Acid Etch Imitation for Porcelain and Glass (Two-Fire Decal Method)

1 General Information

With the following procedure decorations can be produced which are visually similar to acid etching. Imitation acid etch decals can be used on porcelain and glass. Depending on the object to be decorated and the firing range, different underlays, precious metal preparations and screens have to be used.

2 Processing

2.1 Porcelain – Onglaze (Firing Range 830-850°C / 1470-1530°F), containing lead

Mixing the matt underlay paste.

It is recommended to mix 100 parts by weight of Heraeus matt underlay with 60 parts by weight of screen printing medium Nr. 221. To achieve particular gold colours after firing it is also possible to mix both matt underlays in a ratio of 1:1.

Homogenize the paste with a triple roll mill. This is of particular importance as a matt or rough colour surface is usually caused by insufficient dispersion of the colour powder. Consistent use of the triple roll mill can help to avoid these faults.

- Print the matt underlay with a 130-34 to 165-27 polyester screen.
- Leave to dry.
- Mix the bright relief in the same way as the matt underlay using 100 parts by weight of the colour to 50 parts by weight of screen printing medium Nr. 221.
- Print the relief design with bright relief using a 68-55 polyester screen or a 180-220 mesh steel screen.
- Leave to dry.
- After the relief design has dried the print can be covered with the covercoat L 406. A 32-120 polyester screen is best suited to print the covercoat.
- Transfer the decal onto the object to be decorated.
- Fire the imitation design at 830-850°C / 1470-1530°F (first fire).
- Apply the liquid precious metal preparation onto the matt relief.
- The precious metal preparation is then fired in the second fire at 750-760°C / 1380-1400°F. The second fire must be at a lower temperature otherwise the precious metal preparation will crack on the relief. Fine line or flat designs are less likely to crack as opposed to thick relief layers or reliefs with a large surface area. It is recommended to carry out test firings to find the optimum individual firing temperatures and conditions.

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.

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2.2 Porcelain – Onglaze (Firing Range 830-850°C / 1470-1530°F), lead free

- Mixing the matt underlay:

  It is recommended to mix 100 parts by weight of Heraeus matt underlay H 55301 or H 55302 with 60 parts by weight of screen printing medium Nr. 221. To achieve particular gold colours after firing it is also possible to mix both matt underlays in a ratio of 1:1.

  Homogenize the paste with a triple roll mill. This is of particular importance as a matt or rough colour surface is usually caused by insufficient dispersion of the colour powder. Consistent use of the triple roll mill can help to avoid these faults.

- Print the matt underlay with a 130-34 to 165-27 polyester screen.
- Leave to dry.
- Mix the lead free bright relief H 54002 in the same way as the matt underlay using 100 parts by weight of the colour to 60 - 70 parts by weight of screen printing medium Nr. 221.
- Print the relief design with bright relief H 54002 using a 180 mesh steel screen.
- Leave to dry.
- After the relief design has dried the print can be covered with the covercoat L 406. A 32-120 polyester screen is best suited to print the covercoat.
- Transfer the decal onto the object to be decorated.
- Fire the imitation design at 830-850°C / 1470-1530°F (first fire).
- Apply the liquid precious metal preparation onto the matt relief.
- The precious metal preparation is then fired in the second fire at 750-760°C / 1380-1400°F. The second fire must be at a lower temperature otherwise the precious metal preparation will crack on the relief. Fine line or flat designs are less likely to crack as opposed to thick relief layers or reliefs with a large surface area. It is recommended to carry out test firings to find the optimum individual firing temperatures and conditions.

2.3 Porcelain – Fast Firing (Firing Range 1200-1230°C / 2190 - 2250°F)

- Mixing the matt underlay:

  It is recommended to mix 100 parts by weight of Heraeus matt underlay H 8000 or H 8002 with 60 parts by weight of screen printing medium Nr. 221. Homogenize the paste with a triple roll mill.

- Print the matt underlay with a 100-40 polyester screen.
- Leave to dry.
- Mix the bright relief H 8008 in the same way as the matt underlay using 100 parts by weight of the colour to 50 parts by weight of screen printing medium. Always use the same screen printing medium as with the matt underlay.
- Print the relief design with bright relief H 8008 using a 180-220 mesh steel screen.
- Leave to dry.
- After the relief design has dried the print can be covered with the covercoat L 406. A 32-120 polyester screen is best suited to print the covercoat.
- Transfer the decal onto the object to be decorated.
- Fire the imitation design at 1200-1230°C / 2190 - 2250°F (first fire).
- Apply the liquid precious metal preparation onto the matt relief.
- The precious metal preparation is then fired in the second fire at 800-810°C / 1470-1490°F. With this system a higher firing temperature can be chosen, as the precious metal preparation does not crack on the relief fired at the higher first-fire temperature.

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2.4 Products for Porcelain

Precious Metal Preparations

	Colour	Product	Precious Metal Content	ASTM-resistant	Microwave-resistant	Sanitary ware	Remarks
	light yellow	GG 347	10 +12%				Bright Gold
	light yellow	GG 346	10+12%				Bright Gold
	yellow	GG 1539	10%				Bright Gold
	white platinum	GP 350					Bright Platinum
	platinum	GP 3309/1		●			Bright Platinum
	platinum	GP 1404/5					Bright Platinum

*Under laboratoy conditions.

