Our Ref 287118 FORM 1

AUSTRALIA
Patents Act

616795

APPLICATION FOR A STANDARD PATENT

Bayer Aktiengesellschaft, of , LEVERKUSEN, FEDERAL REPUBLIC OF GERMANY

hereby applies for the grant of a standard patent for an invention entitled

An aqueous coating composition based on specific two-component polyurethanes and to a process for it s production

which is described in the accompanying complete specification.

Details of basic application(s):

Basic Application:	Country:	Date:
P 38 29 587.3	FEDERAL REPUBLIC OF GERMANY	1 September 1988

The address for service is:

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DATED this SEVENTH day of SEPTEMBER 1989

Bayer Aktiengesellschaft
By Its Patent Attorneys
ARTHUR S. CAVE & CO.

J.G. SIELY, FIPAA

TO:
The Commissioner of Patents
COMMONWEALTH OF AUSTRALIA

FEE: 234.00

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Regulation 12(2)

PATENT DECLARATION FORM (CONVENTION)

COMMONWEALTH OF AUSTRALIA

Patents Act 1952

DECLARATION IN SUPPORT OF A CONVENTION APPLICATION FOR A PATENT

In support of the Convention application made for a patent for an invention entitled: METHODS FOR PRODUCING DIORGANODIALKOXYSILANES

I/We DR. ROTENBERG AND DR. HULSEWEDE ..... (full name of declarant)
of SCHERING AKTIENGESELLSCHAFT, WALDSTRASSE 14, BERGKAMEN, GERMANY (full address)
do solemnly and sincerely declare as follows:-

1. I am/We are authorised by SCHERING AKTIENGESELLSCHAFT the applicant for the patent to make this declaration on its behalf.

2. The basic Application(s) as defined by Section 141 of the Act was/were made in the following country or countries on the following date namely:-
in GERMANY on 25 JUNE, 1988 by SCHERING AKTIENGESELLSCHAFT

3. Dr. Jürgen Graefe, Mälzerstrasse 6, D-4714 Selm-Cappenberg, Germany, Dr. Wolfram, Uzick, Gäusland 13, D-4600 Dortmund 50, Germany, Udo Weinberg, Im Grevelnkamp 20, D-4709 Bergkamen, Germany

are the actual inventors of the invention and the facts upon which the applicant is entitled to make the application are as follows:

The Applicant is the Assignee of the said invention from the actual inventors.

4. The basic application referred to in paragraph 2 of this Declaration was the first application made in a Convention country in respect of the invention the subject of the application.

Declared at *Bergkamen* this *10th* day of *July*, 1991.

SCHERING AKTIENGESELLSCHAFT
ppa. i.V.
Dr. Rotenberg Hülsewede
Signature of Declarant(s)

To:
The Commissioner of Patents

ARTHUR S. CAVE & CO.
PATENT AND TRADE MARK ATTORNEYS
SYDNEY

(12) PATENT ABRIDGMENT (11) Document No. AU-B-41135/89
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(54) Title
AN AQUEOUS COATING COMPOSITION BASED ON SPECIFIC TWO- COMPONENT POLYURETHANES AND TO A PROCESS FOR ITS PRODUCTION

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(56) Prior Art Documents
GB 1530022
GB 1530021
GB 1162409

(57) Claim

1. A two-component coating composition wherein the binder components comprise

a) a polyol component comprising an aqueous solution and/or dispersion of at least one hydroxyl-containing polymer of olefinically unsaturated compounds, said polymer containing chemically incorporated carboxylate and/or sulfonate groups in a quantity which is sufficient to make said polymer soluble and/or dispersible in water and

b) a polyisocyanate component, which is present in emulsified form in said polyol component, having a viscosity at 23°C of about 50 to 10,000 mPa.s and comprising at least one organic polyisocyanate with free isocyanate groups, wherein components a) and b) are present in quantities corresponding to an NCO:OH equivalent ratio of 0.5:1 to 5:1.

5. A process for the production of a coating composition which comprises emulsifying

a) a polyisocyanate component having a viscosity at 23°C of about 50 to 10,000 mPa.s and comprising at least one organic polyisocyanate with free isocyanate groups, solution and/or dispersion of at least one

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hydroxyl-containing polymer of olefinically unsaturated compounds, said polymer containing chemically incorporated carboxylate and/or sulfonate groups in a quantity which is sufficient to make said polymer soluble and/or dispersible in water,

wherein components a) and b) are present in an amount corresponding to an NCO:OH equivalent ratio of about 0.5:1 to 5:1.

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FORM 10

COMPLETE SPECIFICATION

(ORIGINAL)

616795

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Applicant(s): Bayer Aktiengesellschaft

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Complete specification for the invention entitled

"An aqueous coating composition based on specific two-component polyurethanes and to a process for it s production".

