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(54) **Title**: REMOVABLE LENS PROTECTION COATING AGENT COMPRISING WATER-DISPERSION POLYURETHANE

(57) **Abstract**: The present invention relates to a coating agent for forming a coating film which protects a lens, and, more particularly, to a fluorine-based coating agent for forming a coating film for lens protection on the surface of the lens using water dispersible polyurethane as a base material. The coating agent includes water-dispersed polyurethane containing fluorine-based polyol or includes a fluorine-based surfactant. The coating agent can form a film having good leveling action and releasability but having no adhesivity, and is environment-friendly.

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Description

REMOVABLE LENS PROTECTION COATING AGENT COMPRISING WATER-DISPERSION POLYURETHANE

Technical Field

[1] The present invention relates to a water-dispersed polyurethane film for lens protection, and, more particularly, to a water-dispersed polyurethane film for lens protection, which releasably adheres to the surface of a lens in order to prevent the surface of the lens from being damaged at the time of processing or transporting the lens.

Background Art

[2] Most of optical lenses, such as eyeglasses and the like, are formed thereon with an organic or inorganic outer layer for modifying surface energy, for example, are coated with an antifouling agent or a water-repellent agent. This antifouling agent or water repellent agent is composed of a fluorosilane-based material, which decreases surface energy to prevent fatty stains from adhering to the optical lens, and serves to easily remove the fatty stains from the surface of the optical lens.

[3] A fabricated lens undergoes an edging process for machining it into a desired size before the glass frame is fitted with the lens. This edging process is performed using a grinder provided with a diamond wheel. In this process, in order to fix the lens, the grinder grips the lens using a gripping pad such as a self-adhesive chip, for example, double-sided adhesive tape. During a process of machining the lens, tangential torque stress occurs on the lens, and this tangential torque stress causes the lens to rotate in relation to the stress when the lens gripping means is not sufficiently efficient. Rotation of the lens during the process causes the outer layer of the lens to be damaged.

[4] The lens damage can obstruct a user’s field of vision because crushed chuck traces remain on the surface of the lens. In particular, when the lens is a low-reflection lens coated with a dielectric, the damage of the lens causes the surface of the lens to be cracked and membrane-separated because the dielectric coating layer is shocked. Such a phenomenon more frequently occurs in a urethane-based lens having relatively low surface hardness (refractive index: 1.61 ~ 1.67) compared to in an aryl-based lens (refractive index: 1.56), and commonly occurs in all kinds of lenses even though there is a difference of degree. Further, when the lens is a highly-slippery eyeglass lens, the center of the lens deviates from a fixed chuck at the time of working, and thus the horizontal and vertical axes become different from those of a circular frame after having been worked. In particular, in the case of a lens for correcting astigmatism, when the horizontal and vertical axes of the lens are not in accord with those of the

circular frame, bad effects, such as reduction of eyesight correction effect, eyesight weakening of persons in eyeglasses and the like, occur. Such bad effects occur more seriously when a water-repellent layer is formed on the outermost layer of the lens. In this case, since the slippage of the surface of the lens become very high, the optical, horizontal and vertical axes of the lens deviate from the center of the lens and thus vary greatly therefrom.

[5] In order to solve the above problems, U.S. Patent No. 5,792,537 disclose a method of protecting removable marks printed on the surface of an optical lens by masking the marks using adhesive tape during a process of grinding the optical lens. The adhesive tape may be an electrostatic film, such as a highly-plasticized vinyl film.

[6] Further, WO 2005/031441, filed by Ashyler Ether National Corp., discloses a method of forming a releasable electrostatic film which is electrostatically bonded with a removable outer layer temporarily formed on the surface of a lens using metal fluoride, metal oxide, metal hydroxide, a resin for forming marking ink and the like. This releasable electrostatic film is a flexible film made of polyvinyl chloride (PVC) including 30 ~ 60 wt% of a plastic component.

