

DESCRIPTION

OPTICAL FILM, METHOD FOR PRODUCING OPTICAL FILM, OPTICAL MEMBER, AND IMAGE DISPLAY DEVICE

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TECHNICAL FIELD

[0001] The present invention relates to an optical film, a method for producing the optical film, an optical member, and an image display device.

BACKGROUND ART

10 [0002] Some optical films used in image display devices and the like have a resin layer such as a hard coat layer formed on a translucent base (JP2008-221746 A). Further, another layer may be attached to the resin layer to use.

SUMMARY OF INVENTION

Technical Problem

15 [0003] In order to reduce the thickness of the device such as an image display device, it is preferable that the optical film used therein be as thin as possible.

[0004] However, if the thickness of a resin layer formed on a translucent base is reduced in an optical film, there is a possibility that a display property defect called "cissing (*hajiki*)" may occur. On the other hand, in the case where the amount of the additive in the resin layer is
20 increased for the purpose of preventing cissing, when another layer is attached to the resin layer, there is a possibility that a display property defect may occur due to contamination, peeling, or the like.

[0005] With the foregoing in mind, it is an object of the present invention to provide an optical film suppressed or prevented from a display property defect, a method for producing the optical
25 film, an optical member, and an image display device.

Solution to Problem

[0006] In order to achieve the above object, the present invention provides an optical film including: a translucent base (A); and a resin layer (B), wherein the resin layer (B) is formed on the translucent base (A), elements constituting the resin layer (B) include silicon, and the number
30 of atoms in the resin layer (B) at a depth of 1 nm from a surface facing away from the translucent base (A) satisfies the following equation (1):

$$5.0 \leq [(n_{Si}/n_{total}) \times 100] \leq 9.0 \quad (1)$$

where in the equation (1), n_{total} represents a sum of the number of atoms of carbon, nitrogen, oxygen, and silicon, and n_{Si} represents the number of silicon atoms.

[0007] The present invention also provides a method for producing the optical film according to the present invention, including the step of: forming a resin layer (B) on a translucent base (A) so that the resin layer (B) satisfies the equation (1), wherein the resin layer (B)-forming includes the steps of: coating a resin layer-forming coating liquid on the translucent base (A); and drying the coated resin layer-forming coating liquid to form a coating film, and the resin layer-forming coating liquid includes a resin, a silicon element-containing additive, and a diluting solvent.

[0008] The present invention also provides an optical member including the optical film according to the present invention.

[0009] The present invention also provides an image display device including: the optical film according to the present invention; or the optical member according to the present invention.

Advantageous Effects of Invention

[0010] According to the present invention, it is possible to provide an optical film suppressed or prevented from a display property defect, a method for producing an optical film, an optical member, and an image display device.

BRIEF DESCRIPTION OF DRAWINGS

[0011] [FIG. 1] FIG. 1 is a cross-sectional view showing an example of an optical film and a method for producing the same of the present invention.

[0012] [FIG. 2] FIG. 2 is a cross-sectional view showing another example of the optical film of the present invention.

DESCRIPTION OF EMBODIMENTS

[0012] Next, the present invention is described in details with reference to examples. The present invention, however, is not limited thereto.

Industrial Applicability

[0013] In the optical film of the present invention, for example, the resin layer (B) may have a thickness from 1.0 to 5.0 μm .

[0014] In the optical film of the present invention, for example, the resin layer (B) may include a surface modifier, and elements constituting the surface modifier may include silicon.

[0015] In the optical film of the present invention, for example, the surface modifier may include a silicon compound having a dimethylsiloxane skeleton.

[0016] In the optical film of the present invention, for example, the resin layer (B) may be formed of a copolymer of an oligomer having a functional group and a monomer.

[0017] In the optical film of the present invention, for example, the resin layer (B) may be a

hard coat layer.

