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(54) Title: A COATING COMPOSITION AND METHOD FOR PREPARING AND APPLYING THE SAME

(57) Abstract: The object of the present invention is to provide a mixture to be used for the coating of polymeric materials, particularly of polycarbonate materials in order to increase their resistance against scratching and against the effects of alkaline substances, and, a method for preparing and applying said mixture. The mixture according to the invention comprises an epoxysilane compound to provide the inorganic polymerisation, an epoxy compound to provide the organic modification, a F-silan to provide the coated surface with hydrophobic properties and a metal alkoxide to harden the coating, which in turn provides resistance against alkali.

A COATING COMPOSITION AND METHOD FOR PREPARING AND APPLYING THE SAME

The present invention relates to a mixture that increases the resistance of polymeric materials, particularly of polycarbonate materials against scratching and against the effects of alkaline substances, and to a method for preparing and applying said mixture.

When the polymeric material with such advantageous features as lightness, practical usage and low cost, are used instead of the glass based material, in the domestic appliances, for instance in washing machines, the physical strength of such material is not sufficient and they are scratched and influenced by the alkaline material.

The coating technologies are employed in order to produce material with more superior properties and with higher additional values by coating all kinds of surfaces with a material that will give different thickness and properties to said surfaces. The sol-gel technology is one of the leading technologies, being preferred due to its various advantages and the superior physical, mechanical and chemical properties it provides to the material to be coated, as well as the extension of the service usage life of said material. The sol-gel technique consists of applying the combination of organic polymeric materials and oxidized or not oxidized inorganic ceramic materials and/or a composite mixture formed of organic modified non- metallic compounds, to the surface. These techniques are designed by using different properties of the organic and inorganic material, according to the intended function of the desired coating and are applied in the suitable process with suitable combinations. In this method, reaction is carried out in water or in an organic solvent. A colloidal solution (SOL) comprising particles with nanometric (nm) dimensions, passes to a two-phased gel (GEL) (position) state as the result of the reaction and process while forming the inorganic polymeric net structure of the hydrolyzable compounds, such as metal

(position) state as the result of the reaction and process while forming the inorganic polymeric net structure of the hydrolyzable compounds, such as metal alkoxides, as the result of hydrolyzation-condensation reactions, the organic polymeric net layer is formed in the system by the addition of organic compounds. Here, the organic groups have two important functions:

a) The organic groups modify the inorganic net by carrying their properties to the inorganic net.
b) They form an organic polymeric net by being added in a polymerized form to the inorganic net.

As the result of the said method, a composite layer having the complementary properties of the organic and inorganic phases, such as flexibility, erosion, scratching and resistance to corrosion, is formed on the coated surface. In brief, the sol-gel technique is the technique for forming the organic polymeric net structure of the organic modified alkoxid compounds by using the hydrolyzation and condensation reactions.

In the International Patent Application No. WO 01-042373, a coating for plastic surfaces, which is resistant against scratches, is disclosed.

In the USA Patent No. US 4785067, a coating which is resistant against cleaning materials, is described.

In the European Patent Application No EP 0628610, a coating for plastic surfaces, which is resistant against scratches, is disclosed.

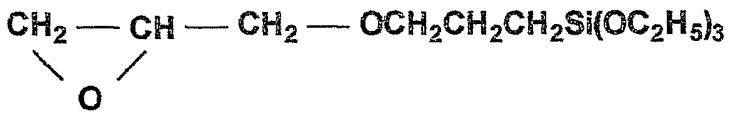
In the European Patent Application No. EP 1137729, a coating for surfaces on which powder paint has been applied, which is resistant against scratches, is disclosed.

The object of the present invention is to realize a mixture to be used for the coating of polymeric materials, particularly of polycarbonate materials in order to increase their resistance against scratching and against the effects of alkaline substances, and, a method for preparing and applying said mixture.

