

UNITED STATES PATENT OFFICE

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PRODUCTION OF DESIGNS ON NONMETALLIC HEAT-RESISTING BASES

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This invention relates to the production of designs on non-metallic heat-resisting bases, such as glass, fused silica, mica, porcelain, china and ceramics.

According to this invention I produce designs on non-metallic heat-resisting bases by a process comprising the steps of: (a) providing the base with a film of "liquid lustre", (b) firing the coated base to burn away organic material and cause the metal oxides contained in the "liquid lustre" to adhere firmly to the base, (c) covering the coated base with a photographic resist, (d) etching away the coating not covered by the resist and (e) firing to burn away the resist.

"Liquid lustres" are solutions of resins of base metals, such as iron, titanium, bismuth, tin, zinc and the like, with or without additions of sulpho-resins of gold and/or other precious metals, in organic solvents, such as essential oils, aromatic alcohols, ethers, ketones, light mineral oils, volatile hydrocarbons and chlorinated hydrocarbons. Compounds of non-metallic elements, such as silicon and boron, may be incorporated to modify the colour and improve the adhesion of the metal oxides.

The colour of the film of metallic oxides comprising the fired "liquid lustre" may be varied by choice of the "liquid lustre" or by mixing two or more "liquid lustres" or also by varying the percentage of gold lustre in the mixture so as to produce a dispersion of finely divided gold in the metallic oxide film. The intensity of the colour may be varied by increasing or decreasing the dilution of the "liquid lustres."

The film of "liquid lustre" may be applied by spraying but I prefer to apply it by a spinning operation consisting in placing the desired amount of "liquid lustre" on the base and then rotating the base so that the liquid is spread evenly over the surface and any excess is thrown off by centrifugal force.

The firing may be carried out at temperatures within the range 400° to 800° C., depending on the material of which the base is composed. It should be continued until all organic matter has been burned away and the film of metallic oxides adheres firmly to the base.

The photographic resist may be produced as follows:

The coated base is covered with a film of glue or gelatin which has been rendered sensitive to light by the addition of a soluble chromate or bichromate. A wetting agent may be added to assist in even distribution of the glue over the base. The glue or gelatin film is then exposed

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to light through a photographic negative, whereby an insoluble positive image of the design is produced. The parts of the film which have remained soluble are washed away with cold water and the remainder dried rapidly. The resulting image is converted into a resist by heating for example for 20 minutes at from 250° to 300° C. or by treatment with chemical reagents, such as formaldehyde or chrome alum.

The etching of step (d) is carried out with a reagent which does not attack the resist or the underlying metallic oxide film. Suitable etching reagents are solutions of bromine or iodine in non-aqueous solvents, such as the lower aliphatic alcohols (such as methyl, ethyl, isopropyl, butyl and amyl alcohols), polyhydroxylic alcohols (such as ethylene glycol, diethylene glycol and glycerol), or their esters, preferably their high boiling esters (such as ethyl lactate, butyl lactate, amyl lactate and the glycol and glycerol acetates).

The following are examples of etching baths, the parts being by weight:

	Parts
(1) ethyl alcohol.....	100
25 potassium iodide.....	4
iodine	2
(2) ethylene glycol monoacetate.....	100
acetic acid.....	10
30 bromine	2
(3) ethyl lactate.....	100
lactic acid.....	10
40 bromine	2

The solutions containing bromine act more rapidly than those containing iodine.

The etching action may be accelerated by suspending in the etching solutions a solid, such as fine sawdust or levigated alumina, which exerts a mild scouring action on the metallic oxide film when the base is gently agitated.

I claim:

1. A process of producing designs on non-metallic heat-resisting bases comprising the steps of: (a) providing a non-metallic base with a thin film of a composition consisting of a solution of a resinate of at least one base metal, (b) firing the coated base to burn away organic material and leave a firmly adherent film of metal oxide on said base, (c) coating the resulting surface with a film of a light-sensitized colloid selected from the group consisting of glue and gelatine and processing said film by photographic methods to produce a positive image in said colloid of the desired design, (d) hardening said image to convert it into a resist, (e) etching away the coating not

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covered by the resist with a solution of a halogen selected from the group consisting of bromine and iodine in a non-aqueous solvent, selected from the group consisting of liquid alcohols and esters, thus leaving the metal oxide design below the resist and (f) firing the coated base to burn away the resist.

2. A process as claimed in claim 1 in which the non-aqueous solvent used in step (e) is amyl lactate.

3. A process as claimed in claim 1, in which the etching solution also contains a suspended solid.

4. A process of producing designs on non-metallic heat-resisting bases comprising the steps of: (a) providing a non-metallic base with a thin film of a composition consisting of a solution of a resinate of at least one base metal, (b) firing the coated base to burn away organic material and leave a firmly adherent film of metal oxide on said base, (c) coating the resulting surface with a film of a light-sensitized colloid selected from the group consisting of glue and gelatine and processing said film by photographic methods to produce a positive image in said colloid of the desired design, (d) hardening said image to convert it into a resist, (e) etching away the coating not covered by the resist with a solution of bromine in amyl lactate, thus leaving the metal oxide design below the resist and (f) firing the coated base to burn away the resist.

5. A process of producing designs on non-metallic heat-resisting bases comprising the steps of: (a) providing a non-metallic base with a thin film of a composition consisting of a solution of a resinate of at least one base metal, (b) firing the coated base to burn away organic material and leave a firmly adherent film of metal oxide on said base, (c) coating the resulting surface with a film of a light-sensitized colloid selected from the

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group consisting of glue and gelatine and processing said film by photographic methods to produce a positive image in said colloid of the desired design, (d) hardening said image to convert it into a resist, (e) etching away the coating not covered by the resist with a solution of bromine in amyl lactate, thus leaving the metal oxide design below the resist and (f) firing the coated base at a temperature of from 400° C. to 800° C. to burn away the resist.

6. A process as claimed in claim 1 in which the non-aqueous solvent used in step (e) is ethyl lactate.

7. A process as claimed in claim 1 in which the non-aqueous solvent used in step (e) is butyl lactate.

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