG 677B H contains a certain amount of silver. Under unfavourable conditions silver containing precious metal decorations can tarnish in the course of time. Especially the contact to cardboard boxes, high humidity and high temperature support the reaction of silver to silver sulphide.

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5 Application of the material

5.1 Preparation for the decoration

Work in a well-ventilated room. Good printing conditions occur at a room temperature of 20 to 25°C.

5.2 Preparation of the substrate to be decorated

Make sure that the surface of the object to be decorated is clean and dry. Dust, fingerprints and water condensation can affect the decoration while firing. Take care that the object to be decorated is not taken from a cold store into a warm shop. A fine condensation film may occur, which is not visible for the naked eye. Result: Firing disturbance (pinholes) in the fired precious metal decoration! Allow enough time for the substrate to adjust to the decoration room temperature.

5.3 Recommendations for the usage

- Please shake the material intensily before usage, so that probably settled gold powder gets distributed again within the liquid burnish material.
- Draw from the bottle only as much as you can consume within 15 or 30 minutes and close the bottle. Consider that the solvent continuously evaporates in air and therefore the viscosity slowly increases.
- Apply the preparation in a moderate layer thickness onto the object to be decorated. A too thin layer influences the mechanical, chemical and optical properties of the fired decoration.
- Ensure a dust free environment during the application as well as during the time to drying. A wet surface is attractiveto dust. After drying firre the item as soon as possible.

5.4 Firing

- During the first heating phase the organic components of the preparation burn off. This process is completed at approx. 400°C. The gold film is formed. A constant, slow temperature increase, enough oxygen and sufficient ventilation are decisive for the quality of the fired precious metal decoration.
- The firing profile considerably influences the mechanical and chemical properties of the fired decoration.
- The rate of cooling has no major influence on the quality of the gold decoration, unlike the firing temperature and soak time. However, the firing process should not be stopped too abruptly after the soak time. If the rate of cooling is too fast, there may be a danger of damaging the article (cracks and broken glass).

5.5 Burnishing of the fired gold layer

After firing the burnish gold decoration needs to be burnished. The gold layer can be burnished with a burnishing machine or by hand with a glass fiber brush. An older method it to burnish the gold with sea sand.

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6 Typical defects, root causes and countermeasures

Defect	Possible Cause	Counter measure
Blurred contours.	a) Too much thinning of the product. b) The thinner was too fat or drying too slowly.	a) Leave the bottle open for a while, so that some of the solvent can evaporate. b) Leave the bottle open for a while, so that some of the solvent can evaporate.
Running precious metal.	Too much organic fumes in the furnace.	Reduce the number of objects in the furnace.
The fired precious metal decoration is too glossy.	a) The liquid silk matt material had not been shaken prior to usage respectively not been shaken intense enough to distribute settled matting agent homogeneously within the material. b) The deposit of the material is too thin.	a) Shake the silk matt material longer before the usage. b) Increase the material deposit layed down by brush.
The fired precious metal decoration looks to matt / dull.	a) Possibly a too thick deposit of material has been applied. b) The material has thickened up during storage / lost solvent.	a) Reduce the material deposit. b) Substitute the lost solvent with thinner and shake the material intensly before usage to assure a homogeneous distribution of the matting agent within the material.
Preparation shows bad application.	Viscosity is too high after long application or long storage.	Thinning of the product with V 35, V 16 or V 18.
Spots.	Contamination as dust, fingerprints or water condensation.	a) Carefully clean the object before decorating.
Firing disturbance.	Problems in the kiln such as: a) Reduced atmosphere in kiln. b) Insufficient ventilation. c) Heat increase is too fast during critical phase between 200-400°C . d) Too many objects in the kiln.	a) Increase air addition. b) Improveme ventilation c) Reduce the heating speed. d) Reduce the number of objects in the kiln.

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Defect	Possible Cause	Counter measure
Precious metal chips offs during firing.	a) Contamination of the surface causes chip off. b) The layer of the product it too thick.	a) Clean the substrate before decorating. b) Reduce layer of the product.
Low mechanical resistance of the precious metal decoration.	a) Firing temperature is too low. b) Layer of the product is too thin.	a) Increase the firing temperature. b) Increase layer thickness.
Fine pinholes.	Pinholes can be released by moisture on the surface of the decorated object. Taking objects from a cool store into a warm shop leads to invisible condensation on the surface.	Allow enough time for the ware to reach shop temperature, so that the condensation has time to evaporate.

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The statements concerning our products correspond to our current knowledge and experience. It is the obligation of the purchaser to examine the usefulness of the products in its intended use in each individual case. In order to prevent production losses the user has to test the preparations in connection with every other material being involved in the production process and has to be satisfied that the intended result can be consistently produced.