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Undercoating for concrete

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(54) Title: UNDERCOATING FOR CONCRETE

**A1**

(54) Bezeichnung: VORANSTRICHT FÜR BETON

**WO 02/051953**

(57) **Abstract:** Novel undercoats for use on porous bases such as, for example, concrete are disclosed. Said undercoats contain or comprise at least one epoxy resin, at least one latent hardener and at least one solvent. The above are characterised in being easy to produce, contain no isocyanate groups and form a good ageing-resistant adhesion, in particular, with single component isocyanate-free sealants, cross-linked by means of silane groups.

(57) **Zusammenfassung:** Es werden neue Voranstriche für die Verwendung auf porösen Untergründen, wie z.B. Beton, beschrieben. Diese erfindungsgemäßen Voranstriche enthalten oder bestehen aus mindestens einem Epoxidharz, mindestens einem latenten Härter und mindestens einem Lösemittel. Sie zeichnen sich dadurch aus, dass sie einfach herstellbar sind, keine Isocyanatgruppen enthalten und insbesondere mit einkomponentigen isocyanatfreien Dichtstoffen, welche über Silangruppen vernetzen, eine gute alterungsbeständige Haftung ermöglichen.

**Undercoating for Concrete**

Reference to Related Applications

5 The present application claims the priority of European patent application No. 00 128 475.1, filed on December 23, 2000, the disclosure whereof is here included by reference.

10 Technical Field

The present invention concerns novel undercoats for improvement of the adhesion of substrates, in particular of porous bases, such as for example 15 concrete, with one- or two-component adhesive systems.

State of the Technology

Undercoats, also described as primers, activators 20 or bonding agents, are used everywhere where the adhesive used achieves only a limited or no adhesion to the substrate or base. In this, the components of the adhesive system, namely the pretreatment, i.e. the undercoat, and the adhesive are matched to one another 25 and to the substrate. Such undercoats can be physically setting or chemically crosslinkable. Pretreatment systems for different substrates are known, however there are no undercoats for porous bases on the market which are single-component, free from 30 isocyanates, free from aromatic solvents and applicable with simple aids, e.g. brushes, and in combination with moisture-reactive adhesives or sealants, especially with isocyanate-free sealants based on silane-group terminated prepolymers, known as polyurethane hybrid or 35 MS-Kaneka systems, display good, ageing-resistant adhesion.

In EP 0 921 140 A1 and US 6,080,817, under  
with isocyanate group-containing binders are descr  
these undercoats being used for the applicatio  
paint in automobile manufacture.

5 Already known from DE 100 26 148 are undercoats  
which contain an epoxy resin, a latent hardener, a  
solvent, and vinyltrimethylsiloxane.

10 The purpose of the present invention is to provide  
new undercoats for improving the adhesion of  
substrates, in particular of porous substrates, such as  
for example concrete, which are preferably isocyanate-  
free.

Description of the Invention

15 Surprisingly, it has now been found that an  
undercoat containing or consisting of at least one  
epoxy resin, at least one latent hardener, at least one  
bonding agent additive, which contains at least 2  
functional groups, where at least one thereof is an  
20 epoxy group which can react with the latent hardener,  
and at least one thereof is a silane group or titanate  
group, and at least one solvent displays the desired  
good affinity to porous bases, such as for example  
concrete (DIN standardized or sandblasted), absorbent  
25 clinker, ceramics, garden paving stones, facing brick  
and various wood species (beech, pine, teak, etc.), and  
also to non-porous bases such as glazed clinker, and  
thus renders good adhesion of the coating material  
possible. Preferred coating materials are in particular  
30 single-component silane-based sealants. Moreover, the  
undercoats according to the invention are very simple  
to produce.

Means of Implementing the Invention

35 Substances preferably used in the undercoats  
according to the invention comprising at least one  
epoxy resin, at least one latent hardener, at least one  
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bonding agent additive and at least one solvent are described in more detail below.

