bright palladium paste

GPP RC/4021 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

GPP RC/4021 H is a bright palladium paste for machine lining neoprene. The fired metal film shows a white platinum finish. Correctly applied and fired decorations created with GPP RC/4021 H show a good dishwasher durability and ASTM resistance and therefore GPP RC/4021 H finds its major usage in the decoration of institutional beer glasses. 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]
soda lime glass	560-620

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 metal 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 an 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. 0,15 to 0,30g/100 cm^2.

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 GPP RC/4021 H under defined, standard test conditions and run certain tests of the achieved precious metal decoration.

4.1 Dishwasher resistance

All information about dishwasher durability of precious metal decorations must be considered as approximations, because the test results depend on the type of dishwasher, rising programme, dishwashing detergent, water quality, the firing condition and so on.

Heraeus tests the dishwasher durability of glass decoration in a Winterhalter Gastronom GS 29 with an automatic proportion of the detergent and the clear rinse, under defined test conditions (see our technical information sheet "behaviour of precious metal decoration in the dishwasher") Precious metal decoration on glass will not achieve the resistance as a similar decoration on porcelain. If a decor withstands 200 wash cycles we describe it as dishwasher durable.

Test decorations with GPP RC/4021 H proofed to be dishwasher durable on most of the test glasses.

4.2 ASTM/Colgonite/Cascade-Resistance

Test decorations with GPP RC/4021 H showed a good ASTM resistance in our tests.

4.3 Abrasion resistance

In tests decorations created with GPP RC/4021 H showed a reasonable abrasion resistance.

4.4 Oxidation resistance

GPP RC/4021 H contains a small amount of silver. Under unfavourable storage 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 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. As orientation point 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 for dustfree 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 or 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).

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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
Gold is cracking after firing	a) The layer of the preparation is too thick b) The product was thinned with a too slow drying thinner, runs give thick layers which crack during firing	a) Reduce the precious metal layer b) Use less fat thinner
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

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Defect	Possible Cause	Counter measure
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 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
Weak, copper precious metal film	Too thin precious metal layer	Increase the preparation flowability or the number of rotation
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
Precious metal film is dull but the abrasion resistance is good	Too high firing temperature or too long soak time	Modify the firing conditions (lower temperature and / or shorter soak tim e)
Matt firing result	Too thick product layer. Possible causes: a) Too high preparation fluidity b) Too many rotations per lined object c) Preparation flows into hollows in the lined area and causes a too thick layer	a) Reduce preparation fluidity b) Reduce the number of rotation c) Use of a less flowing product which has normally a higher viscosity

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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.