The following statement is a full description of this invention, including the best method of performing it known to me:-

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5020

AN AQUEOUS COATING COMPOSITION BASED ON SPECIFIC TWO-COMPONENT POLYURETHANES AND TO A PROCESS FOR ITS PRODUCTION

BACKGROUND OF THE INVENTION

Field of the Invention

This invention relates to an aqueous coating composition based on specific two-component polyurethanes and to a process for its production.

Description of the Prior Art

Ecological factors play an important part in surface technology. A particularly urgent problem is to reduce the organic solvents used for paints and coating compositions.

Previously, it has not been possible to prepare the highest quality chemically cross-linking polyurethane paints without organic solvents. These paints by virtue of their outstanding properties have acquired considerable significance in the coatings field. The use of water instead of organic solvents in two-component polyurethane paints based on polyisocyanates containing free isocyanate groups has not been possible because it is known that isocyanate groups react not only with alcoholic hydroxyl groups, but also with water. In addition, the concentration of active hydrogen atoms emanating from the water in these systems is far higher than the concentration of hydroxyl groups in the organic NCO-reactive component. Therefore, it had to be assumed that, in the ternary system of polyisocyanate, organic polyhydroxyl compound and water, the isocyanate/water reaction predominates with formation of urea and carbon dioxide. This reaction does not lead to cross-linking of the organic polyhydroxyl compounds and results in foaming of the paint mixture through the formation of carbon dioxide.

Although it is known from DE-OS 2 708 442 and from DE-OS 3 529 249 that organic polyisocyanates can be added to aqueous polymer dispersions to improve the property spectrum, these polymer dispersions are not organic polyhydroxyl compounds

of the type normally used in polyurethane chemistry as reactants for polyisocyanates. Further, the effect described in these prior publications of adding polyisocyanates to aqueous polymer dispersions is presumably attributable to coating the dispersed polymer with the urea formed from polyisocyanate and water.

It has now surprisingly been found that it is possible by using selected organic polyhydroxyl compounds, i.e. polyhydroxy-polyacrylates of the type described in detail hereinafter, as reactants for organic polyisocyanates containing free isocyanate groups to produce aqueous two-component polyurethane coating compositions by emulsifying the polyisocyanates containing free isocyanate groups in the aqueous polymer solution or dispersion. The coating compositions according to the invention have a pot life of several hours and harden to form high-quality, cross-linked films which have comparable properties to known coatings obtained from solvent-containing two-component polyurethane lacquers. This is extremely surprising for the reasons explained above because it had been expected that such a selective reaction would not take place between the polyisocyanate and the hydroxyl-containing polymer when dissolved or dispersed in water.

SUMMARY OF THE INVENTION

The present invention is directed to a two-component coating composition which contains as binder components

a) a polyol component containing at least one hydroxyl-containing polymer having chemically incorporated carboxylate and/or sulfonate groups and based on olefinically unsaturated compounds and

b) a polyisocyanate component having a viscosity at 23°C of about 50 to 10,000 mPa.s and based on at least one organic polyisocyanate

in quantities corresponding to an NCO/OH equivalent ratio of about 0.5:1 to 5:1, characterized in that component a) is an aqueous solution and/or dispersion of a polymer containing hydroxyl groups in which the polyisocyanate component b) is present in emulsified form.

The present invention also relates to a process for the production of this coating composition which is characterized in that a polyisocyanate component having a viscosity at 23°C of isocyanate is emulsified in an aqueous solution or dispersion of one or more polymer resins containing hydroxyl groups and chemically incorporated sulfonate and/or carboxylate groups in a quantity which makes them soluble and/or dispersible in water, the quantitative rations between the two components corresponding to an NCO/OH equivalent ratio, based on the isocyanate groups of the polyisocyanate component and the incorporated hydroxyl groups of the polymer component, of about 0.5:1 to 5:1.

DETAILED DESCRIPTION OF THE INVENTION

Component a) is based on polymers of olefinically unsaturated monomers containing hydroxyl groups, sulfonate and/or carboxylate groups, preferably carboxylate groups and, optionally, sulfonic acid and/or carboxyl groups, preferably carboxyl groups. These polymers preferably have a molecular weight M_n (number average), as determined by gel permeation chromatography, of about 500 to 50,000, more preferably about 1,000 to 10,000; preferably a hydroxyl value of about 16.5 to 264, more preferably about 33 to 165 mg KOH/g of polymer; preferably an acid value (based on the optional unneutralized sulfonic acid and/or carboxyl groups) of about 0 to 150, more preferably about 0 to 100 mg KOH/g of polymer; and preferably a content of sulfonate and/or carboxylate groups of 5 to 417, more preferably 24 to 278 milliequivalents per 100 g of polymer (solids). In a particularly preferred embodiment, these anionic groups are carboxylate groups.

The polymer resins a) are used for the production of the coating compositions preferably in the form of about 10 to 50% by weight, more preferably about 20 to 40% by weight aqueous solutions and/or dispersions which preferably have a viscosity of about 10 to 10^5, more preferably about 100 to 10,000 mPa.s/23°C and preferably a pH value of about 5 to 10, more preferably about 6 to 9.

