Luster for direct screen printing and decals for ceramic and glass
LUP N 631/SI WHITE H

1 General Information

LUP N 631/SI WHITE H is an iris luster paste for direct screen printing and for the production of decals. After firing the luster shows and iridicent white metal effect. The intensity of the effect is strongly related to the layer thickness of the material. Lusters are generally very layer sensitive, means its colour intensity is also influenced by the deposit of the material.

For a nice shiny luster effect, the luster needs to be applied on a smooth surface. Lusters are typically used on glazed ceramic substrates like porcelain pieces or tiles or on glass items, from soda lime glasses to lead crystal.

The layer thickness of a luster decoration is below 0,1 µm.

2 Standard Firing Range

Substrate	Firing range
Glass	480 – 630°C
Ceramic (e.g. porcelain, tiles)	700 – 850°C

The firing result depends on the firing temperature, the soak time and the total cycle of the firing as well as on the type of substrate. For an optimal firing result we recommend pre-tests under the users own individual conditions.

3 Properties of luster pastes

The major characteristics of a Heraeus luster is determined by its production recipe. From each lot produced, we take a sample and check defined characteristics.

In case of luster pastes for direct screen printing and decal production 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 luster 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 deliver LUP N 631/SI WHITE H ready to use.

Screen printing pastes have a thixotropic nature in order to reach their printing properties. In some cases, the preparations reach their typical processing viscosity only under mechanical stress, that means under a certain print speed. Thixotropic pastes allow for printing fine lined decorations with a sharp outline.

3.2 Storage

Luster pastes are subject to an ageing process. We recommend using LUP N 631/SI WHITE H within 6 months time. 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 0,20g/100 cm².

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4 Properties of finished decorations

The main properties of fired luster decorations comprise brilliance, colour intensity as well as chemical and mechanical resistance.

Being extremely thin layers of less than 0,1 µm, luster decorations generally do not achieve the same chemical and mechanical resistance level as bright gold/platinum decorations. Their strength is laying in their artistical level, their special iridicent and metal colour effects.

The quality of a fired decoration derives from the interaction of the preparation, the application, the substrate surface and the firing conditions. With lusters, these influencing factors may cause significant deviations in the colour after firing. When using lustre pastes for the decoration of ceramic tiles, siginificant deviations in colour may occur depending on the glaze used. We recommend printing and firing tests under the ones own individual conditions.

4.1 Chemical resistance

Luster decorations typically do not achieve levels of chemical resistance which distinguish them to be judged as dishwasher durable. This statement is also true for LUP N 631/SI WHITE H.

4.2 Mechanical resistance

Luster decorations are comparably sensitive to scratching. Still luster decorations are regularly used for example for tile decoration.

LUP N 631/SI WHITE H achieves a mechanical resistance within the boundaries of the product group of lusters.

4.3 Oxidation resistance

LUP N 631/SI WHITE H does not contain silver. Therefore fired decorations do not tarnish.

5 Application recommendations

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 and a relative humidity of 60 to 70%.

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.

5.2 Miscability of lusters

Lustres can be mixed with each other. However, unpredictable colour changes may occur, especially if lustres containing precious metals are mixed with lustres free of precious metals.

5.3 Application of the material

Heraeus supplies LUP 9301/SI IRIS H ready for use. In general, thinning is not necessary. In case the paste’s viscosity has increased too much during storage, the solvent concentration can be adjusted with the addition of about 5-10% thinner V 170 H. The thinner needs to be intermixed very carefully. We recommend to homogenise the paste with a triple role mill.

For the printing of the luster paste we recommend screens from 90-48 (intense luster colour shade) to 150-34 polyester screen (for a light luster colour shade). In case one likes to do a multi layer print, we recommend applying maximum two layers with a 130-34 polyester screen. Too thickly applied layers tend to roll or flake off during firing.

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For good printing results, it is important to have a well sharpened squeegee (hardness: 60-75° shore).

5.3 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.

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6.0 Typical defects, root causes and countermeasures

Defect	Possible Cause	Counter measure
Streaks in the printed lustre decoration.	The squeegee is possibly scratched.	Exchange or sharpen the squeegee.
Squashed print.	Incorrect gap between screen and substrate.	Adjust gap between screen and substrate.
Spots, pin holes, matt firing result.	Objects were soiled by dust, finger marks or water drops before printing.	Clean the object before decorating.
	Problems in the kiln such as: • reduction 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 the heating speed. • reduce the number of objects in the kiln.
Blurred outline after lustre has been fired (spreading or running).	Too many objects in kiln.	Reduce the number of objects in the kiln.
Lustre flakes off during firing.	Printed layer was too thick.	Reduce thickness of applied film.
Fine pinholes.	Moisture on the objects before decoration is applied leads to firing faults (pinholes).	Give the ware enough time to adjust to the temperature of the decoration shop and so allow the possible condensation film to evaporate.
Low mechanical resistance of the precious metal decoration.	Firing temperature was too low.	Increase the firing temperature.

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