[0018] In the optical film of the present invention, for example, another layer (C) may be attached to the surface of the resin layer (B) facing away from the translucent base (A) by a pressure-sensitive adhesive layer.

5 [0019] In the optical film of the present invention, for example, the pressure-sensitive adhesive layer may satisfy the condition of the following equation (2). The method for measuring the water contact angles d_1 and d_2 in the following equation (2) is not particularly limited, and can be measured by, for example, the method described in Examples to be described below.

10 $(d_1 - d_2) / d_1 \geq 0.10 \quad (2)$

where in the equation (2), d_1 represents a water contact angle ($^\circ$) of the surface of the resin layer (B) in a case where the pressure-sensitive adhesive layer and another layer (C) are not formed thereon, and d_2 represents a water contact angle ($^\circ$) of a surface of the pressure-sensitive
15 adhesive layer after another layer (C) is peeled from the pressure-sensitive adhesive layer. Incidentally, the equation (2) is synonymous with d_2 being 90% or less of d_1 (10% or more is reduced).

[0020] In the optical film of the present invention, for example, another layer (C) may be a glass or a resin film.

20 [0021] In the method for producing an optical film of the present invention, for example, the resin layer (B)-forming may further include the step of: curing the coating film.

[0022] In the method for producing an optical film of the present invention, for example, the resin layer (B) in the optical film may include a surface modifier, elements constituting the surface modifier may include silicon, and the silicon element-containing additive may be the
25 surface modifier. The surface modifier may include, for example, a silicon compound having a dimethylsiloxane skeleton as described above.

[0023] In the method for producing an optical film of the present invention, for example, the diluting solvent may include MIBK (methyl isobutyl ketone) and cyclopentanone.

[0024] The optical member of the present invention may be a polarizing plate, for example.

30 [0025] In the present invention, the terms "weight" and "mass" may be substituted for each other unless otherwise specified. For example, "parts by mass" may be read as "parts by weight," "parts by weight" may be read as "parts by mass", "% by mass" may be read as "% by weight", and "% by weight" may be read as "% by mass".

[0026] [1. Optical film]

The optical film of the present invention includes: a translucent base (A); and a resin layer (B), wherein the resin layer (B) is formed on the translucent base (A), elements constituting the resin layer (B) include silicon, and the number of atoms in the resin layer (B) at a depth of 1 nm from a surface facing away from the translucent base (A) satisfies the following equation (1):

$$5.0 \leq [(n_{Si}/n_{total}) \times 100] \leq 9.0 \quad (1)$$

where in the equation (1), n_{total} represents a sum of the number of atoms of carbon, nitrogen, oxygen, and silicon, and n_{Si} represents the number of silicon atoms.

[0027] FIG. 1 shows an example of an optical film and a method for producing the same of the present invention. First, as shown in (a) in FIG. 1, a translucent base (A) 11 is provided. Next, as shown in (b) in FIG. 1, a resin layer (B) 12 is formed on one surface of the translucent base (A) 11. The number of atoms in the resin layer (B) 12 at a depth of 1 nm from the surface facing away from the translucent base (A) 11 satisfies the equation (1). In this manner, an optical film 10 of the present invention shown in (b) in FIG. 1 can be produced. Note that a method for producing an optical film of the present invention will be described below in detail.

[0028] Further, as shown in (c) in FIG. 1, another layer (C) 20 may be attached to the surface of the resin layer (B) 12 facing away from the translucent base (A) 11 by a pressure-sensitive adhesive layer 13 to form an optical film 10' of the present invention including another layer (C) 20.

[0029] FIG. 2 shows another example of the optical film of the present invention. As shown in FIG. 2, in this optical film 10, a resin layer (B) 12 is laminated on one surface of a translucent base (A) 11. The resin layer (B) 12 in the optical film 10 of FIG. 2 is an anti-glare hard coat layer. In the anti-glare hard coat layer (B) 12, particles 12b and a thixotropy-imparting agent 12c are contained in a resin layer-forming resin 12a.

