COLOR AND PROTECTION BY "VEROGLAZE"

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ABSTRACT

VEROGLAZE is a revolutionary new technology to protect solid surfaces by coatings of quartz glass consisting of pure silicon dioxide similar to hard enameling or glazing. These coatings are highly resistant to chemicals, corrosion, high temperatures and mechanical impacts. According to the state of the art of enameling or glazing the complete parts to be coated are heated to the melting temperatures of the glass or glaze in the range of 800°C to 1200°C and kept at these temperatures for a certain period. These processes cause high costs for ovens and energy and restrict shape and size of parts and to temperature resistant materials like Steel and ceramics. VEROGLAZE is for example for metals like Steel, Stainless Steel, Aluminium as well as ceramics, concrete and wood. VEROGLAZE can be produced colorless transparent or in any type and intensity of color.

1 THE NEW TECHNOLOGY

The new technology of VEROGLAZE process enables the application of coatings formed by pure silicon dioxide like hard enamel or glaze on nearly any solid surface resistant to temperatures not exceeding 150°C to 200°C. The application is widely independent on shape and size of the parts to be coated and does not need substantial investments in plants or installations. Materials, which can be coated with as a source of silicon dioxide the VEROGLAZE process uses organic silanes as they are used for the production of common sol-gel-coatings. They are applied like liquid lacquers and transformed into solid layers by drying. The resulting layers contain silicon dioxide combined with organic compounds and show relatively low hardness and resistance to chemicals and temperatures.

The VEROGLAZE process uses gas flames to convert the sol gel layers into pure silicon dioxide without any organic compounds. The gas flames contain overheated water steam mixed with oxygen at temperatures in the range of 800°C to 1200°C. They are applied to the surfaces for less than 30 seconds. The impact of temperature to the underlying substrates is restricted to 150° C to 200° C as maximum. The resulting coatings have a thickness in the range of 1 to 8 µm and safely adhere to the substrates. They consist of pure inorganic silicon dioxide comparable to quartz glass. These coatings are hard, dense, inert, smooth and resistant to chemicals and temperatures over 1000° C. VEROGLAZE can easily be applied and repaired at any time and also on site.

2 THE IDEA BEHIND

There is an increasing demand to reduce the losses of assets and valuable materials by corrosion and wear and to increase lifetime of goods. Another point is to provide high quality components and installations at low costs for investment and with high efficiency in view of performance and energy consumption. Designers and architects are increasingly interested in affordable materials and attractive surfaces, which combine a free and repeatable choice of colors and surface finishes with durability and easy cleaning properties.

Most of the functional and decorative properties are surface related. The most promising way to meet the majority of these different demands by only one widely applicable solution is to provide an adequate surface coating with optimized properties related as well to technical as also to decorative aspects. To meet the multiple demands and to offer a wide field for application this special coating must combine a considerable number of properties:

- high resistance to corrosion, chemicals, temperature, mechanical impact, friction and wear
- inert to products, firm adhesion, easy to clean, resistant to fouling and good heat transfer
- durability and resistance to ageing, transparency, selectable colors and color densities, smooth haptic and conservation of the character of the base material
- easy and safe application to a wide variety of materials and firm adhesion to substrates

Nearest to all of these demands come surfaces based on silicon dioxide like glass, enamel and hard glaze. Silicon dioxide is cheap and exists in abundance. The problem to be solved is to provide an easy and safe method for application and to avoid the impact of high temperatures to the substrates. Besides of that the coating should be applicable to a variety of materials and form firm, durable and sufficiently flexible compounds with the base materials.

3 THE SOLUTION – VEROGLAZE

VEROGLAZE is a revolutionary new technique to apply long living hard and dense layers of pure silicon dioxide (quartz glass) onto the surfaces of a number of different solid materials like Steel, Stainless Steel, Aluminum, Zinc, ceramic, concrete, natural stone and wood. Enameling and glazing start from powders of mineralic silicon dioxide, which are melted at high temperatures of 800°C to 1200°C and applied to the surfaces of parts, which are also heated to the same temperatures and kept on this level of temperature for a considerable duration. This restricts the application to temperature resistant materials like steel and ceramics.

VEROGLAZE uses organic silanes as a source for silicon dioxide. The silanes are dissolved in alcohols to clear and transparent liquids, which can be applied to surfaces like liquid lacquers at ambient temperatures. For coloring inorganic pigments can be mixed into the lacquers with selectable concentration. The application of the lacquers can be done by spraying, rolling, wiping, brushing, rolling or similar methods. After some minutes the lacquers are dried on air and form soft coatings consisting of silicon dioxide and organic compounds.

For hardening after drying the surfaces are exposed for a period of 10 to 30 seconds to the gas stream of a gas flame. The gas stream contains overheated steam and oxygen at temperatures in the range of 800°C to 1200°C. By an instant reaction the overheated stem converts the organic compound into alcohols, which evaporate and are burnt by the oxygen to water and carbon dioxide. By this reaction structure and consistence of the primary layers are converted into homogenous and nonporous layers formed by pure silicon dioxide like quartz glass. The duration of the heat treatment is selected in a way, that the temperature impact to the base material does not exceed the range of 150°C to 200°C. If necessary the heat treatment can be cut into steps with short interruptions for intermediate cooling of the surfaces.

