

Method To Protect Patinated Surfaces Of Copper Products As Well As Patinated Copper Product

5 FIELD OF INVENTION

The invention concerns a method to protect patinated surfaces of copper products as well as a copper product with a patinated surface.

10 BACKGROUND

In the field of roof and façade covering as well as roof draining systems it is known to industrially patinate copper sheets using specially developed mechanical-chemical-thermal methods. In the case of this method an oxide coating is produced from the copper. This is a process, as it takes place also in
15 the course of the natural formation of the patina, caused by atmospheric influences over a long period. The industrial weathering of the copper sheets reduces the waiting time until a suitable surface under natural weathering would naturally turn green in the final phase. Roofs, façades and roof draining systems have therefore a green patina from the beginning, that occurs only on copper. It is
20 difficult to master the entire weathering process, since colour variations between the individual copper sheets may occur due to the manufacturing technology. The colour range extends from lime green to blueish green, so that ultimately each patinated copper product is unique. By natural weathering the patina is continually subjected to a development, that ultimately may lead to adjustment of
25 the colour differences, but also to colour changes, emphasising the natural character of the surface.

In the case of different copper products, however, often problems occur with regard to the visual appearance of the surfaces due to the treatment, to which the
30 material is subjected before and during its installation on the building site. In addition, in the case of patinated copper sheets during transport and re-packing of the copper products the patina may be rubbed off and patina dust will be raised, that during the processing of the copper products may lead to impairments of the health and to an aggressive affect on the tools used. Whereas

uncoated copper products in the field of roof and façade covering as well as roof draining systems can be often supplied protected by films against getting damaged, this solution for patinated surfaces is not available. The reason for this is that the patina dust, loosely sitting on the copper products, prevents an
5 adequate adhesion of the film. When using an adhesive to fix the film, an interaction with the patina coating will occur depending on the type and quantity of the adhesive used, what may lead to undesirable discolourations. Varnishing, to protect the patina, is absolutely out of the question, as in this case the desired weathering of the copper products would be disrupted.

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SUMMARY

Based on the above the object of the invention is to indicate a method to protect patinated surfaces of copper products, that prevents the occurrence of patina
15 dust during the transport and re-packing of the copper products, yet at the same time ensures that the weathering ability is not permanently interrupted. Moreover, a copper product with these properties should be indicated.

This objective is achieved with a method having the features of patent claim 1. A
20 copper product, satisfying these requirements, is subject matter of patent claim 6.

Advantageous developments of the inventive idea are subject matter of the sub-claims.

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DETAILED DESCRIPTION

In the case of the method according to the invention to protect patinated surfaces of copper products, in particular of copper sheets, an aqueous polymer dispersion is applied to the patinated surface. By doing so this polymer dispersion
30 penetrates into the regions of the porous patina close to the surface and the result after drying is that hollow spaces near to the surface and pores with an organic mass will be stabilised. This means that the polymer dispersion, together with the patina, forms a water-vapour diffusion permeable compound.

By virtue of this method the loose patina dust will be bonded. At the same time the resistance to wear of the patina is improved, so that now new dust will be formed. The patinated copper products, treated at the plant in this manner, can be considerably simpler handled during packing and transport. Impairments of the health by patina dust are also prevented as well as a corrosion of the tools.

In addition, the organic coating in the form of aqueous polymer dispersion results also in a simplified handling during further treatment as well as to reduced chipping of the patina when bending or stretching the copper products. The chipping can be markedly reduced in the folded areas of the copper product.

In the case of the aqueous polymer dispersion one deals with a liquid with weak water hazardous quality of the water hazard class 1. The viscosity of the aqueous polymer dispersion is so adjusted, that it will be completely absorbed by the porous patina coating. As a result of this the patina itself obtains a texture, that is different from that of the uncoated patina, at least in the regions close to the surface.

Within the scope of the invention under copper products copper and copper-alloy semi-products are understood, on which patina is formed as copper salt, as that occurring in the course of natural weathering.

It is considered advantageous, when the polymer dispersion is applied to the patinated surface in the form of drops. In a preferred form the polymer dispersion is finely atomised and so applied, that single droplets are absorbed by the patina coating without a completely enclosed covering layer being able to be formed, as is the case with varnish. By keeping the amount applied in this manner, particularly by spraying on, low at 5 g/m^2 to 10 g/m^2 , not all hollow spaces and pores of the patina with the sponge-like structure will be filled with aqueous polymer dispersion, only the hollow spaces close to the surface.