[0030] In the present invention, the resin layer (B) may be formed only of a resin, but may contain other components. The other components are not particularly limited, and may be one kind or two or more kinds, and may be, for example, particles, a thixotropy-imparting agent, and the like as shown in FIG. 2.

[0031] In the resin layer (B), the surface of the resin layer (B) facing away from the translucent base (A) may be flat or the surface may have, for example, asperities as shown in FIG. 2. Incidentally, in the present invention, the "depth" from the surface of the resin layer (B) facing away from the translucent base (A) is the depth in the direction perpendicular to the surface of the translucent base (A) both in the case where the surface is flat and the case where the surface

has asperities.

[0032] The number of atoms in the resin layer (B) at a depth of 1 nm from the surface facing away from the translucent base (A) satisfies the equation (1), as described above. Satisfying the equation (1) is synonymous with the fact that, the number of silicon atoms in the resin layer (B) at a depth of 1 nm from the surface facing away from the translucent base (A) is 5.0 to 9.0% relative to the sum of the number of atoms of carbon, nitrogen, oxygen, and silicon. At a depth of 1 nm from the surface facing away from the translucent base (A), the number of silicon atoms may be, for example, 5.5% or more, 6.0% or more, or 6.5% or more, and, for example, 8.5% or less, 8.0% or less, or 7.5% or less relative to the sum of the number of atoms of carbon, nitrogen, oxygen, and silicon.

[0033] The resin layer (B) always contains silicon as an element, as defined by the equation (1). In addition, the resin layer (B) may or may not contain all kinds (three kinds) of carbon, nitrogen, and oxygen as elements, and may contain only one kind or two kinds. Further, the resin layer (B) may or may not contain elements other than carbon, nitrogen, oxygen, and silicon.

[0034] Further, the thickness of the resin layer (B) may be, for example, 1.0 to 5.0 μm as described above. The thickness of the resin layer (B) may be, for example, 1.5 μm or more, or may be, for example, 4.5 μm or less, 4.0 μm or less, 3.5 μm or less, 3.0 μm or less, or 2.5 μm or less.

[0035] Hereinafter, each of the translucent base (A), the resin layer (B), the pressure-sensitive adhesive layer, and another layer (C) will be described with further examples.

[0036] The translucent base (A) is not particularly limited, and may be, for example, a transparent plastic film base. The transparent plastic film base is not particularly limited and preferably has superior light transmittance of visible light (preferably, light transmittance of 90% or more) and superior transparency (preferably, haze value of 1% or less), and may be, for example, a transparent plastic film bases described in JP 2008-90263 A. As the transparent plastic film base, a base having optically low birefringence is preferably used. The optical film of the present invention can be used, for example, as a protective film in a polarizing plate, and in this case, a film formed of triacetyl cellulose (TAC), polycarbonate, an acrylic polymer, polyolefin having a cyclic or norbornene structure, or the like is preferred as the transparent plastic film base. In the present invention, the transparent plastic film base may be a polarizer itself as described below. With such a configuration, it is possible to simplify the structure of the polarizing plate without the need for a protective layer made of TAC or the like, to reduce the number of steps of producing the polarizing plate or the image display device, and to improve the production efficiency. Further, with such a configuration, the polarizing plate can be thinner.

In the case where the transparent plastic film base is a polarizer, the resin layer (B) and another layer (C) function as a protective layer. Further, with such a configuration, for example, the optical film also functions as a cover plate in the case where the anti-glare film is attached to the surface of the liquid crystal cell.

5 [0037] In the present invention, the thickness of the translucent base (A) is not particularly limited, and is, for example, in the range from 10 to 500 μm , from 20 to 300 μm , or from 30 to 200 μm from the viewpoint of strength, workability such as handleability, and film thinness, for example. The refractive index of the translucent base (A) is not particularly limited, and is in the range from 1.30 to 1.80 or from 1.40 to 1.70, for example.