AUSTRALIAN PATENT OFFICE

Depending upon the molecular weight of the polymers and their content of anionic groups or free acid groups, the aqueous systems containing the polymers may be either colloidal dispersions or molecular dispersions, but are generally so-called "partial dispersions," i.e., aqueous systems which are part molecular dispersions and part colloidal dispersions.

The polymers containing hydroxyl groups may be produced in known manner by copolymerization of olefinically unsaturated monomers, both monomers containing hydroxyl groups and monomers containing acid groups (i.e. sulfonic acid groups or carboxyl groups, preferably carboxyl groups) being copolymerized as the monomers, generally admixed with other monomers, after which the acid groups are at least partly neutralized.

The monomers containing acid groups are used for the purpose of incorporating carboxyl and/or sulfonic acid groups in the copolymers which, by virtue of their hydrophilic nature, ensure the solubility or dispersibility in water of the polymers, particularly after at least partial neutralization of the acid groups. The quantity of "acidic" comonomers used and the degree of neutralization of the "acidic" polymers initially obtained are selected in accordance with the following guidelines. In general, the "acidic" comonomers are used in quantities of about 1 to 30% by weight, preferably in quantities of about 5 to 20% by weight, based on the total weight of the monomers used. When less than 5% by weight of "acidic" monomers are used, the aqueous dispersions contain at most a low percentage of polymers in the form of a molecular dispersion even after complete neutralization. Larger contents of "acidic" monomers at the same degree of neutralization produce increasing percentages of polymers in the form of molecular dispersions until the colloidal dispersion components disappear at contents above about 12% by weight.

In principle, suitable "acidic" comonomers are any olefinically unsaturated, polymerizable compounds which contain at least one carboxyl and/or sulfonic acid group, e.g., olefinically unsaturated mono- or dicarboxylic acids having a molecular weight

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of 72 to 207 (such as acrylic acid, methacrylic acid, maleic acid or itaconic acid) or olefinically unsaturated compounds containing sulfonic acid groups such as 2-acrylamido-2-methylpropanesulfonic acid, or mixtures of such olefinically unsaturated acids.

The monomers containing hydroxyl groups are used in such quantities that the polymers have the hydroxyl values set forth above which correspond to a hydroxyl group content of the polymers of about 0.5 to 8, preferably 1 to 5% by weight. In general, the hydroxyfunctional comonomers are used in quantities of about 3 to 75% by weight, preferably about 6 to 47% by weight, based on the total weight of the monomers used. In addition, it is important to ensure that the quantity of hydroxyfunctional monomers is selected to provide copolymers containing an average of at least two hydroxyl groups per molecule.

Suitable monomers containing hydroxyl groups include, in particular, hydroxyalkyl esters of acrylic acid or methacrylic acid preferably containing 2 to 4 carbon atoms in the alkyl radical such as 2-hydroxyethyl acrylate or methacrylate, 2- or 3-hydroxypropyl acrylate or methacrylate, the isomeric hydroxybutyl acrylates or methacrylates and mixtures of such monomers.

The third group of olefinically unsaturated monomers which may be used for the production of the copolymers are olefinically unsaturated compounds which contain neither acidic nor hydroxyl groups. These compounds include esters of acrylic acid or methacrylic acid containing from 1 to 18, preferably from 1 to 8 carbon atoms in the alcohol radical, such as methyl acrylate, ethyl acrylate, isopropyl acrylate, n-propyl acrylate, n-butyl acrylate, 2-ethylhexyl acrylate, n-stearyl acrylate, the methacrylates corresponding to these acrylates, styrene, alkyl-substituted styrenes, acrylonitrile, methacrylonitrile, vinyl acetate, vinyl stearate and mixtures of such monomers. Comonomers containing epoxide groups such as glycidyl acrylate or methacrylate or monomers such as N-methoxymethyl acrylamide or methacrylamide may be used in small quantities.

The monomers of this third group are used in quantities of up to 90% by weight, preferably about 40 to 80% by weight, based on the total weight of the monomers used.

The polymers may be produced by standard polymerization processes. The polymers are preferably produced in organic solution. Continuous or discontinuous polymerization processes may be applied. Among the discontinuous processes, the batch process and inflow process may be used, the inflow process being preferred. In the inflow process, the solvent is initially introduced by itself or with part of the monomer mixture and heated to the polymerization temperature. The polymerization reaction is radically initiated when the monomers have been initially introduced and the remaining monomer mixture is added together with an initiator mixture over a period of about 1 to 10 hours, preferably about 3 to 6 hours. Thereafter more activator may optionally be added to take the polymerization to a conversion of at least 99%.

Suitable solvents include aromatic hydrocarbons such as benzene, toluene, xylene and chlorobenzene; esters such as ethyl acetate, butyl acetate, methyl glycol acetate, ethyl glycol acetate and methoxypropyl acetate; ethers such as butyl glycol, tetrahydrofuran, dioxane and ethyl glycol ether; ketones such as acetone and methyl ethyl ketone; halogen-containing solvents such as methylene chloride and trichloromonofluoroethane; and mixtures of these solvents.