Possible epoxy resins are aliphatic and aromatic epoxy group-bearing compounds, especially those which 5 are solid at room temperature. Preferred epoxy resins are: solid, bisphenol A-based resins of medium molecular weight.

Latent hardeners can be selected from the substance groups ketimines, aldimines or oxazolidines, 10 cyclic, aliphatic ketimines being preferred. Preferred latent hardeners are: blocked, cycloaliphatic diamines and/or urethane bisoxazolidines.

For ecological reasons, possible solvents are preferably aliphatic solvents, such as for example 15 ethyl acetate, butyl acetate, and other acetate-based solvents, acetone, methyl ethyl ketone, hexane, heptane, ethyl alcohol, cyclohexane, etc. Particularly for application on porous bases, the solvent content in the undercoat according to the invention lies in the 20 range from 20 to 80 wt. %, preferably in the range from 50 to 60 wt. %, and the viscosity should lie between 20 and 200 mPas, particularly between 40 and 80 mPas. With too low a viscosity, the covering of a porous base, such as for example concrete, is insufficient, which 25 results in reduced adhesion quality. With too high a viscosity, the pores of porous bases are inadequately filled, which owing to reduced mechanical anchoring of the undercoat to the base leads to a loss in adhesion. In addition, the workability of the primer is impaired. 30 The optimal layer thickness in the dry state lies between 10  $\mu\text{m}$  and 200  $\mu\text{m}$ , particularly between 40  $\mu\text{m}$  and 90  $\mu\text{m}$ . By addition of small proportions of thixotropizing fillers, a thickness of about 65  $\mu\text{m}$  is attained with one brushstroke, without thixotropization 35 a layer thickness is of usually ca. 48  $\mu\text{m}$ .

Depending on the application and the requirements profile, additives such as drying agents, catalysts, pigments, fungicides, stabilizers, fillers, such as for

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example uncoated or coated silicon dioxide, etc., can be added.

Bonding agents according to the invention contain titanates or silane groups, and the bonding agent 5 contains at least one epoxy group as second functional group. By means of this second functional group, the bonding agent is incorporated into the matrix during or after the hardening reaction under the influence of the amine compound of the latent hardener, which is 10 liberated by moisture. Preferably the bonding agent additive is hydrophobic.

The bonding agent serves firstly to improve the quality of adhesion to the base by means of chemical and physical properties, and secondly to provide 15 attachment groups to the coating material, which are preferably single-component and isocyanate-free sealants.

The undercoat according to the invention can be used for the production of a coating in such a way that 20 it is applied in a suitable layer thickness and, if necessary after a hardening period of preferably 30 to 120 minutes, is overlaid with a single-component isocyanate-free silane-based adhesive.

Below, some examples will be demonstrated, which 25 further illustrate the invention, but are in no way intended to limit the scope of the invention. The undercoats according to the invention are simple to produce, stable on storage, and have good adhesion properties even after stressing, in particular after 1 30 week's storage in a saturated calcium hydroxide solution, and comply with the standards DIN 18540F and ISO 11600 25LM.

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## 1) Production of the coatings according to the invention Ex. 1 and Ex. 2

Item	Chemical name	Function	Supplier	Ex. 1 Amount [wt. %]	Ex. 2 Amount [wt. %]
1	ethyl acetate	solvent	Impag AG Zürich	39.7	39.2
2	solid bisphenol A-based epoxy resin, medium molecular weight, EP No.: 1.9-2.0 Eq/kg	film-forming agent		38.7	38.2
3	Aerosil 200	thixotropizing agent	Degussa-Hüls, Zürich	0.0	1.2
4	orthoformate	drying agent		2.0	2.0
5	epoxysilane (Silquest A-187)	bonding agent	Degussa-Hüls, Zürich	10.3	10.2
6	1,3,3-trimethyl-N-(2-methylpropylidene)-5-[(2-methylpropylidene)-amino]cyclohexane-methylamine	latent hardener		9.3	9.2
<b>Total</b>				<b>100.0</b>	<b>100.0</b>

All step were carried out under nitrogen. The 5 epoxy resin (item 2) was divided into three portions of equal size. Each individual portion was completely dissolved before the next portion was added. Items 4, 5 and 6 were each added one after the other with constant stirring. The thixotropizing agent Aerosil 10 200 was dispersed into the epoxy resin solution by intensive stirring.