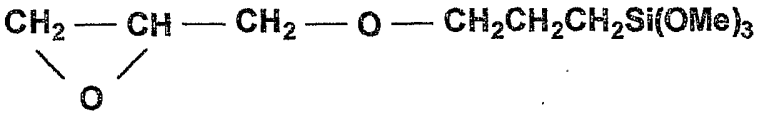
The mixture according to the invention comprises an epoxysilane compound to provide the inorganic polymerisation, an epoxy compound to provide the organic modification, a F-silan to provide the coated surface with hydrophobic properties and a metal alkoxide to harden the coating, which in turn provides resistance against alkali.

The epoxy-containing silanes that provide the inorganic polymerization are listed below:

Alternative 1: ***GLYEO (3-Glycidoxypropyltriethoxysilan)***



Alternative 2: ***GPTS (3-Glycidoxypropyltrimethoxysilane)***



In the preferred embodiment, the mixture is composed of GLYEO (3-Glycidoxypropyltriethoxysilan), as the epoxy-silane that provides the inorganic polymerization, Araldite GZ 601 as an epoxy compound for organic modification, Tridecafluoro-1,1,2,2-tetrahydro-octyl-1-triethoxysilan ($C_6F_{13}CH_2Si(OC_2H_5)_3$) as the F-silane and Zirkonium butylate ($Zr(O(CH_2)_3CH_3)_4$) as the metal alkoxide to provide resistance against alkali by hardening the coating.

While preparing the mixture, GLYEO is mixed with Araldite at a ratio of 10-50% of its weight. The mixture is hydrolysed by 0.1 N HCl; then the solution is diluted with 5-25% wt. butoxyethanol or ethylalcohol or isopropoxyethanol ($(CH_3)_2$ CHOCH2CH2OH) and F-silane (0.5-2.5% of its total weight) is added and stirred. 15-20% wt Zr-butylate is added to the mixture after each 1 mole Zr-butylate is modified by 0.2-1.0 mol acetylacetone. 0.1-0.5% of the total weight BYK 306 or BYK 341 (polyether modified polydimethyl polysiloxane) is added and the solution is stirred.

Before applying the mixture, the surface of the substrate is cleaned to eliminate grease and dirt, surface activity is enhanced, for instance by the corona method, in order to increase the binding and adhering properties between the surface and the coating, and the surface is cleaned again. Then the mixture is applied onto the surface, the coated plates are dried at a temperature between 25-250°C for 5-120 minutes, after they are allowed to stay at the room temperature for 10-60 minutes.

In a preferred embodiment of the invention, the surface is coated by immersing the material to be coated into the mixture and drawing it out at a certain speed.

In another embodiment of the invention, the surface is coated by spraying the mixture onto said surface.

In the domestic appliances, e.g. washing machines, by coating the surface of the windows made of polycarbonate material instead of glass, which are provided on the doors of said appliances, with the mixture according to the present invention, their resistance against scratches and alkali substances, is increased.

CLAIMS

1. A mixture for coating the surfaces of polymeric material, particularly of polycarbonate material in order to increase their resistance against scratches and against the effects of alkali substances, which comprises an epoxysilane compound to provide the inorganic polymerisation, an epoxy compound to provide the organic modification, a F-silan to provide the coated surface with hydrophobic properties and a metal alkoxide to harden the coating, which in turn provides resistance against alkali.

2. A mixture as defined in Claim 1, wherein the epoxysilane compound that provides inorganic polymerization is GLYEO (3-Glycidoxypropyltriethoxysilan).

3. A mixture as defined in Claim 1, wherein the epoxysilane compound that provides inorganic polymerization is GPTS (3-Glycidoxypropyltrimethoxysilane).

4. A mixture as defined in Claims 1 to 3, wherein F-silane is Tridecafluoro-1,1,2,2-tetrahydro-octyl-1-triethoxysilan ($C_6F_{13}CH_2Si(OC_2H_5)_3$).

