Burnish Palladium Paste for decals on porcelain PPP 341/209 H

1 General Information

PPP 341/209 H is a standard burnish palladium paste for decals. After firing the metal layer has a thickness between 0,3 and 1,0 µm, depending on the screen size and its emulsion thickness. The decoration needs to be burnished. After burnishing PPP 341/209 H shows a platinum white colour shade.

Burnish palladium decorations with PPP 341/209 H showed in tests a good detergent durability and scratch resistance. The material is often used for institutional tableware.

2 Standard Firing Range

Substrate	Firing range
Porcelain	780 – 880°C

The firing result depends on the firing temperature, the total cycle time, the soak time as well as the glaze chemistry of the substrate decorated. To achieve an optimal firing result, we recommend firing tests under the users own individual conditions.

3 Properties of the preparations

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 decal pastes we check the viscosity 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 the burnish palladium decal paste ready to use. After firing the decoration needs to be burnished to reach its final appearance.

3.2 Storage

Printing pastes are subject to an ageing process. Therefore, we recommend using the material within 6 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 0,4g/100 cm².

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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, the quality of the print, the material deposit, the quality of the decal paper, the correct application of the decal and of course the firing conditions.

The main properties of fired bright precious metal decorations comprise brilliance and precious metal tone, dishwasher resistance, scratch resistance and resistance against chemical attack.

We have processed the bright precious metal preparations under standard test 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 whether finished decorations are dishwasher durable, roughly following the test-washing programme 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 PPP 341/209 H proofed to be dishwasher durable.

4.2 Abrasion resistance

Burnish pallidium decorations with PPP 341/209 H showed a good scratch resistance.

4.3 Oxidation resistance

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.

PPP 341/209 H does not contain silver. Fired decoration do not face a risk of oxidation.

5 Application recommendations

5.1 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.

5.2 Production of decals

Work in a well-ventilated room. The room temperature is recommended to be between 20 and 25°C with a relative humidity of 60 to 70%.

Heraeus supplies decal pastes with a viscosity ready to use. In general, thinning is not necessary. In case the paste has an increased viscosity after a long storage time, the printing properties can be improved with an addition of maximum 5 - 10% of thinner V 167. The thinner has to be stirred in very well. We recommend using a triple roll mill for an optimal homogenisation.

Apply an appropriate quantity of the material onto the screen, so that the screen can be flooded with one squeegee motion. We recommend applying not too much paste. It is better to add fresh paste during the printing

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procedure. This way, the viscosity increase caused by the evaporation of the solvent from the precious metal paste during printing can be minimized.

During shorter printing breaks (a few minutes), the screen should be continuously flooded, to prevent the paste from drying and blocking of the screen. During longer breaks, the screen has to be cleaned with our screen cleaner V 34 before the resumption of printing.

As a general rule, the precious metal paste is printed at first. For the printing of PPP 341/209 H we recommend the usage of a 77-34 to 100-34 polyester screen. For a good printing result a well sharpened squeegee is required. Shore hardness 60-75 shore.

After the drying of the precious metal paste, additional colours might be applied. If the precious metal material borders colours, the registration of the prints is very important because an incompatibility reaction with the bordering colour is possible. Precious metals preparations typically react sensitive to bordering cadmium containing colours most of all reds.

The complete motif needs to be covered with layer of covercoat. For the printing of the covercoat we recommend to use a 32HD polyester screen.

After drying, the decal can be transferred to the object to be decorated.

5.3 Transfer of the decal

The decals are soaked in slightly warmed water (20 to 30°C). If the water is too cold the decals do not release well from the decal paper. Is the water too warm, the decals might get too soft. It is important to change with water quite regularly.

It is essential to remove the water between decal and substrate by a careful squeeging of the decal. Trapped water could fire off explosively and create defects in the metal film. Aditionally we recommend cleaning the surface of the applied decal with a sponge, in order to remove all dextrin rests on top of the decal.

The decorated ware should be dried before firing at room temperature (20 to 22°C) for 16 to 24 hours.

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.

5.5 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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6.0 Typical defects, root causes and countermeasures

Defect	Possible Cause	Countermeasure
stripes in the printing precious metal decoration	the squeegee possibly shows scratches	change the squeegee
squashed printing format	the squeegee does not have enough pressure or is ounded off	change the squeegee
blurred contours, running precious metal	too much thinning of the product	leave the pot open for a while, so that solvent can evaporate
spots, pin holes, matt firing result	Objects were soiled by dust, finger marks or water drops before printing	clean the object before decorating
	dextrin residues under or on the decal	frequent changing of the steep water. Wipe off the decal with a damp sponge
	problems in the kiln such as: • reduced atmosphere in kiln • insufficient ventilation • heat increase is too fast during critical phase between 200-400°C • too many objects in the kiln	 • increase air addition • improve ventilation • reduce heating speed • reduce the number of objects in the kiln
precious metal is cracking after firing	contamination of the substrate surface causes cracking	clean the substrate before application
	water residues under the decal	careful pressing of the decal by the squeegee and drying
	the layer of the product is too thick	reduce the layer of the product
cracking of the decoration	decal extension was too great	do not extend the decal too much. If necessary use a more elastic screen printing covercoat
	steeping water is too cold and / or transfer of the decal onto a cold object	steeping water should be warmed up a little. It is of great importance to warm up the object to be decorated e.g. with a infrared radiator
low chemical and mechanical resistance of the precious metal decoration	the layer of the preparation is too thin	use a 77-34 screen or a calendered 350VA-steel screen
	too much a thinning	leave the pot open for a while for evaporation
	too low a firing temperature	increase firing temperature

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