[7] Generally, plastic eyeglass lenses shipped from a factory are wrapped in a paper wrapper and then distributed in the market. During the course of distribution, the surface of the lens cannot be completely protected from surface damages, such as cracks, foreign matter adsorption, fingerprints and the like, so that it is difficult for the lenses supplied to retail stores through the distribution course thereof to maintain the original state of their surfaces. In particular, in the case of a plastic eyeglass lens on which a multiple thin film is formed to prevent reflection, the surface of the lens can be deformed or chemically changed under the influence of temperature and humidity during the distribution course thereof. Further, in the case of a plastic eyeglass lens treated with a UV absorber, the surface of the lens absorbs ultraviolet rays from the sun and can become discolored (yellow).

[8] Korean Patent No. 562783, whose patentee is Nam Sangwook in Korea, discloses a method of fabricating an eyeglass lens, in which a coating solution including 10 ~ 20 wt% of a chlorinated polyolefin resin having a molecular weight of 20,000 ~ 200,000, 20 ~ 50 wt% of a ketone-based organic solvent and 10 ~ 70 wt% of an aromatic organic solvent is applied on the entire surface of the lens to form a protective layer having stronger friction force and higher releasability than that of the lens itself.

[9] Conventional films for lens protection are required to have sufficient adhesiveness to the surface of a lens in order to prevent the lens from slipping at the time of working, and are required to be sufficiently strong so that the film can be easily separated from the lens after working. However, since these properties conflict with each other, there is a problem in that it is difficult to simultaneously satisfy these properties.

[10] Further, as environmental requirements are increased in the manufacturing of film, aqueous coating films are becoming continuously required. However, in the case of a lens on which a water-repellent coating layer is formed, there is a problem in that it is difficult to form an aqueous coating itself on the lens having the water-repellent coating layer thereon.

Disclosure of Invention

Technical Problem

[11] An object of the present invention is to provide a releasable polyurethane coating agent for protecting a lens.

[12] Another object of the present invention is to provide a releasable water-dispersed polyurethane coating agent for protecting a lens.

[13] Yet another object of the present invention is to provide a releasable water-dispersed fluorine-containing polyurethane coating agent for protecting a lens.

[14] Still another object of the present invention is to provide a water-dispersed fluorine-containing polyurethane.

Technical Solution

[15] In order to accomplish the above objects, the present invention provides a coating agent comprising water-dispersed polyurethane containing a fluorine component.

[16] In the present invention, the water-dispersed polyurethane containing a fluorine component means that the fluorine component is introduced into the water-dispersed polyurethane or a dispersion medium in which the water-dispersed polyurethane is dispersed.

[17] In the present invention, the water-dispersed polyurethane is prepared by reacting one or more polyols with polyisocyanate and hydrophilic diol and then dispersing the reaction product in water. Examples of the polyols may include polyalkylene glycols, such as polyester diol, polyether diol, polycarbonate diol, caprolactone diol, polypropylene glycol, polyethylene glycol and the like, and acrylic polyols.

[18] In an embodiment of the present invention, it is preferred that polycarbonate polyol or polycaprolactone polyol be used as the polyol. Polycarbonate polyol or polycaprolactone polyol may be prepared using well known methods. Polycarbonate polyol can be prepared by the reaction of aliphatic or aromatic polyol with phosgene or by the ester exchange reaction of carbonic ester. Aliphatic polycarbonate polyol is generally prepared by the ester exchange reaction of carbonic ester. Further, Belgium Patent No. 630530 (1963) discloses a method of preparing high-molecular-weight poly carbonate polyol having a narrow molecular weight distribution from cyclic carbonate. For example, the high-molecular-weight polycarbonate polyol can be obtained by the substitution reaction of ethylene glycol carbonate with diols having various structures. The

polycarbonate diol can be commercially used, and, preferably, Carb 100, manufactured by Ube Corp. in Japan, can be used as the polycarbonate diol.

[19] Polycaprolactone polyol is polyester polyol obtained by ring-opening-polymerizing ε-caprolactone using a polyol initiator or a polyamine initiator. Examples of the polyol initiators may include: diols, such as ethylene glycol, propylene glycol, 1,4-butylene glycol, 1,3-butylene glycol, 1,6-hexanediol, neo-pentyl glycol, bisphenol A, resorcin and the like; triols, such as glycerin, 1,2,6-hexanetriol, 1,1,1-tris(hydroxymethyl)propane and the like; tetraols, such as pentaerythritol, erythritol, methylglucoxide and the like; hexaols, such as sorbitol, dipentaerythritol and the like; and octaols, such as sucrose and the like.

