burnish gold paste

PGP 6500-20% H for machine lining

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

PGP 6500-20% H is a bright gold paste for machine lining neoprene on porcelain. The fired metal film shows a yellow gold colour shade. With the slow drying high viscos lining paste lines of up to 10mm width can be achieved.

2 Standard firing range

Substrate	Firing range [°C]
porcelain	780-880

The firing result depends on the firing temperature, on the total firing time, the soak time and not least on the glass type. To achieve an optimized firing result, we therefore recommend a firing test 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 machine lining pastes we check the physical properties and the application properties compared to a predefined standard. After firing under standard firing conditions, we check the gold colour shade and the adhesion to the substrate. Controlling each single production lot assures the highest product quality and lot-to-lot consistency.

3.1 Processing

We supply bright precious metal preparations for machine lining neoprene ready to use. If the viscosity requires some adjustment, we recommend thinner V 170 H.

3.2 Storage

Printing pastes 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. 0,2 to 0,40g/100 cm².*

4 Properties of finished decorations

The properties of finished decorations are influenced by a number of factors which interact with each other: The precious metal preparation used application, substrate, possible substrate treatment and last but not least the firing conditions. We processed PGP 6500-20% H under defined, standard test conditions and run certain tests of the achieved precious metal decoration.

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 program, washing-up detergent, water quality and firing conditions.
- Heraeus tests whether finished decorations are dishwasher durable, roughly following the test-washing program 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 PGP 6500-20% H proofed to be dishwasher durable.

4.2 Abrasion resistance

In tests decorations created with PGP 6500-20% H showed a good abrasion resistance.

4.3 Oxidation resistance

Being a material of yellowish gold colour shade PGP 6500-20% H does contain 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. The room temperature should be between 20-25°C with a relative humidity of 60-70%.

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 fill only 3/4 of the reservoir of the lining machine with the lining material. During the lining process part of the solvents will evaporate. Therefore please fill from time to time some fresh material into the tank. Before you start regular production, take some time to determine the optimal application conditions:
- Roller hardness: For wider lines softer neoprene rolls are recommended, for thinner lines harder neoprene rolls show best results. We recommend the following neoprene rolls: Thin lines: Approx. 50 shore. Wides lines: Approx. 40 shore.
- Fixing the angle of incidence of the roller. The choice of the optimal angle is of great importance for good coverage of the applied material. Especially for wide lines and for the decoration of very arched areas or of hollows. Investigation of the optimal angle is essential.
- Rotations: The number of necessary rotations is influenced by the lining machine used (two or one rollers). Mostly 2 to 4 rotations are enough for a sufficiently strong and homogenous precious metal layer.
- Preparation fluidity: The optimal preparation fluidity out of the reservoir onto the roller needs to be determined by testing. If too much material flows out of the reservoir the precious metal line tends to fray. A too thick layer can result in cracking, boiling up and matt areas of the precious metal decoration. If too little preparation is released, many rotations are necessary to reach a homogenous precious metal film. A too thin precious metal film has influence on the chemical and mechanical resistance of the fired decoration.
- After the application: Please take care of dust free surroundings during the application and the drying. The wet surface is extremely sensitive to dust. After drying, the decoration is not as dust sensitive as before, but the objects should be fired as soon as possible. Using heat radiators or infrared lamps, the drying time can be reduced to few minutes.

5.4 Cleaning of the lining machine

After finishing the application / at the end of the working day, the reservoir should be cleared and cleaned as well as the metal wheel, the brush or the roller. For cleaning of the stock container, the metal wheel or the roller we recommend our cleaners V 35 or V 39.

5.5 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).

5.6 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
Rough edge to the precious metal line.	Too much preparation was applied to the object.	Reduce preparation flowability and/or number of rotation.
Blurred contours.	Too much thinning of the product.	Leave the pot open for a while, so that some of the solvent can evaporate.
Running gold.	Too much organic fumes in the furnace.	Reduce the number of objects and/or improve the ventilation.
Spots.	Contaminations as dust, finger marks or water drops.	Clean the object before decorating.
Firing disturbance.	Problems with the furnace such as: a) Furnace atmosphere reduction. b) Insufficient ventilation. c) Too quick a heat up between 300-400°C. d) Too many objects in the furnace.	a) Optimize air addition and ventilation. b) Improvement of the ventilation. c) Reduce the speed of heat up. d) Reduce the number of objects.
Low mechanical resistance of the precious metal decoration.	a) Too low a firing temperature. b) The layer of the product is too thin.	a) Increase the firing temperature. b) Increase the layer thickness of the precious metal decoration
Fine pinholes.	Pinholes can be released by moisture on the surface of th decorated object. Taking objects from a cool store into a warm shop gives invisible condensation on the surface.	Give the goods time to take on the temperature of the decoration room and with that the possibility to evaporate the condensation film.
Bulg formation during application with neoprene roller.	a) Neoprene roller is too hard. b) Paste has been thinned too much.	a) Use of a less hard neoprene roller. b) Let the solvents evaporate or add fresh preparation.

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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.