When the intended amount is applied to a smooth, i.e. without open pores, surface, the result after drying was an enclosed layer with a thickness of approx. $5 \text{ }\mu\text{m}$. Customary varnishes have after application and drying relatively great

coating thicknesses of 80 μ to 150 μ m. In addition, the aqueous polymer dispersion has only a very low solids content of approx. 15 % to 20 %. In comparison, varnishes often have a solids content of up to 50 %. This low solids content has the advantage that the polymer dispersion is highly fluid just like
5 water and consequently diffuses into the patina without any problem. During drying the high water content of the polymer dispersion is evaporated in an environmentally friendly manner, what can be carried out particularly very efficiently with the aid of infrared radiation. After drying the remaining solids content lies only on the walls of the hollow spaces, but does not fill them
10 completely. By virtue of this the open porousness of the patinated copper products will be retained.

An essential advantage of the method according to the invention is that the patina layer treated in this manner visually hardly differs from a natural patina surface,
15 but can be considerably better processed and handled. The water vapour-permeable polymer coating, preferably on acrylate base, weathers with the passing of time depending on the installed position of and the strain on the copper products, without leaving any traces or discolouration. Therefore one deals here with a temporary protection. In contrast to protective films, which so
20 far have been used for transport, no rubbish occurs on the place of application.

The organic coating is hydrophobic, yet it allows the necessary access by air humidity and water into the patina layer, so that during the weathering the patina surface can, as it is known, further change.
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In a surprising manner it has been established, that in the course of weathering the colour adjustment takes place faster than in the case of copper products with non-coated patinated surfaces.

30 In any case, it has been demonstrated that patinated surfaces, treated in accordance with the method according to the invention, have a changed wetting behaviour. Whereas when wetted with water untreated surfaces immediately absorb the moisture and become darker, the water is repelled off the treated surface. Only after wetting with water for a longer period do the treated copper

products also become darker. The protective coating, applied with the polymer dispersion, is transparent, however it has a reflection behaviour of a slightly different kind than an untreated patina surface, so that in the case of a lateral incidence a light matt sheen can be observed.

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The method according to the invention is preferably used in conjunction with known patinating methods. For patination usually firstly the surface of the copper product is ground, followed by a coating with a patinating chemical. This is followed by storing it in a climatising chamber and weathering in a maturing storage. After reaching a specified patina quality, the method according to the invention can be carried out, i.e. the coating of the surface with a temporary protective coating in the form of an aqueous polymer dispersion and subsequent drying of the polymer dispersion. Finally, the ready copper products can pass a quality control and conveyed to final packing.

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Claims

1. A method to protect patinated surfaces of copper products, whereby an aqueous polymer dispersion is applied to the patinated surface, so that the polymer dispersion penetrates into the regions of the porous patina close to the surface and whereby the aqueous polymer dispersion is subsequently dried, whereby the polymer dispersion, with the patina, forms a water-vapour diffusion permeable compound.
2. A method according to claim 1, characterised in that an amount of 5 g/m² to 10 g/m² aqueous polymer dispersion is applied to the patinated surface.
3. A method according to claim 1 or 2, characterised in that the aqueous polymer dispersion is applied to the patinated surface in the form of drops.
4. A method according to any one of claims 1 to 3, characterised in that the solids content of the aqueous polymer dispersion is between 15 % to 20 %.
5. A method according to any one of claims 1 to 4, characterised in that the water content of the polymer dispersion applied is evaporated with the aid of infrared radiation.
6. A copper product with a patinated surface, characterised in that the regions of the porous patina close to the surface are stabilised with an aqueous polymer dispersion which, together with the patina, forms a water-vapour diffusion permeable compound.
7. A copper product with a patinated surface according to claim 6, characterised in that an aqueous polymer dispersion, that is visually neutral relative to the patina, is applied to the patina,
8. A copper product according to claim 6 or 7, characterised in that solids content of the polymer dispersion is between 15 % and 25 %.

9. A copper product according to any one of claims 6 to 8, characterised in that an amount of 5 g/m² to 10 g/m² of the aqueous polymer dispersion is applied to the patinated surface.

5 10. A copper product according to any one of claims 6 to 9, characterised in that the aqueous polymer dispersion is produced on acrylate base.

11. A copper product according to any one of claims 6 to 10, characterised in that the polymer dispersion is free of solvent.