[20] In the embodiment of the present invention, the polyol may have a molecular weight of 600 ~ 6000, preferably, 1000 ~ 3000. When the molecular weight of the polyol is excessively low, hardness becomes low, and thus it is difficult to remove a film from a lens. When the molecular weight thereof is excessively high, it is difficult to form a film, and hardness becomes high, thus causing the adhesivity of a film to decrease.

[21] In the embodiment of the present invention, the polyol may include triols such that the releasability and adhesivity of a film can be adjusted by controlling the degree of crosslinking. Examples of the triols may include trimethylolpropane, polycaprolactam triol and epoxy having three functional groups. In the embodiment of the present invention, the triols are commercially available, the trimethylolpropane is commercially available from Hansol Chemical Co., Ltd., the polycaprolactam triol may be Tone0310 having a molecular weight of 900, manufactured by UCC Corp. in U.S., and the epoxy having three functional groups may be a product having an epoxy equivalent of 140 ~ 155, manufactured by Nicechem Co., Ltd.

[22] In the present invention, polyisocyanate may include a mixture of one or more kinds of commonly-used diisocyanates which can be used to prepare water-dispersed polyurethane. Examples of the diisocyanates may include: aromatic diisocyanates, such as tolylenediisocyanate, diphenylmethane-4,4'-diisocyanate, p-phenylenediisocyanate, xylenediisocyanate, 1,5-naphthalenediisocyanate, 3,3'-dimethylphenyl-4,4'-diisocyanate, dianisidineisocyanate, tetramethylxylenediisocyanate and the like; cycloaliphatic diisocyantes, such as isophoronediisocyanate, dicyclohexylmethane-4,4'-diisocyanate, trans-1,4-cyclohexyldiisocyanate, norbornenediisocyanate and the like; and aliphatic diisocyanates, such as 1,6-hexamethylenediisocyanate, 2,4 and/or (2,4,4)-trimethylhexamethylenediisocyanate, lysinediisocyanate and the like. Here, since polyurethane molecules obtained from the diisocyanates and a coating film obtained from the polyurethane molecules have excellent hydrolysis resistance, cycloaliphatic diisocyanates, particularly, isophoronediisocyanate and dicyclo-

hexylmethane-4,4'-diisocyanate, may be preferably used.

[23] In the present invention, in order to disperse the polyurethane prepolymer in water, a hydrophilic diol introduced into chains of the prepolymer is introduced such that the polyurethane prepolymer is dispersed in water. As the hydrophilic diol, dimethylolpropionic acid, dimthylolbutanoic acid or the like may be used.

[24] In the present invention, an organic solvent used to prepare the polyurethane prepolymer may be selected from general organic solvents commonly used in the related art. Examples of the organic solvent may include benzene, toluene, ethyl acetate, acetone, methylethyl ketone, diethyl ether, tetrahydrofuran, methyl acetate, acetonitrile, chloroform, methylene chloride, carbon tetrachloride, 1,2-dichloroethane, 1,1,2-trichloroethane, tetrachloroethylene, N-methylpyrrolidone, dipropyleneglycol dimethyl ether, and mixtures thereof. In the embodiment of the present invention, it is preferred that dipropyleneglycol dimethyl ether, which is a nonpoisonous organic solvent, be used as the organic solvent.

[25] In the present invention, the polyurethane prepolymer may have an NCO content of 0.5 ~ 15%, preferably, 1 ~ 7%, and more preferably 6% at the ends thereof. When the content of NCO is low, its hardness, solvent property or the like is deteriorated. When the content of NCO is high, its material properties are improved, but its storage stability becomes problematic.

[26] The water-dispersed polyurethane according to the present invention is obtained by dispersing the polyurethane prepolymer in water using commonly-used dispersion methods. In the embodiment of the present invention, the polyurethane prepolymer reacts with a monoamine to be hydrated, and the hydrated polyurethane prepolymer is chain-extended and then dispersed by a diamine to prepare the waster-dispersed polyurethane.

