bright palladium paste

GPP 1119 D/TH H for direct screen printing thermoplastic

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 1119D/TH H is a standard thermoplastic bright palladium paste for direct screenprinting on glass. It is used for the decoration of drinking glasses as well as for glass bottles.

2 Standard firing range

Substrate	Firing range [°C]
soda lime glass	560-620
glass bottles	580-640

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.

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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 screen-printing preparations, before firing, we check the physical properties (e. g. viscosity, thixotropy) and the printing 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 thermoplastic screen printing ready to use. GPP 1119D/TH H has a thixotropic nature, means the typical printing viscosity is reached at certain printing speed, when the thixotropy is temporarily broken. The applied material hardens instantly and assure a sharp outline of the print.

3.2 Storage

Thermoplastic bright metal 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 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, possible bordering colours, application, substrate, possible substrate treatment and last but not least the firing conditions. We processed GPP 1119D/TH 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 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 do not 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 prepared with GPP 1119D/TH H had been dishwasher durable.

4.2 Abrasion resistance

In tests decorations created with GPP 1119D/TH H showed a good abrasion resistance.

4.3 Oxidation resistance

GPP 1119D/TH H contains only a small amount of silver, therefore there is little risk that the decoration tarnishes over time in unfavourable storage conditions. Risk factors for tarnishing of a bright metal decoration are the contact to cardboard boxes, high humidity and high temperature.

4.4 Precious metal colour at the reverse side

Precious metal decorations on glass often show a reddish discoloration on the reverse side. The tendency to this kind of red discoloration is strongly related to the chemical formulation of the glass, but also influenced by the precious metal product used and the kiln atmosphere during firing. Under our test conditions GPP 1119D/TH H showed no reddish discoloration on the reverse side.

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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

- For printing GPP 1119D/TH H 400 to 500 mesh stainless steel screens are recommended to be used.
- For a good printing result, it is important to have a well sharpened squeegee (hardness: 60-75° shore).
- To print thermoplastic bright gold paste the screen needs to be heated to a temperature of 65 to 75°C.
- Mostly the material chunks are pre-melted. The pre-melting temperature should not be higher than the recommended screen temperature.

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).

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6 Typical defects, root causes and countermeasures

Defect	Possible Cause	Counter measure
Streaks in the printed precious metal film	The squeegee is possibly scratched	Exchange or sharpen the squeegee
Squashed print	The squeegee is not sharp enough or it is worn out	Exchange or sharpen the squeegee
Spots	Objects were soiled by dust, finger marks or water drops before printing	Clean the object before decorating
Firing disturbance	Problems in the kiln such as: a) Furnace atmosphere reduction b) Insufficient ventilation c) Too quick heat up in the 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
Fired result is blotchy or matt	Screen used is too coarse; printed layer is too thick	we recommend a 400-500 mesh steel screen.
Blurred outline after firing (spreading or running)	Too many objects in the kiln	reduce the number of objects in the kiln
Precious metal flakes off during firing	Printed layer was too thick.	Remove product from the screen (=> recycling). Cleaning the screen and print with fresh preparation. Be sure that the screen temperature is 65 -75°C
Fine pinholes	Moisture on the objects before decoration leads to firing faults (pinholes)	give the ware enough time to acclimate to the temperature of the decoration shop and so a possible condensation film to evaporate
Low mechanical resistance of the precious metal decoration	a) Too low firing temperature b) The layer of the preparation is too thin	a) Increase firing temperature b) Use 425-500 mesh steel screen to print thermoplastic precious metal preparations

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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.