The polymerization may be initiated by initiators having a decomposition half time at 80 to 180°C of about 0.01 to 400 minutes. In general, the copolymerization reaction takes place at temperatures in the range previously set forth, preferably at a temperature of about 100 to 160°C under a pressure of about 1000 to 20,000 mbar. The exact polymerization temperature is determined by the type of initiator used. The initiators are used in quantities of about 0.05 to 6% by weight, based on the total quantity of monomers.

Suitable initiators include aliphatic azo compounds such as azoisobutyronitrile and peroxides such as dibenzoyl peroxide, t-butyl perpivalate, t-butyl per-2-ethylhexanoate, t-butyl perbenzoate, t-butyl hydroperoxide, di-t-butyl peroxide, cumene hydroperoxide and dicyclohexyl and dibenzyl peroxydicarbonate.

The molecular weight of the polymers may be regulated by standard regulators such as n-dodecylmercaptan, diisopropyl xanthogene disulfide, di-(methylenetrimethylolpropane)-xanthogene disulfide and thioglycol. They are added in quantities of up to about 3% by weight, based on the monomer mixture.

On completion of polymerization, the copolymers are converted into an aqueous solution or dispersion. The organic polymer solution is introduced into a preheated aqueous phase and, at the same time, the organic solvent is removed by distillation, preferably under vacuum. To obtain good solubility or dispersibility in water, a neutralizing agent such as an inorganic base, ammonia or an amine, is preferably added to the aqueous phase. Inorganic bases include sodium hydroxide and potassium hydroxide, while the amines, in addition to ammonia, include trimethylamine, triethylamine and dimethyl ethanolamine. The neutralizing agents may be used in either substoichiometric or excess quantities to produce the above-mentioned acid values and contents of sulfonate and/or carboxylate groups, particularly carboxylate groups. When the acidic groups present are completely neutralized, an acid value of zero is obtained, while the content of sulfonate and/or carboxylate groups corresponds to the original content of sulfonic acid groups or carboxyl groups. When these groups are partially neutralized, the contents of sulfonate and/or carboxylate groups correspond to the quantity of neutralizing agent used. However, it is important to note, particularly when a stoichiometric excess of neutralizing agent is used, that a distinct increase in viscosity can occur through the polyelectrolyte character of the polymers. The aqueous solutions or dispersions obtained have the above-mentioned concentrations and viscosities and generally contain less than 5%

by weight, preferably less than 2% by weight of residual solvent. The substantially complete removal even of solvents boiling at higher temperatures than water is possible by azeotropic distillation.

The polyisocyanate component b) may be any organic polyisocyanate containing aliphatically, cycloaliphatically, araliphatically and/or aromatically bound isocyanate groups which are liquid at room temperature. The polyisocyanate component generally has a viscosity at 23°C of about 50 to 10,000, preferably about 50 to 1,000 mPa.s and is preferably not modified to be water dispersible or soluble although it may be so modified in a less preferred embodiment. The polyisocyanate component b) is preferably a polyisocyanate or polyisocyanate mixture exclusively containing aliphatically and/or cycloaliphatically bound isocyanate groups and having an (average) NCO functionality of about 2.2 to 5.0 and a viscosity at 23°C of about 50 to 500 mPa.s.

If necessary, the polyisocyanates may be used in admixture with small quantities of inert solvents to reduce the viscosity to a value within the limits mentioned. However, the maximum quantity in which such a solvent is used is determined such that the coating compositions according to the invention contain at most 20% by weight of solvent, based on the quantity of water, including the solvent, if any, still present in the polymer dispersions or solutions. Suitable solvents for the polyisocyanates include aromatic hydrocarbons such as "solvent naphtha," or the solvents set forth as suitable for the polyol component.

Suitable polyisocyanates include, in particular, the so-called "paint polyisocyanates" containing aromatically or (cyclo)aliphatically bound isocyanate groups; as already stated, (cyclo)aliphatic polyisocyanates are particularly preferred. Particularly suitable "paint polyisocyanates" include those based on hexamethylene diisocyanate, 1-isocyanato-3,3,5-trimethyl-5-isocyanatomethyl cyclohexane (IPDI) and/or bis-(isocyanatocyclohexyl)-methane, particularly those based on hexamethylene