[27] In the embodiment of the present invention, the monoamine compounds may be used as a mixture of one or more kinds of commonly-used monoamine compounds. Examples of the monoamine compounds may include: alkylamines, such as ethylamine, propylamine, 2-propylamine, butylamine, 2-butylamine, tert-butylamine, iso-butylamine and the like; aromatic amines, such as aniline, methylaniline, phenylnaphthylamine, naphthylamine and the like; cycloaliphatic amines, such as cyclohexane amine, methylcyclohexane amine and the like; ether amines, such as 2-methoxyethylamine, 3-methoxypropylamine, 2-(2-methoxyethoxy)ethylamine and the like; and alkanolamines, such as ethanolamine, propanolamine, butylethanolamine, 1-amino-2-methyl-2-propanol, 2-amino-2-methylpropanol, diethanolamine, diisopropanolamine, dimethylaminopropyleneethanolamine, dipropanolamine, N-methylmethanolamine, N-ethylethanolamine and the like. Among the monoamine compounds, alkanol amines may be preferably used because they impart good water

dispersion stability to polyurethane molecules, and, particularly, 2-aminoethanol and diethanolamine may be more preferably used because they are cheap.

[28] In the embodiment of the present invention, the diamine compounds may be used as a mixture of one or more kinds of commonly-used diamine compounds. Examples of the diamine compounds may include: low molecular weight diamines whose amino groups are substituted with alcoholic hydroxy group of the above-exemplified low molecular diols, such as ethylenediamine, propylenediamine and the like; polyetherdiamines, such as polyoxypropylenediamine, polyoxyethylenedimine and the like; cycloaliphatic diamines, such as menthenediamine, isophoronediamine, norbornenediamine, bis(4-amino-3-methyldicyclohexyl)methane, diaminocyclohexylmethane, bis(aminomethyl)cyclohexane, 3,9-bis(3-aminopropyl)2,4,8,10-tetraoxaspiro(5,5) undecane and the like; aromatic diamines, such as m-xylenediamine, α-(m/p aminophenyl)ethylamine, m-phenylenediamine, diaminodiphenylmethane, diaminediphenylsulfone, diaminodiethyldimethyldiphenylmethane, diaminodiethyldiphenylmethane, dimethylthiotoluenediamine, diethyltoluenediamine, α,α'-bis(4-aminophenyl)-p-diisopropylene and the like; hydrazine; and dihydrazine dicarboxylate compounds which are compounds of dicarboxylic acid and hydrazine exemplified in the polyvalent carboxylic acid used in the polyester polyol. Among the diamine compounds, low molecular diamines, particularly, ethylenediamine may be preferably used because they are cheap.

[29] In the present invention, the water-dispersed polyurethane containing a fluorine component can be obtained using polyols including fluorine-based polyols. Perfluoropolyetherdiol may be used as the fluorine-based polyol, and the fluorine-based polyols are commercially available. The fluorine-based polyol may be E10-H (Mw = 1500) manufactured by Ausinont Corp. in Italy. In the preparation of the water-dispersed polyurethane prepolymer, the fluorine-based polyol can be independently used in the reaction in which it reacts with polyisocyanate and hydrophilic diol, and may be mixed with various polyols and then used.

[30] In the embodiment of the present invention, the amount of the fluorine-based polyol may be 5 ~ 100 wt%, preferably 10 ~ 70 wt%, more preferably 15 ~ 50 wt% of a total amount of polyols. When the amount of the fluorine-based polyol is large, a final product becomes expensive. When the amount thereof is small, there is a problem in that the adhesivity of a final coating film becomes high.

[31] Further, in the embodiment of the present invention, the water-dispersed polyurethane containing a fluorine component may be prepared by introducing a fluorine-based surfactant into a dispersion medium in which water-dispersed polyurethane is dispersed. The fluorine-based surfactant may be a surfactant having a

perfluoroalkyl group, preferably a perfluoroalkyl group of 1 to 14 carbon atoms, more preferably a perfluoroalkyl group of 3 to 10. The perfluoroalkyl group may have oxygen atoms on the straight chain, straight chain or main chain thereof. The fluorine-based surfactant is commercially available, and may be FC-4430 D manufactured by 3M Corp.