10 [0038] In the optical film of the present invention, for example, a resin contained in the translucent base (A) may contain an acrylic resin.

[0039] In the optical film of the present invention, for example, the translucent base (A) may be an acrylic film.

[0040] In the optical film of the present invention, for example, the surface of the resin layer
15 (B) facing away from the translucent base may have asperities, and the external haze value caused by asperities may be 5% or more. In the case of a high anti-glare film, the overall appearance may be blurred and a black-and-white shading pattern may easily occur. From the viewpoint of suppressing or preventing this, and from the viewpoint of suppressing reflected glare, it is preferable that the external haze value be as large as possible. On the other hand, from
20 the viewpoint of suppressing or preventing deterioration of display property (e.g., blurring of an image, deterioration of contrast in a dark place, or the like.), it is preferable that the external haze value be not excessively large. The external haze value is not particularly limited, and may be, for example, 5% or more, 10% or more, 15% or more, or 20% or more, and may be, for example, 50% or less, 45% or less, 40% or less, or 35% or less. In the present invention, the method for
25 measuring the external haze value is not particularly limited, and the external haze value can be measured by, for example, the following measurement methods (1) to (3):

(1) The total haze value of the optical film of the present invention is measured according to JIS K 7136.

30 (2) A translucent pressure-sensitive adhesive is laminated on the surface of the resin layer (B) of the optical film of (1) facing away from the translucent base (A), and a COP film (trade name: ZEONOR film, produced by Zeon Corporation) is further attached thereon to prepare a laminate. The inner haze value of the optical film of (1) can be obtained by the same method as the

measuring method of the total haze value according to JIS K 7136 (i.e., the measuring method of (1)). This inner haze value is a haze value obtained by removing the effect of the asperities on the outermost surface on the resin layer (B) side from the total haze value of (1).

5 (3) A numerical value obtained by subtracting the inner haze value measured in (2) from the total haze value measured in (1) is used as the external haze value of the optical film of (1).

[0041] In the optical film of the present invention, the resin contained in the resin layer (B) is not particularly limited, and the resin layer (B) may contain, for example, an acrylate resin (also referred to as an acrylic resin).

10 [0042] In the optical film of the present invention, for example, the resin contained in the resin layer (B) may contain a urethane acrylate resin.

[0043] In the optical film of the present invention, for example, as described above, the resin layer (B) may be formed of a copolymer of an oligomer having a functional group and a monomer. The oligomer having a functional group is not particularly limited, and can be, for example, a curable urethane acrylate resin. The curable urethane acrylate resin can be, for example, "UV-1700TL" (trade name, produced by Mitsubishi Chemical Corporation). The monomer is not particularly limited, and can be, for example, a polyfunctional acrylate. The polyfunctional acrylate can be, for example, "M-920" (trade name, produced by Toagosei Company, Limited).

20 [0044] In the optical film of the present invention, for example, the resin contained in the resin layer (B) may be a copolymer of a curable urethane acrylate resin and a polyfunctional acrylate.

[0045] In the optical film of the present invention, the resin layer (B) always contains silicon as an element as described above. Thus, as described above, the resin layer (B) may contain a surface modifier, and the elements constituting the surface modifier may include silicon. Further, the surface modifier may include a silicon compound having a dimethylsiloxane skeleton.

25 Examples of the surface modifier include a leveling agent, a dimethylsiloxane-modified methacrylic acid ester, and a polydimethylsiloxane ring. Examples of the surface modifier include "LE-303" (trade name, produced by KYOEISHA CHEMICAL Co., LTD.) and "PC4100" (trade name, produced by DIC Corporation). The amount of the surface modifier to be added is not particularly limited, and may be set appropriately so that, for example, the silicon content in the resin layer (B) falls within the above range.