diisocyanate. "Paint polyisocyanates" based on these diisocyanates are understood to be the biuret, urethane, uretdione and/or isocyanurate derivatives of these diisocyanates which, after their production, have been freed in known manner, preferably by distillation, from excess starting diisocyanate to a residual content of less than 0.5% by weight. Preferred aliphatic polyisocyanates for use in accordance with the invention include biuret polyisocyanates based on hexamethylene diisocyanate which correspond to the criteria mentioned above and which are based on mixtures of N,N',N"-tris-(6-isocyanatohexyl)-biuret with small quantities of its higher homologs. These polyisocyanates may be obtained by the processes according to US Patents 3,124,605; 3,358,010; 3,903,126; 3,903,127 or 3,976,622. Also preferred are the cyclic trimers of hexamethylene diisocyanate corresponding to the criteria mentioned above which may be obtained in accordance with US-P 4,324,879 and which are based on N,N'N"-tris-(6-isocyanatohexyl)-isocyanurate in admixture with small quantities of its higher homologs. It is particularly preferred to use mixtures corresponding to the criteria mentioned of uretdione and/or isocyanurate polyisocyanates based on hexamethylene diisocyanate of the type formed by the catalytic oligomerization of hexamethylene diisocyanate using trialkyl phosphines. The last-mentioned mixtures having a viscosity at 23°C of about 50 to 500 mPa.s and an NCO functionality of about 2.2 to 5.0 are particularly preferred.

The aromatic polyisocyanates which may also be used in accordance with the invention, but are less preferred, are in particular "paint polyisocyanates" based on 2,4-diisocyanatotoluene or commercial mixtures thereof with 2,6-diisocyanatotoluene or based on 4,4'-diisocyanatodiphenylmethane or mixtures thereof with its isomers and/or higher homologs. Aromatic paint polyisocyanates of this type include the urethane isocyanates obtained by the reaction of excess quantities of 2,4-diisocyanatotoluene with polyhydric alcohols such as trimethylol-

propane and subsequent removal of the unreacted diisocyanate excess by distillation. Other aromatic paint polyisocyanates include the trimers of the previously mentioned monomeric diisocyanates which have also been freed from excess monomeric diisocyanates, preferably by distillation, after their production.

It is also possible to use unmodified polyisocyanates of the type mentioned by way of example provided that they correspond to the foregoing requirements with regard to viscosity. In addition, the polyisocyanate component b) may be based on mixtures of the polyisocyanates mentioned by way of example in the foregoing.

To prepare the ready-to-use coating compositions, polyisocyanate component b) is emulsified in an aqueous dispersion of polymer component a). The dissolved or dispersed polymer simultaneously serves as an emulsifier for the polyisocyanate added. Mixing may be carried out by simple stirring at room temperature. The quantity of the polyisocyanate component is selected to provide an NCO:OH equivalent ratio, based on the isocyanate groups of component b) and the alcoholic hydroxyl groups of component a), of about 0.5:1 to 5:1, preferably about 0.8:1 to 2:1.

Before polyisocyanate component b) is added, the auxiliaries and additives typically used in lacquer technology may be incorporated into polymer component a). The auxiliaries and additives include foam inhibitors, levelling aids, pigments, dispersion aids for pigments, etc.

The coating compositions according to the invention thus obtained are suitable for virtually any applications where solvent-containing, solventless or other aqueous paint and coating systems having a high property profile are currently used. Examples include the coating of virtually any mineral building-material surfaces such as lime- and/or cement-bound plasters, gypsum-containing surfaces, fiber-cement building materials and concrete; the painting and sealing of wood and wood-based materials such as particle board, fiberboard and

paper; the painting and coating of metal surfaces; the coating and painting of asphalt or bitumen-containing pavements; and the painting and sealing of various plastic surfaces. They are also suitable for the surface bonding of various materials wherein the materials may be the same or different.

The invention is further illustrated but is not intended to be limited by the following examples in which all parts and percentages are by weight unless otherwise specified.

EXAMPLES

Starting materials:

Polyisocyanate 1

A mixture of 70 parts by weight of a uretdione, i.e. dimerized, hexamethylene diisocyanate containing two terminal NCO groups and 30 parts by weight of N,N',N"-tris-(6-isocyanatohexyl)-isocyanurate in admixture with small quantities of higher homologs of both products. In its solventless form (i.e., 100% solids) polyisocyanate 1 had an average viscosity of 150 mPa.s/23°C and an average NCO content of 22.5%.

Polyisocyanate 2

N,N',N"-tris-(6-isocyanatohexyl)-biuret containing small quantities of its higher homologs. At 100% solids the product had an average NCO content of 22.5% by weight and an average viscosity of about 3,000 mPa.s/23°C.

Polyisocyanate 3

N,N',N"-tris-(6-isocyanatohexyl)-isocyanurate containing small quantities of higher homologs as obtained in accordance with US Patent 4,324,879. At 100% solids the product had a viscosity of about 3,200 mPa.s/23°C and an average NCO content of 21.5%.

Polyisocyanate 4

A polyisocyanate prepolymer prepared by reacting 80 parts by weight of polyisocyanate 2 and 20 parts by weight of a saturated polyester of phthalic acid and propylene glycol having a hydroxyl group content of 2%. In the form of a 65% solution in solvent naphtha 100/methoxypropyl acetate (ratio by weight of the

solvents 4:1), the prepolymer had an NCO content of 10.4% and a viscosity of 1,300 mPa.a/23°C.