[32] In the embodiment of the present invention, the fluorine-based surfactant may be used in an amount of 1 ~ 20 parts by weight based on 100 parts by weight of the water-dispersed polyurethane. When the amount of the fluorine-based surfactant is excessively small, the adhesivity of a final product becomes high. When the amount thereof is excessively large, there is a problem in that it is difficult to adhere the coating agent to the surface of a water-repellent coating lens.

[33] In the present invention, the releasable lens coating agent may be maintained at a solid content of 15 wt% or more. When the solid content is excessively low, a coating film becomes thin, thus causing a problem in that the coating film tears when it is separated from the lens.

[34] In the embodiment of the present invention, the releasable lens coating agent may further include 0.1 ~ 5.0 parts by weight of a defoamer based on 100 parts by weight of the water-dispersed polyurethane in order to prevent the occurrence of foam. The defoamer, for example, Defoamer #822 manufactured by Tego Corp., is commercially available.

[35] In the embodiment of the present invention, the releasable lens coating agent may further include a leveling agent in order to uniformly coat a lens. The leveling agent, for example, Surfynol 102 manufactured by Air Product Corp., is commercially available. The leveling agent may be used in an amount of 0.1 ~ 5.0 parts by weight based on 100 parts by weight of the water-dispersed polyurethane.

[36] In the embodiment of the present invention, the releasable lens coating agent may further include a thickener in order to adjust the flowability thereof. The thickener is commercially available, and may be used in an amount of 0 ~ 10 parts by weight based on 100 parts by weight of the water-dispersed polyurethane.

[37] The present invention provides a method of shaping the lens coated with the coating agent

[38] In the present invention, the lens can be applied to lenses for eyeglasses, lenses for cameras and the like, and may be a spherical or nonspherical lens made of polycarbonate or polyacrylate. The lens includes a primer layer for improving impact resistance and a hard coating layer which is formed by vacuum-depositing inorganic oxide on the surface of the primer layer and whose surface is formed of a ceramic layer, and may further include a water-repellent layer and/or an oil-repellent layer formed by vacuum-depositing or liquid-coating organic silicon compounds having a

fluoro group or perfluoropolyether. The lens is commercially available from Ace Optics Co., Ltd. or Hoya Lens Co., Ltd. in Korea.

[39] In the present invention, the inorganic oxide is a commonly-known compound for forming an antireflection film on a lens, and Examples of the inorganic oxides may include SiO_2, ZrO_2, Al_2O_3, TiO_2 and the like. In the present invention, the water-repellent layer and/or the oil-repellent layer is a layer having one or more properties of hydrophobicity and lipophobicity, and may include commonly-know compounds which decrease the surface energy of glass. Examples of the water-repellent and oil-repellent compositions are disclosed in Korean Patent No. 10-689110 and cited references described therein.

[40] The lens coating agent according to the present invention may be applied onto the inorganic oxide layer and the water-repellent and/or oil-repellent layer using commonly-known methods in order to form a protective film. Preferably, the application of the lens coating agent may be performed using dip coating, spray coating, spin coating, flow coating, roll coating or the like. In this case, in order to unify processes and obtain a uniform coating film, it is more preferred that the lens coating agent be applied onto the lens using dip coating. The lens coating agent according to the present invention may be applied to a thickness of 0.1 ~ 100 ㎛, preferably 0.1 ~ 10 ㎛. The lens coated with the coating agent is advantageous in that it does not slip and is not damaged by foreign matter or chemicals. Further, the lens coated with the coating agent is advantageous in that its diopter can be accurately measured because its coating film is transparent.

[41] The present invention provides a lens coated with a releasable water-dispersed polyurethane film. The lens may be selectively coated with a water-repellent or oil-repellent layer.