30 [0046] In the optical film of the present invention, the resin layer (B) is not particularly limited, and may be, for example, a hard coat layer, and may be, for example, an anti-glare hard coat layer.

[0047] In the optical film of the present invention, for example, the resin layer (B) is formed by using an anti-glare hard coat layer-forming material containing a resin and a filler, and the resin layer (B) may have a flocculated portion forming a convex portion on the surface of the resin layer (B) by flocculating the fillers. In addition, in the flocculated portion forming the convex
5 portion, the fillers may be present in the state of being gathered in one direction in an in-plane direction of the resin layer (B). In the image display device of the present invention, for example, the optical film of the present invention may be disposed such that the one direction in which the fillers are gathered coincides with the long side direction of the black matrix pattern. Examples of the filler include the particles and the thixotropy-imparting agent.

10 [0048] The resin layer (B) is formed by, for example, coating a coating liquid that contains a resin, a silicon element-containing additive, and a diluting solvent on the surface of the translucent base (A) to form a coating film, and then removing the solvent from the coating film, as described below. Examples of the resin include a heat-curable resin and an ionizing radiation-curable resin which is cured by ultraviolet rays and/or light. As the resin, a commercially
15 available heat-curable resin and/or an ultraviolet-curable resin can also be used.

[0049] As the heat-curable resin and/or the ultraviolet-curable resin, a curable compound having at least one of an acrylate group and a methacrylate group cured by, for example, heat, light (ultraviolet rays or the like) and/or an electron beam can be used, and examples thereof include a silicone resin, a polyester resin, a polyether resin, an epoxy resin, an urethane resin, an
20 alkyd resin, a spiroacetal resin, a polybutadiene resin, a polythiol polyene resin, and an oligomer and/or a prepolymer of acrylate and/or methacrylate of a polyfunctional compound such as a polyhydric alcohol. One kind of them may be used alone or two or more kinds of them may be used in combination.

[0050] As the resin, a reactive diluent having at least one of an acrylate group and a
25 methacrylate group can be used, for example. As the reactive diluent, reactive diluents described in JP 2008-88309 A can be used, and examples thereof include monofunctional acrylate, monofunctional methacrylate, polyfunctional acrylate, and polyfunctional methacrylate. As the reactive diluent, acrylate having a trifunctional group or more or methacrylate having a trifunctional group or more is preferable because the hardness of the resin layer (B) can be
30 superior. Examples of the reactive diluent also include butanediol glycerin ether diacrylate, acrylate of isocyanuric acid, and methacrylate of isocyanuric acid. One kind of them may be used alone or two or more kinds of them may be used in combination.

[0051] The resin layer (B) may or may not contain a thixotropy-imparting agent, as described above. The thixotropy-imparting agent may be at least one selected from the group consisting of,

for example, organoclay, oxidized polyolefin, and denatured urea. Further, the thixotropy-imparting agent may be, for example, a thickener. One kind of the thixotropy-imparting agents may be used alone, or two or more kinds of them may be used in combination.

[0052] In the optical film of the present invention, for example, the thixotropy-imparting agent
5 may be contained in an amount of 0.2 to 5% by mass or 0.4 to 4% by mass relative to the total mass of the resin layer-forming resin of the resin layer (B).

[0053] Another layer (C) is not particularly limited, and examples thereof include a protective layer and a decorative layer. Another layer (C) may be, for example, a glass or a resin film (plastic film). The resin film is not particularly limited, and may be, for example, "E-MASK"
10 series (trade name, produced by Nitto Denko Corporation). The thickness of another layer (C) is not particularly limited, and may be, for example, 10 μm or more, 20 μm or more, or 30 μm or more, and may be, for example, 80 μm or less, 70 μm or less, 60 μm or less, 50 μm or less, or 40 μm or less.