Polyisocyanate 5

A polyisocyanate mixture of the diphenylmethane series; at 100% solids the product had an NCO content of 31% and a viscosity of 120 mPa.s/23°C.

Polymer resins A to H:

Production method:

The starting medium I (cf. Table) was initially introduced into a 3 liter autoclave equipped with a reflux condenser, stirrer and gas inlet and outlet, and purged with nitrogen. Nitrogen was then passed over in a steady stream and the mixture was heated with stirring at approximately 200 rpm to an internal temperature of 110°C. Mixture II was then uniformly added over a period of 4 hours. After the addition, the combined mixtures were stirred for approximately 30 minutes, followed by radical polymerization with mixture III. The reaction time was 6 hours. Thereafter, approximately 100 ml of residual monomers were distilled off together with the solvent, n-butyl acetate, under a vacuum of about 200 to 400 mbar. The quantity distilled off was replaced by fresh solvent. The polymer resins dissolved in the organic solvent had the physical-chemical data shown in the Table.

To convert the organic solution into an aqueous dispersion, the mixtures IV were initially introduced into an 8 liter reactor and heated with stirring to approximately 95°C. The organic polymer solutions were then added over a period of about 0.5 to 1 hour and, at the same time, n-butyl acetate was distilled off by azeotropic distillation. The quantity of water distilled off was continuously replaced. pH values of 7 to 8 were established by addition of an approximately 25% aqueous ammonia solution (or N-dimethyl ethanolamine in Example H). The physical-chemical data of the aqueous polymer dispersions are also shown in the Table. The solvent content of the aqueous partial dispersions ultimately obtained was always below 2%.

		A	B	C	D	E	F	G	H
I. Starting medium									
n-Butyl acetate	(g)	900	900	900	900	900	900	900	900
II.									
2-Hydroxyethyl methacrylate	(g)	344	459	574	459	459	459	459	459
Methyl methacrylate	(g)	323	266	208	191	116	381	231	381
Styrene	(g)	323	266	208	191	116	--	--	--
n-Butyl acrylate	(g)	300	300	300	450	600	450	600	450
Acrylic acid	(g)	150	150	150	150	150	150	150	150
Azoisobutyronitrile	(g)	50	50	50	50	50	50	50	50
III.									
t-Butyl peroctoate	(g)	10	10	10	10	10	10	10	10
n-Butyl acetate	(g)	100	100	100	100	100	100	100	100
Concentration (% by weight)		63.7	65.3	64.4	58.8	58.6	60.9	58.9	59.1
Viscosity (Pa.s/23 C)		27.9	74.4	49.0	7.8	5.0	20.8	6.0	6.1
Hydroxyl value (mg KOH/g solution)		62.7	82.8	95.3	80.3	77.7	80.8	79.7	79.9
Acid value (mg KOH/g solution)		47.3	46.8	44.6	46.1	46.1	48.6	46.6	46.5
IV.									
Deionized water	(g)	3500	3500	3500	3500	3500	3500	3500	3500
Aqueous ammonia solution (25%)	(g)	143	143	143	143	143	143	143	--
n-Dimethyl ethanol amine	(g)	--	--	--	--	--	--	--	175
Concentration (% by weight)		26.3	30.1	30.1	24.8	26.2	27.8	26.2	30.3
pH value		6.8	6.5	6.6	7.1	7.1	7.1	7.0	7.6
Viscosity* (Pa.s/23 C)		--	--	--	0.97	4.6	5.7	1.8	--
Carboxylate groups (Mequiv./100 g solids)		139	139	139	139	139	139	139	131
Acid value (calculated) (mg KOH/g solid resin, after neutralization)		0	0	0	0	0	0	0	4.4

* mean values; the viscosities were not constant in view of structural viscosity.

EXAMPLE 1

100.0 parts by weight of polyhydroxyacrylate G having a solids content of 26.2% by weight, a viscosity of 1,800 mPa.s at 23°C and a pH value of 7.0 were mixed with 8.0 parts by weight of demineralized water, 0.25 parts by weight of a commercial, silicone-containing foam inhibitor (Foamex 1488, a product of Th. Goldschmidt AG, Essen), 0.3 parts by weight of a commercial dispersion aid (Pigmentverteiler A, a product of BASF AG, Ludwigshafen) and 19.0 parts by weight of titanium dioxide, rutile (Bayertitan R-KB4, a product of Bayer AG, Leverkusen) and the resulting mixture was dispersed for approximately 20 minutes in a mixer at a rotational speed of approximately 14 m/second. A dispersion which was storable almost indefinitely was obtained.

a) After the addition of 11.7 parts by weight of polyisocyanate 1, a white-pigmented, water-dilutable two-component polyurethane paint was obtained, having the following composition:

	By weight
Binder	27.21
Pigment	13.61
Additive	0.43
Total solids	41.25
Water	58.75
	100.00

The ready-to-use paint contained no organic solvent. The ratio of NCO to OH groups was 1.0 and the pot life was approximately 4 hours.

