liquid bright gold

GG 1046-12% 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

GG 1046-12% H is a standard liquid bright gold which can be used on a wider range of glass types. The material is suitable for the decoration of soda lime and borosilicate glass, but can also be used for the decoration of lead crystal. GG 1046-12% H shows a yellow gold colour shade after firing. GG 1046-12% H can also be used for the Two-Fire-Etching-Imitation-System on glass.

2 Standard firing range

Substrate	Firing range [°C]
soda lime glass	520-620
borosilicate glass	580-620
lead crystal	480-510

The firing result depends on the firing temperature, the soak time and the total cycle of the firing as well as on the type of glass, the glass chemistry and on the possible coating of the glass item to be decorated. For an optimal firing result we recommend pre-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 bright 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 GG 1046-12% H ready to use. The material can be applied without further thinning and distinguish themselves by its excellent application properties.

3.2 Storage

Liquid golds are subject to an ageing process. Therefore, we recommend using the material within 9 months. The material should be stored at room temperature (20°C). Cool storage – but no freezing – has a positive impact on the shelf life.

3.3 Consumption

The material consumption depends on the thickness of the applied precious metal layer. Under our conditions, the consumption is approx. 0,15 to 0,30g/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 the dishwasher durability of glass decorations under defined test conditions in a Winterhalter Gastronom GS 29 with an automatic proportion of the detergent and the clear rinse. Precious metal decorations on glass usually don´t achieve the resistance of a similar decoration on ceramics. If a decor withstands 200 wash cycles under our conditions essentially without damage, we designate it as dishwasher durable.

Test decorations with GG 1046-12% H showed a good dishwashing result on a majority of tested glasses, under the precondition of a reasonable heatwork at the upper end of the mentioned firing ranges.

4.2 Abrasion resistance

The chemical composition of glass and the low firing range on glass limit the obtainable mechanical resistance. Therefore, precious metal products on glass do not show such an abrasion resistance as similar decorations on porcelain, bone china or earthenware.

4.3 Oxidation resistance

GG 1046-12% H contains some 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 objects to be decorated are not taken from a cold store into a warm shop. A fine condensation film may occur, which is not visible to the naked eye. This results in firing disturbance (pinholes) in the fired precious metal decoration. Allow enough time so that they can adjust to the decoration room temperature.

5.3 Recommendations for the usage

- Do not shake the bright precious metal preparations prior to use.
- 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. In extreme cases, it can lead to a reddish colour of the surface without any gold character. A too thick layer may lead to cracking, blistering, or to a matt surface.
- In case the preparation is used for spraying, thinning with about 30% thinner V 35, V 16 or V 18 is required.

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). Typical defects, root causes and countermeasures to prevent them

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6 Typical defects, root causes and countermeasures

Defect	Possible Cause	Counter measure
Blurred contours, running precious metal	a) Too much thinning of the product b) The thinner was too fat or drying too slowly c) Too much organic fumes in the furnace	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 c) Reduce the number of objects in the furnace
Preparation shows bad application	Viscosity is too high after long application or long storage	Thinning of the product with V 35, V 16 or V18
Spots	Contamination as dust, fingerprints or water condensation	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 (390-750°F) d) Too many objects in the kiln	a) Increase air addition b) Improve ventilation c) Reduce the heating speed d) Reduce the number of the objects in the kiln
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 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.