Special Underlays and Reliefs

Number of Colour	Name of Colour	Firing Temperature approx.	Appearance after Firing	Contains silver	Lead free	Cadmium free	Resistent DIN EN 1388-1-2	Remarks
H 55301	white	800-830°C	matt		●	●	●	Underlay (onglaze)
H 55302	white	800-830°C	matt		●	●	●	Underlay (onglaze)
H 54002	transparent	800-830°C	bright		●	●		Relief (onglaze), suitable for combination with underlays H 55301 and H 55302
H 30152	transparent	800-830°C	bright		●	●		Relief (onglaze)
H 8002	white	1180-1230°C	matt				●	Underlay (inglaze)
H 8008	white	1180-1230°C	bright				●	Relief (inglaze), suitable for combination with underlays H 8000 and H 8002

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Auxiliary Materials

Screen Printing Medium	Viscosity	Solids content approx.	Thinner	Porcelain	Bone China	Vitreous China	Earthenware	Glass	Enamel	Remarks
Nr. 221	120-130 / 4 mm	46%	V 193	●	●	●	●	●	●	-

Covercoat	Block resistance	Viscosity	Thinner	Solids content approx.	Porcelain	Bone China	Vitreous China	Earthenwrae	Glass	Enamel	Remarks
L 406	Not block resistant	95-105 / 6 mm	V 41	42%	●	●	●	●	●	●	Interleaving paper necessary

2.5 Glass (Firing Range 540-580°C / 1000-1075°F), containing lead

- Mixing the matt underlay:

  It is recommended to mix 100 parts by weight of Heraeus matt underlay with 60 parts by weight of screen printing medium Nr. 221. Homogenize the paste with a triple roll mill.

- Print the matt underlay with a 130-34 to 165-27 polyester screen.
- Leave to dry.
- Mix the bright relief H 31005 in the same way as the matt underlay using 100 parts by weight of the colour to 50 parts by weight of screen printing medium Nr. 221.
- Print the relief design with bright relief using a 68-55 polyester screen or a 180-220 mesh steel screen.
- Leave to dry.
- After the relief design has dried the print can be covered with the covercoat L 406. A 32-120 polyester screen is best suited to print the covercoat.
- Transfer the decal onto the object to be decorated.
- Fire the imitation design at 560-580°C / 1040-1080°F (first fire).
- Apply the liquid precious metal preparation onto the matt relief.
- The precious metal preparation is then fired in the second fire at a lower temperature of approx. 500°C / 930°F to avoid cracking.

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2.6 Glass (Firing Range 540-580°C / 1000-1075°F), lead free

- Mixing the matt underlay:

  It is recommended to mix 100 parts by weight of Heraeus matt underlay H 52004 with 80 parts by weight of screen printing medium Nr. 221. Homogenize the paste with a triple roll mill.

- Print the matt underlay with a 130-34 to 165-27 polyester screen.
- Leave to dry.
- Mix the bright relief H 50201 in the same way as the matt underlay using 100 parts by weight of the colour to 50 parts by weight of screen printing medium Nr. 221.
- Print the relief design with bright relief H 50201 using a 68-55 polyester screen or a 180-220 mesh steel screen.
- Leave to dry.
- After the relief design has dried the print can be covered with the covercoat L 406. A 32-120 polyester screen is best suited to print the covercoat.
- Transfer the decal onto the object to be decorated.
- Fire the imitation design at 560-580°C / 1040-1080°F (first fire).
- Apply the liquid precious metal preparation onto the matt relief.
- The precious metal preparation is then fired in the second fire at a lower temperature of approx. 480-500°C / 866-930°F to avoid cracking.

2.7 Products for Glass

Precious Metal Preparations

	Colour	Product	Precious Metal Content	Glass	Lead Crystal (firing temperature approx. 540°C)	Coated glass	Remarks
	Light yellow	GG 1212 D	10%	●			Bright Gold
	Yellow	GG 1046	12%	●	●		Bright Gold
	Yellow	GG 1013	10%	●			Bright Gold
	Platinum	GP 3000		●	●		Bright Platinum

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Special Underlays/Reliefs

Number of Colour	Colour	Firing Temperature (approx.)	Optical Finish	Contains silver	Lead free	Cadmium free	Resistant	Gilding in one fire	Gilding in two fires	Remarks
H 50201	Transparent	580°C	Bright		●	●			●	Bright relief, for use in combination with H 52004
H 52004	Matt white	540-620°C	Matt		●	●				Matt underlay, for use in combination with H 50201

Auxiliary Materials

Screen Printing Medium	Viscosity	Solids Content (approx.)	Thinner	Porcelain	Bone China	Vitreous China	Earthenware	Glass	Enamel	Remarks
Nr. 221	120-130 / 4 mm	46%	V 193	●	●	●	●	●	●	-

Covercoat	Block Resistance	Viscosity	Thinner	Solids Content	Porcelain	Bone China	Vitreous China	Earthenware	Glass	Enamel	Remarks
L 406	Not block resistant	95-105 / 6 mm	V 41	42%	●	●	●	●	●	●	Interleaving paper necessary

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