bright copper paste

GGP 2067-7,4% H for direct screen printing wet paste

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

GGP 2067-7,4% COPPER H is a wet paste for direct screen printing on glass. The copper paste is mainly used for the decoration of glass bottles, but also suitable for drinking glass decoration. The material is of thixotropic nature with a comparably high viscosity for fast printing and high contour sharpness of the designs to be decorated.

2 Standard firing range

Substrate	Firing range [°C]
soda lime glass	560-620
glass bottles	600-640

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.

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 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 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 direct screen printing ready to use. GGP 2067-7,4% COPPER 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

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, possible bordering colours, application, substrate, possible substrate treatment and last but not least the firing conditions. We processed GGP 2067-7,4% COPPER H under defined, standard test conditions and run certain tests of the achieved precious metal decoration.

4.1 Abrasion resistance

In tests decorations created with GGP 2067-7,4% COPPER H showed a good abrasion resistance.

4.2 Oxidation resistance

GGP 2067-7,4% COPPER H does not contain silver and therefore bares no risk of oxidation.

4.3 Adhesion of the fired decoration on coated bottles

We are testing the adhesion of a printing paste designed for the decoration of coated bottles with our so called “freezing test”. We are putting a decorated test bottle over night in freezer. The decoration is exposed to cold and humidity. The next day the bottle gets removed and warms up to room temperature. Then a scotch tape is applied on the gold decoration and gets removed with one stroke. No metal should be removed with the scotch tape. Test decorations prepared with GGP 2067-7,4% COPPER H passed the freezing test without removal of material. We recommend running such a test under the individual customer conditions. The result is impacted not only by the used material, but by the eveness and thickness of the bottle coating as well as by the quality of the print and the firing conditions.

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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

We recommend to print GGP2067-7,4% COPPER H with a 120-34 to 140-34T polyester screen. For a good printing result, it is important to have a well sharpened squeegee (hardness: 60-75° shore).

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 120-34 to 140-34 T polyester 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	Reduce thickness of applied film
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 product is too thin	a) Increase the firing thickness b) The use a 120-34 to 140-34T polyester screen contributes to a reasonable layer thickness after firing

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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.