[42] The present invention provides a method of fabricating a lens, including the steps of: coating a lens with a coating agent including 100 parts by weight of water-dispersed polyurethane containing a fluorine component, 0.1 ~ 5.0 parts by weight of a leveling agent, 0.1 ~ 5.0 parts by weight of a defoamer and 0 ~ 10.0 parts by weight of a thickener, based on 100 parts by weight of the water-dispersed polyurethane; finishing the coated lens; and removing a coating from the finished lens.

[43] The present invention provides a lens coated with the water-dispersed polyurethane coating agent containing a fluorine component.

Advantageous Effects

[44] The present invention provides a water-dispersed polyurethane coating agent for surface protection, which has excellent surface properties and leveling properties and can be easily removed because it contains fluorine. The water-dispersed polyurethane

coating agent according to the present invention has strong adhesivity and has no viscosity and can be separated without becoming elongated, thus fabricating a film which is simple and environment-friendly compared to complicated conventional protection films.

[45] Further, since the water-dispersed polyurethane coating agent according to the present invention has good water repellency, its contact angle to water is high.

Mode for the Invention

[46] Preparation of water-dispersed polyurethane

[47] Example 1

[48] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 495 g of perfluoropolyetherdiol (manufactured by Ausinont Corp. in Italy, Mw=1500), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 150 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 1.87% NCO at the ends thereof.

[49] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 3.2 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a transparent water-dispersed polyurethane resin having a viscosity of 560 cps, a pH of 8.2 and a solid content of 40.1%.

[50]

[51] Example 2

[52] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 85 g of perfluoropolyetherdiol (manufactured by Ausinont Corp. in Italy, Mw=1500), 305 g of polycarbonatediol (manufactured by Ube Corp. in Japan, Mw=1000), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 220 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 3.58% NCO at the ends thereof.

[53] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 5.6 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a transparent water-dispersed polyurethane resin having a viscosity of 430 cps, a pH of 7.9 and a solid content of 39.2%.

[54]

[55] Example 3

[56] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 429 g of perfluoropolyetherdiol (manufactured by Ausinont Corp. in Italy, Mw=1500), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 360 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 6.11% NCO at the ends thereof.

[57] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 7.5 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a transparent water-dispersed polyurethane resin having a viscosity of 350 cps, a pH of 7.5 and a solid content of 40.5%.

[58]

[59] Example 4

[60] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 401 g of perfluoropolyetherdiol (manufactured by Ausinont Corp. in Italy, Mw=1500), 118 g of polytetramethylether glycol (manufactured by BASF Corp. in Germany, Mw=1000), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 257 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 3.58% of NCO at the ends thereof.

[61] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 7.5 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a transparent water-dispersed polyurethane resin having a viscosity of 420 cps, a pH of 7.7 and a solid content of 40.5%.

[62]

[63] Example 5

[64] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 421 g of perfluoropolyetherdiol (manufactured by Ausinont Corp. in Italy, Mw=1500), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 530 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 8.2% of NCO at the ends thereof.

[65] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then

mixed with 521.8 g of ion exchange water and 9.3 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a translucent water-dispersed polyurethane resin having a viscosity of 230 cps, a pH of 7.3 and a solid content of 41%.

[66]

[67] Example 6

[68] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 381 g of polycarbonatediol (manufactured by Ube Corp. in Japan, Mw=1000), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 538 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 8.2% NCO at the ends thereof.

[69] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 9.3 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, and then 52 g of a fluorine-based surfactant (FC-4430D, manufactured by 3M Corp.) was added thereto and stirred, thereby preparing a translucent water-dispersed polyurethane resin having a viscosity of 235 cps, a pH of 7.5 and a solid content of 39%.

[70]

[71] Comparative Example 1

[72] After a clean 2L flask, a stirrer, a mantle and a cooling tube were provided, 381 g of polycarbonatediol (manufactured by Ube Corp. in Japan, Mw=1000), 62 g of dimethylbutanoic acid and 60 g of NMP were put into the 2L flask, heated to 110°C, dewatered under a nitrogen atmosphere for 30 minutes, and then cooled to 80°C. Subsequently, 97 g of isophoronediisocyanate and 0.03 g of dibutyltin dilaurate (DBTDL) were added thereto, and then reacted at 80°C for 4 hours and 30 minutes to prepare a prepolymer having 0.38% of NCO at the ends thereof.