The application of VEROGLAZE can be done to clean and dry surfaces. It does not need complex installations for production besides of the application devices for the lacquers like spray guns and special gas burners. These devices can also be mobile or hand held for applications on site or on large or firmly installed objects. The application of VEROGLAZE does not need water and does not produce solid waste. The thickness of VEROGLAZE is in the range of 1 to 8 micrometers. Materials coated with VEROGLAZE can be recycled without problems. In case of damage VEROGLAZE can easily be repaired also on site.

4 PROPERTIES OF VEROGLAZE

VEROGLAZE is nonporous and firmly protects the coated surfaces. It is durable and does not age or embrittle. VEROGLAZE can be produced either colorless transparent or with any desired color and color density. Due to the low thickness of the layer finishes and structures of the substrates coated with VEROGLAZE are widely preserved. VEROGLAZE is 1 to 8 micrometers thick and due to good heat transfer, the haptic of the surfaces does not resemble to coatings. Due to the low thickness and firm bonding to the substrates coated surfaces can be bent within a range, which does not cause deformation like stretching of the substrates.

VEROGLAZE is homogenous and insulating to electricity. It is hard and widely resistant to blunt impact, scratches and normal wear. The surfaces are not combustible and are resistant to corrosion and chemicals (except of hot and concentrated hydrofluoric acid), to radiation and to temperatures up to 1200°C. VEROGLAZE is food safe and easy to clean.

VEROGLAZE is nonporous and firmly seals the coated surfaces from liquids, vapors and gases.

5 APPLICATION OF VEROGLAZE

VEROGLAZE can be applied to a variety of solid materials like Steel, Stainless Steel, Aluminium, ceramic, concrete, natural stone, enamel and wood. The application can be done for functional or decorative reasons or a combination of both. The application is widely independent on size and shape of the objects. VEROGLAZE can be applied both integrated in production lines like coil coating as also onto single parts and on site to large or firmly installed objects like facades or civil work.

5.1 Application to metals

A precondition for coating of VEROSPECTRAL on metallic surfaces is that the surfaces have an oxide layer for bonding. Metals with natural oxide layers are for example Stainless Steel, Aluminium, Titanium and Zinc. Other metals may require a peroxidation of the surfaces prior to coating with VEROGLAZE. An adequate treatment for hot oxidation is for example a short application of the oxidating gas flame, which is used for the production of VEROGLAZE.

Stainless Steel of any alloy can be coated with VEROGLAZE on any surface finish and independent on shape and size of objects. It can be applied on clean and degreased surfaces. The application on Stainless Steel is easy and safe due to its temperature resistance. The resulting surfaces provide the full range of advantageous properties of VEROGLAZE without restrictions.

Mild Steel can be coated similar to Stainless Steel after a pretreatment for oxidation. The resulting surfaces are comparable in quality and behavior to enamel. Damaged enamel can locally be repaired by VEROGLAZE.

Aluminum may require a peroxidation prior to coating with VEROGLAZE. The resulting surface quality is clearly superior to surfaces achieved by anodizing or powder coating.

Titanium and Zinc can directly be coated with VEROGLAZE.

5.2 Application to ceramic

VEROGLAZE can be applied to all types of ceramic without any restriction or pretreatment. The resulting coating is similar to hard glazing.

5.3 Application to concrete

VEROGLAZE can be applied to surfaces of concrete. The application can be done on clean and solid surfaces, which are dry. During the application the liquid lacquer penetrates into porosities and small imperfections. So VEROGLAZE is firmly connected to the upper surface layer of the concrete. It tightly seals the surface and protects it from moisture, acids, salts, gases and biological corrosion. It provides easy to clean properties. VEROGLAZE can be applied as well to new parts as also for repair and refurbishment to older objects on site.

5.4 Application to wood

VEROGLAZE can be applied to soft wood and to hard wood as well. When applied the liquid lacquer is soaked into the upper layer of the wood and forms a combined solid zone of material formed by wood fibers and silicon dioxide. The aspect of the resulting surfaces clearly shows the initial surface texture of the wood widely unchanged, but properties and behavior are different: The coated surfaces are hard and repellent to liquids. The coated surfaces are also impermeable to gases like oxygen and conflagration gasses at high temperatures. Consequently the surfaces coated with VEROGLAZE have a significantly higher resistance to inflammation so that they can be hardened at 1200°C without change of the aspect.

VEROGLAZE provides a wide and profitable potential for the application on wood not only for decorative purposes, but also to improve the resistance to fire, insects, moisture and rotting.

VEROGLAZE can be applied for functional and to decorative purposes or a combination thereof. Functional reasons are high corrosion resistance, hardness of surfaces, good cleaning properties, antifouling properties, inertness to products, reduction of contamination.

6. FIELDS OF APPLICATION

The development of VEROGLAZE has started in November 2016. Consequently neither has the total potential been explored on which materials and purposes VEROGLAZE is applicable nor the effects, which can be achieved.

VEROGLAZE is substantially different to all presently existing traditional coating processes. There is an extremely

vast range of application for functional or for decorative purposes like corrosion protection, cleaning properties, coloring of surfaces, resistance to heat and fouling protection resistance to rotting.

Some examples out of the large fields of application are process- and food industry, medical purposes, electrical components, kitchen appliances, automotive industry, aircraft industry, processing plants, marine environment, civil work like bridges, architecture, energy production and constructional wood.

Fascinating potentials for the application of VEROSPECTRAL can be expected for the application on concrete. This includes the production of colored surfaces as well as sealing and corrosion protection as well as for repair and refurbishment of objects on site.