5. A mixture as defined in Claims 1 to 4, wherein the epoxy compound that provides the organic modification is Araldite GZ 601.

6. A mixture as defined in Claims 1 to 5, wherein metal alkoxide is zirconium butylate.

7. Method for preparing a mixture as defined in Claims 1, 2 and 4-6, comprising the steps of;

mixing GLYEO with Araldite at a ratio of 10-50% of its weight, hydrolyzing the mixture with 0.1N HCl, diluting the solution with 5-25% wt isopropoxyethanol ((CH3)CHOCH2CH2OH), adding F-silane (0.5-2.5 % of its total weight), adding 15-20% wt Zr-butylate to the mixture after each mole Zr-butylate is modified by 0.2-1.0 mol acetylacetone, and adding 0.1-0.5% of the total weight BYK 306 or BYK 341 (polyether modified polydimethyl polysiloxane).

8. Method for preparing a mixture as defined in Claims 1, 2 and 4-6, comprising the steps of;

mixing GLYEO with Araldite at a ratio of 10-50% of its weight, hydrolyzing the mixture with 0.1N HCl, diluting the solution with 5-25% wt butoxyethanol, adding F-silane (0.5-2.5 % of its total weight), adding 15-20% wt Zr-butylate to the mixture after each mole Zr-butylatı is modified by 0.2-1.0 mol acetylacetone, and adding 0.1-0.5%of the total weight BYK 306 or BYK 341 (polyether modified polydimethyl polysiloxane).

9. Method for preparing a mixture as defined in Claims 1, 2 and 4-6, comprising the steps of;

mixing GLYEO with Araldite at a ratio of 10-50% of its weight, hydrolyzing the mixture with 0.1N HCl, diluting the solution with 5-25% wt ethylalcohol, adding F-silane (0.5-2.5 % of its total weight), adding 15-20% wt Zr-butylate to the mixture after each mole Zr-butylatı is modified by 0.2-1.0 mol acetylacetone, and adding 0.1-0.5%of the total weight BYK 306 or BYK 341 (polyether modified polydimethyl polysiloxane).

10. Method for applying a mixture as defined in Claims 1 to 9, onto the surface of a polymeric material based substrate, comprising the steps of;

cleaning the surface to eliminate grease and dirt, enhancing the surface activity to increase the binding and adhering properties between the

surface and the coating, cleaning the surface again, immersing the surface into the mixture, allowing the surface coated to stand at room temprature for 10-60 minutes, and drying it at 25-250°C for 5-120 minutes.

11. Method for applying a mixture as defined in Claims 1 to 9, onto the surface of a polymeric material based substrate, comprising the steps of; cleaning the surface to eliminate grease and dirt, enhancing the surface activity to increase the binding and adhering properties between the surface and the coating, cleaning the surface again, spraying the mixture onto the surface, allowing the surface coated to stand at room temprature for 10-60 minutes, and drying it at 25-250°C for 5-120 minutes.

12. A polymeric material based substrate which is coated with a mixture as defined in Claims 1 to 11.

INTERNATIONAL SEARCH REPORT

International Application No
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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 C09D183/06 C09D163/00 C09D101/10 C07F7/12

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 C09D C07F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category °	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	DE 198 57 317 A (BSH BOSCH SIEMENS HAUSGERAETE ;INST NEUE MAT GEMEIN GMBH (DE)) 15 June 2000 (2000-06-15) cited in the application claims; examples	1-12
A	DE 199 15 378 A (BSH BOSCH SIEMENS HAUSGERAETE ;INST NEUE MAT GEMEIN GMBH (DE)) 12 October 2000 (2000-10-12) claims; examples	1-12

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

° Special categories of cited documents :

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Date of the actual completion of the international search	Date of mailing of the international search report
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INTERNATIONAL SEARCH REPORT

information on patent family members

Inte[illegible]l Application No
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