[73] Thereafter, 39 g of triethylamine was added to 436 g of the prepolymer, and then mixed with 521.8 g of ion exchange water and 3.2 g of ethylenediamine under strong stirring. Subsequently, the mixture was chain-elongated while being strongly stirred, thereby preparing a transparent water-dispersed polyurethane resin having a viscosity of 680 cps, a pH of 8.2 and a solid content of 30%.

[74]

[75] <u>Preparation of a coating composition</u>

[76] Example 7

[77] A coating composition was prepared by mixing 60 parts by weight of the water-

dispersed polyurethane resin prepared in Example 1, 2.5 parts by weight of a thickener (Pur-40, manufactured by Minzing Corp. in Germany), 0.5 parts by weight of a defoamer (Deformer #822, manufactured by Tego Corp.), 0.5 parts by weight of a leveling agent (Surfynol 102, manufactured by Air Product Corp.) and 40 parts by weight of water.

[78]

[79] Example 8

[80] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Example 2 was used.

[81]

[82] Example 9

[83] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Example 3 was used.

[84]

[85] Example 10

[86] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Example 4 was used.

[87]

[88] Example 11

[89] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Example 5 was used.

[90]

[91] Example 12

[92] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Example 6 was used.

[93]

[94] Comparative Example 2

[95] A coating composition was prepared using the same method as in Example 7, except that the water-dispersed polyurethane resin prepared in Comparative Example 1 was used.

[96]

[97] Lens coating

[98] Fabrication of a plastic lens having an antireflection film, a water-repellent and oil-repellent layer

[99] A plastic lens was coated by dipping a polycarbonate polymer lens (refractive index: 1.499) provided with a hard coating layer, a water-repellent and oil-repellent layer into the coating solutions prepared in Examples 7 to 12 and Comparative Example 12. The plastic lens was coated at a withdrawal speed of 15 cm/min, and then dried at 75℃ for

10 minutes. The coatability, surface leveling property, adhesivity, releasability and surface viscosity of the coating compositions were measured, and the results thereof are given in Table 1.

[100] Table 1

[Table 1]

[Table]

Items	Example 7	Example 8	Example 9	Example 10	Example 11	Example 12	Comparative Example 2
Coatability	◎	◎	◎	◎	○ ~ △	◎	◎
Leveling property	◎	◎	○	◎	△	◎	○ ~ △
Adhesivity	◎	◎	◎	◎	△	◎	○
Transparency	◎	◎	◎	◎	◎	◎	○
Releasability	◎	◎	◎	◎	○	◎	△
viscosity	◎	◎	◎	◎	◎	◎	X

[101] ◎ very good ○ good △ insufficient X poor

[102]

[103] (1) Coatability

[104] The coatability of the coating compositions was measured by observing whether or not a coating film was formed after the dipping of the plastic lens. Here, ◎: a coating film was uniformly formed on the surface of the plastic lens, ○: a coating film was unevenly formed on the surface thereof, and X: a coating film was not formed on the surface thereof.

[105]

[106] (2) Leveling property

[107] The leveling property of the coating compositions was measured by observing whether or not a coating film was evenly distributed after the coated plastic lens was dried. Here, ◎: a coating film was formed on the surface of the plastic lens, and the surface of the coating film is even; ○: a coating film was formed on the surface of the plastic lens, and the surface thereof is uneven; and X: a coating film was not formed

on the surface of the plastic lens.

[108]

[109] (3) Measurement of adhesivity

[110] The adhesivity of the coating compositions was measured by observing with the naked eye whether or not a coating film was separated from the plastic lens after the coated plastic lens was dried.

[111]

[112] (4) Measurement of transparency

[113] The transparency of the coating compositions was observed by measuring the light transmittance in a visible region after and before the application of the coating compositions using a light transmittance meter (Haze Guide Plus, manufactured by BYK Guidener).