Films applied in a wet layer thickness of 100 to 600 µm (corresponding to a dry film thickness of 25 to 180 µm) dried in 30 to 120 minutes to form a tack-free and defect-free film. The hardening process was complete after 7 to 14 days.

b) After the addition of 20.0 g of polyisocyanate 4 (which had been diluted to a solids content of 50% with 6 g of solvent naphtha 100) to the dispersion used in a), a ready-to-use, white-pigmented, water-dilutable two-component polyurethane paint was obtained, having the following composition:

	By weight
Binder	25.54
Pigment	12.37
Additive	0.35
Total solids	38.26
Water	53 27
Organic solvent	8.47
	100.00

The mixture as a whole contained only 8.47% by weight of organic solvents. The ratio of NCO to OH groups was 1.0 and the pot life was several hours.

Films applied in a wet layer thickness of 100 to 600 µm (corresponding to a dry film thickness of 25 to 180 µm) dried in 30 to 120 minutes to form a tack-free and defect-free film. The hardening process was complete after 7 to 14 days.

c) After the addition of 22.4 parts by weight of polyisocyanate 3 (in the form of a 50% solution in solvent naphtha 100) to the dispersion used in a), a white-pigmented, water-dilutable, two-component polyurethane paint was obtained, having the following composition:

	By Weight
Binder	24.94
Additive	0.37
Pigment	12.67
Total solids	37.98
Water	54.55
Organic solvents	7.47
	100.00

The mixture as a whole contained only 7.47% by weight of organic solvents. The ratio of NCO to OH groups was 1.0 and the pot life was several hours. Films applied in a wet layer thickness of 100 to 600 µm (corresponding to a dry film thickness of 25 to 180 µm) dried in 30 to 120 minutes to form a tack-free

and defect-free film. The hardening process was complete after 7 to 14 days.

The hardened films of Examples 1a to 1c had the following properties:

	1a	1b	1c
Pendulum hardness, DIN 53 157 (sec)	75	75	85
Gloss, DIN 67 530 (angle 60)	80	90	75
Solvent resistance			
White spirit	very good	very good	very good
Toluene	very good	very good	very good
Methoxypropyl acetate	good-moderate	good	very good
Acetone	moderate	moderate	moderate
Ethanol	moderate	good-moderate	moderate

EXAMPLE 2

100 parts by weight of polyhydroxyacrylate G having a solids content of 26.2% by weight, a viscosity of 1800 mPa.s at 23°C and a pH value of 7.0 were homogeneously stirred with 8.0 parts by weight of demineralized water and 0.25 parts by weight of a commercial silicone-containing foam inhibitor (Foamex 1488, a product of Th. Goldschmidt AG, Essen).

A resin solution, which was slightly clouded because of the foam inhibitor, having an average flow viscosity (DIN 53 211) of 200 seconds and substantially indefinite storability was obtained.

Varying amounts of Polyisocyanate 1 were stirred into the resin solution to provide four different mixtures having NCO:OH ratios of

A: 0.5 (addition of 5.57 parts by weight polyisocyanate 1)
B: 1.0 (addition of 11.51 parts by weight polyisocyanate 1)
C: 1.5 (addition of 17.26 parts by weight polyisocyanate 1)
D: 2.0 (addition of 23.00 parts by weight polyisocyanate 1)

Ready-to-use clear lacquers were obtained in each case having the following compositions:

	A	B	C	D
NCO:OH	0.5	1.0	1.5	2.0
Binder	23.03	31.49	34.63	37.49
Additive	0.22	0.21	0.19.	0.19
Total solids	28.25	31.70	34.83	37.68
Water	71.75	68.70	65.17	62.32
Organic solvents	-	-	-	-
	100.0	100.0	100.0	100.0

Films of Examples 2A to 2D applied in a wet layer thickness of 100 to 600 µm (corresponding to a dry film thickness of 25 to 180 µm) dried in 30 to 120 minutes to form tack-free and defect-free films. The hardening process was complete in 7 to 14 days.

The hardened films of Examples 2A to 2D had the following properties.

	2A	2B	2C	2D
Gloss, DIN 67 530 (angle 60)	100	100	100	100
Pendulum hardness, DIN 53 157 (sec)	50	60	85	100
Solvent resistance White spirit	very good	very good	very good	very good
Toluene	moder-ate	good	very good	very good
Methoxypropyl acetate	moder-ate	good	good	very good
Acetone	moder-ate-poor	moder-ate-poor	moder-ate-poor	good
Ethanol	moder-ate-poor	moder-ate-poor	moder-ate	very good

EXAMPLE 3

100 parts by weight of polyhydroxyacrylate F having a solids content of 27.8% by weight, a viscosity of 5700 mPa.s at 23°C and a pH value of 7.1 were mixed with 8.0 parts by weight of demineralized water, 0.25 parts by weight of a commercial, silicone-containing foam inhibitor (Foamex 1488, a product of