2) Test results with the undercoat according to the invention in combination with PUR hybrid adhesive, Sikaflex-20AT

Substrate	Reference	Example 1	Example 2
Concrete, sand-blasted	2/5	1/2	1/1
Garden paving slab	1/5	1/1	1/1
Concrete, DIN standardized	1/5	1/1	1/1
Tiles	1/4	1/2	1/1
Clinker, porous	1/3	1/1	1/1
Clinker, glazed	1/5	1/1	1/1
Ceramic, porous	1/4	1/2	1/1
Beech	1/4	1/2	1/2

5 Key: 1 = > 95% cohesive failure, OK  
 2 = 75% - 95% cohesive failure, OK  
 3 = 25% - 75% cohesive failure, not OK  
 4 = < 25% cohesive failure, not OK  
 5 = 0% cohesive failure, not OK

10

The first number gives the assessment of the adhesion after 2 weeks storage in an air-conditioned room (23°C, 50% rel. atmospheric humidity).

15 The second number gives the adhesion after 2 weeks air-conditioned storage and 1 week storage in water at room temperature.

20 Examples 1 and 2 show that the undercoat according to the invention after the storage in water ensures very good adhesion compared to the reference.

25 While preferred embodiments of the invention are described here at present, it must clearly be understood that the invention is not limited to these, but in the context of the following claims can be implemented in many other ways.

**Patent Claims**

1. An undercoat, characterized in that it contains at least one epoxy resin, at least one latent hardener, at least one solvent and at least one bonding agent additive or consists thereof, wherein the bonding agent additive contains at least 2 functional groups, whereof at least one is an epoxy group which can react with the latent hardener, and at least one a silane group or titanate group.
- 5 2. The undercoat as claimed in claim 1, characterized in that it has a viscosity between 20 and 200 mPas, in particular between 40 and 80 mPas.
- 10 3. The undercoat as claimed in claim 1 or 2, characterized in that the bonding agent additive is a hydrophobic bonding agent additive.
- 15 4. The undercoat as claimed in one of claims 1 to 3, characterized in that the solvent is free from aromatics.
- 20 5. The undercoat as claimed in one of claims 1 to 4, characterized in that the latent hardener is an oxazolidine and/or a ketimine and/or an aldimine.
- 25 6. The undercoat as claimed in one of claims 1 to 5, characterized in that the latent hardener in addition to the groups causing the hardening also additionally contains a silane group.
- 30 7. The undercoat as claimed in one of claims 1 to 6, characterized in that the epoxy resin is solid.
8. The undercoat as claimed in one of claims 1 to 30 7, characterized in that it is isocyanate-free.
- 35 9. A process for application of an undercoat onto a base, characterized in that the undercoat as claimed in one of claims 1 to 8 is applied in a layer thickness after drying of 10 µm to 200 µm, in particular 40 µm to 90 µm.
10. The process as claimed in claim 9, characterized in that the base is a porous base, in particular concrete.

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11. A process for the production of a coating, characterized in that an undercoat applied by the process as claimed in claim 9 or 10, if necessary after a hardening period of preferably 30 to 120 minutes, is  
5 overlaid with a single-component, isocyanate-free, silane-based adhesive.

12. The use of an undercoat as claimed in one of claims 1 to 8 for improving the adhesion of a single-component, isocyanate-free, silane-based adhesive on a  
10 porous base, in particular on concrete.

13. The use of a bonding agent additive which contains at least 2 functional groups, whereof at least one is an epoxy group which can react with the latent hardener, and at least one a silane group or titanate  
15 group, to improve adhesion in undercoats as claimed in one of claims 1 to 8.

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