[114]

[115] (5) Releasability

[116] The releasability of the coating compositions was evaluated by observing the degree to which a coating film was released from the plastic lens when the coating film was drawn by the strength greater than the adhesion between the coating film and the plastic lens after the coated plastic lens was dried. Here, ◎: the coating film was released from the plastic lens while not being stretched, ○: the coating film was released from the plastic lens while being slightly stretched, △: the coating film was released from the plastic lens while being stretched, and X: the coating film was torn while being stretched.

[117]

[118] (6) Surface viscosity

[119] The surface viscosity of the coating compositions was evaluated by observing with the naked eye whether or not fingerprints remained on the surface of a coating film when the coating film was pushed with fingers after the coated plastic lens was dried. Here, ◎: fingerprints did not remain at all, ○: fingerprints were not clear and were removed when they were wiped, △: fingerprints were clear and were not removed when they were wiped, and X: fingerprints were sticky.

[120]

[121] Although the preferred embodiments of the present invention have been disclosed for illustrative purposes, those skilled in the art will appreciate that various modifications, additions and substitutions are possible, without departing from the scope and spirit of the invention as disclosed in the accompanying claims.

Claims

[1] A releasable film coating agent for protecting a lens, comprising water-dispersed polyurethane containing a fluorine component.

[2] The releasable film coating agent for protecting a lens according to claim 1, wherein the lens is a water-repellent coating lens.

[3] The releasable film coating agent for protecting a lens according to claim 1, wherein the water-repellent polyurethane containing the fluorine component is prepared by reacting a polyol including a fluorine-based polyol with a diisocyanate and a hydrophilic diol.

[4] The releasable film coating agent for protecting a lens according to claim 3, wherein the fluorine-based polyol is 5 ~ 100 wt% of a total of polyols.

[5] The releasable film coating agent for protecting a lens according to claim 3, wherein the fluorine-based polyol is perfluoropolyetherdiol.

[6] The releasable film coating agent for protecting a lens according to claim 1, wherein the water-dispersed polyurethane includes a fluorine-based surfactant in a dispersion medium.

[7] The releasable film coating agent for protecting a lens according to claim 6, wherein the fluorine-based surfactant is 1 ~ 20 parts by weight based on 100 parts by weight of polyurethane.

[8] The releasable film coating agent for protecting a lens according to any one of claims 1 to 7, wherein the water-repellent polyurethane is prepared by reacting polyol having a molecular weight of 600 ~ 6000 with diisocyanate and hydrophilic diol, and has an NCO content of 0.5 ~ 15% at ends thereof.

[9] The releasable film coating agent for protecting a lens according to any one of claims 1 to 7, further comprising 0.1 ~ 5.0 parts by weight of a leveling agent, 0.1 ~ 5.0 parts by weight of a defoamer and 0 ~ 10.0 parts by weight of a thickener, based on 100 parts by weight of the water-dispersed polyurethane.

[10] A lens coated with a film made of water-dispersed polyurethane containing a fluorine component.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/KR2008/006315

A. CLASSIFICATION OF SUBJECT MATTER

C09D 175/04(2006.01)i, C09D 127/12(2006.01)i, G02C 7/00(2006.01)i, G02B 1/10(2006.01)i

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 : C09D

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

Korean utility models and applications for utility models since 1975
Japanese utility models and applications for utility models since 1975

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

eKIPASS(KIPO internal), PAJ, USP, USAPP

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X Y A	US 5798409 A (HO, C.-T.) 25 August, 1998 See claims 1-46	1, 3, 5, 6, 10 2, 9 4, 7, 8
Y	KR 10-0772651 B1 (GU et al.) 2 November. 2007 See claims 1-10, pages 3-6	2, 9
A	KR 10-0764108 B1 (GU et al.) 5 October 2007 See claims 1-10	1-10
A	US 6632508 B1 (PELLERITE et al.) 14 October, 2003 See claims 1-18	1-10
A	US 7358306 B2 (TURRI et al.) 15 April, 2008 See claims 1-22	1-10

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

* Special categories of cited documents:
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"Y" document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents,such combination being obvious to a person skilled in the art
"&" document member of the same patent family

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INTERNATIONAL SEARCH REPORT

Information on patent family members

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