Th. Goldschmidt AG, Essen), 0.3 parts by weight of a commercial dispersion aid (Pigmentverteiler A, a product of BASF, Ludwigshafen) and 20.0 parts by weight of a commercial titanium dioxide, rutile (Bayertitan R-KB4, a product of Bayer AG, Leverkusen) and the resulting mixture was dispersed for about 20 minutes in a mixer at a rotational speed of approximately 14 m/second. A dispersion having almost indefinite storability was obtained.

a. After the addition of 16.28 parts by weight of polyisocyanate 2, a ready-to-use, white-pigmented, water-dilutable, two-component polyurethane paint was obtained having the following composition:

	By weight
Binder	27.62
Pigment	13.81
Additive	0.38
Total solids	41.81
Water	55.38
Organic solvents	2.81
	100.00

The ready-to-use paint contained only 2.81% by weight of organic solvents. The ratio of NCO:OH groups was 1.0 and the pot life was several hours.

Films applied in a wet-layer thickness of 180 µm (corresponding to a dry film thickness of approximately 50 µm) dried in 30 to 60 minutes to form tack-free and defect-free films. The hardening process was complete after about 7 to 14 days.

b. When polyisocyanate 1 was used as hardener for the described pigment dispersion, a ready-to-use white paint having the following composition was obtained:

	By weight
Binder	28.42
Pigment	14.21
Additive	0.39
Total solids	43.02
Water	56.98
	100.00

The ready-to-use two-component paint contained no organic solvent. The ratio of NCO:OH groups was 1.0 and the pot life was several hours.

Films applied in a wet layer thickness of 180 µm (corresponding to a dry film thickness of approximately 50 µm) dried in 30 to 60 minutes to form tack-free and defect-free films. The hardening process was complete after 7 to 14 days.

The properties of the films applied in accordance with Examples 3a and 3b were as follows:

	3a	3b
Pendulum hardness (sec) approx.	65	110
Gloss, DIN 67 530 (angle 60)	85	85
Solvent resistance		
White spirit	very good	very good
Toluene	very good	very good
Methoxypropyl acetate	good-moderate	good-moderate
Acetone	moderate	moderate
Ethanol	moderate	moderate

Although the invention has been described in detail in the foregoing for the purpose of illustration, it is to be understood that such detail is solely for that purpose and that variations can be made therein by those skilled in the art without departing from the spirit and scope of the invention except as it may be limited by the claims.

The claims defining the invention are as follows:

1. A two-component coating composition wherein the binder components comprise

a) a polyol component comprising an aqueous solution and/or dispersion of at least one hydroxyl-containing polymer of olefinically unsaturated compounds, said polymer containing chemically incorporated carboxylate and/or sulfonate groups in a quantity which is sufficient to make said polymer soluble and/or dispersible in water and

b) a polyisocyanate component, which is present in emulsified form in said polyol component, having a viscosity at 23°C of about 50 to 10,000 mPa.s and comprising at least one organic polyisocyanate with free isocyanate groups, wherein components a) and b) are present in quantities corresponding to an NCO:OH equivalent ratio of 0.5:1 to 5:1.

2. The coating composition of Claim 1 wherein said polymer has an average molecular weight M_n of about 500 to 50,000, a hydroxyl value of 16.5 to 264 mg KOH/g of said polymer, an acid value of 0 to 150 mg KOH/g of said polymer and a content of chemically incorporated carboxylate and/or sulfonate groups of 5 to 417 milliequivalents per 100 g of said polymer.

3. The coating composition of Claim 1 wherein polyisocyanate component exclusively contains aliphatically or cycloaliphatically bound isocyanate groups.

4. The coating composition of Claim 2 wherein said polyisocyanate component exclusively contains aliphatically or cycloaliphatically bound isocyanate groups.

5. A process for the production of a coating composition which comprises emulsifying

a) a polyisocyanate component having a viscosity at 23°C of about 50 to 10,000 mPa.s and comprising at least one organic polyisocyanate with free isocyanate groups, solution and/or dispersion of at least one

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hydroxyl-containing polymer of olefinically unsaturated compounds, said polymer containing chemically incorporated carboxylate and/or sulfonate groups in a quantity which is sufficient to make said polymer soluble and/or dispersible in water,

wherein components a) and b) are present in an amount corresponding to an NCO:OH equivalent ratio of about 0.5:1 to 5:1.

6. The process of Claim 5 wherein said polymer has an average molecular weight M_n of about 500 to 50,000, a hydroxyl value of 16.5 to 264 mg KOH/g of said polymer, an acid value of 0 to 150 mg KOH/g of said polymer and a content of chemically incorporated carboxylate and/or sulfonate groups of 5 to 417 milliequivalents per 100 g of said polymer.

7. The process of Claim 5 wherein said polyisocyanate component exclusively contains aliphatically or cycloaliphatically bound isocyanate groups.

8. The process of Claim 6 wherein said polyisocyanate component exclusively contains aliphatically or cycloaliphatically bound isocyanate groups.

9. A two-component coating composition substantially as herein described with reference to any one of the Examples.

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