[0054] The pressure-sensitive adhesive layer may be, for example, a pressure-sensitive
15 adhesive layer formed by a pressure-sensitive adhesive (pressure-sensitive adhesive composition). In the present invention, it is preferable that the pressure-sensitive adhesive layer be a layer enabling another layer (C) to be peeled from the resin layer (B). The thickness of the pressure-sensitive adhesive layer is not particularly limited, and may be, for example, 5 μm or more, or 10 μm or more, and may be, for example, 50 μm or less, 40 μm or less, 30 μm or less,
20 or 20 μm or less. The pressure-sensitive adhesive is not particularly limited, and can be, for example, a (meta)acrylic polymer and the like. These may be dissolved or dispersed in, for example, a solvent to form a solution or a dispersion, which may be used as the pressure-sensitive adhesive (pressure-sensitive adhesive composition). The solvent can be, for example, ethyl acetate and the like, and only one kind of them may be used or two or more kinds of them
25 may be used in combination. The concentration of the solute or dispersoid (e.g., the acrylic polymer) in the solution or dispersion may be, for example, 10% by mass or more or 15% by mass or more, and may be, for example, 60% by mass or less, 50% by mass or less, 40% by mass or less, or 25% by mass or less. Note that, in the present invention, a "(meta)acrylic polymer" refers to a polymer or a copolymer of at least one monomer of (meta)acrylic acid, (meta)acrylic acid ester, and (meta)acrylamide. In addition, in the present invention, a "(meta)acrylic acid"
30 means "at least one of acrylic acid and methacrylic acid", and a "(meta)acrylic acid ester" means "at least one of acrylic acid ester and methacrylic acid ester". The (meta)acrylic ester can be, for example, a linear or branched alkyl ester of (meta)acrylic acid and the like. The number of carbons in an alkyl group in a linear or branched alkyl ester of (meta)acrylic acid may be, for

example, 1 or more, 2 or more, 3 or more, or 4 or more, and may be, for example, 18 or less, 16 or less, 14 or less, 12 or less, 10 or less, or 8 or less. The alkyl group may be substituted or unsubstituted with, for example, one or two or more substituents. The substituent can be a hydroxyl group, and in the case of being substituted with two or more substituents, the substituents may be the same or different. Specific examples of the (meta)acrylic acid ester include 2-ethylhexylacrylate, 2-hydroxyethylacrylate, and 4-hydroxybutylacrylate. In addition, only one kind of the pressure-sensitive adhesive may be used, or two or more kinds of the pressure-sensitive adhesives may be used in combination.

[0055] Further, the optical film of the present invention may or may not include yet another layer other than translucent base (A), the resin layer (B), the pressure-sensitive adhesive layer, and another layer (C). The yet another layer is not particularly limited, and examples thereof include an easy adhesive layer, an antireflection layer, a base layer to which an adhesive is attached, and the like.

[0056] As described above, if the thickness of a resin layer formed on a translucent base is reduced in an optical film, there is a possibility that a display property defect called "cissing (*hajiki*)" may occur. On the other hand, in the case where the amount of the additive (e.g., a surface modifier such as a leveling agent) in the resin layer is increased for the purpose of preventing cissing, when another layer is attached to the resin layer, there is a possibility that a display property defect may occur due to contamination, peeling, or the like. In this regard, since the resin layer (B) satisfies the equation (1), the present invention can suppress or prevent, for example, the contamination, peeling, or the like, and as a result, can provide an optical film suppressed or prevented from a display property defect.

[0057] [2. Production method of optical film]

The method for producing the optical film of the present invention is not particularly limited and may be produced by any method, and is preferably produced by the optical film production method of the present invention.

[0058] The optical film production method can be performed, for example, as follows.

[0059] First, the resin layer (B) is formed on the translucent base (A) so as to satisfy the equation (1) (resin layer (B)-forming). Thereby, a laminate of the translucent base (A) and the resin layer (B) is produced. The resin layer (B)-forming includes the steps of: coating the resin layer-forming coating liquid (hereinafter, sometimes simply referred to as "coating liquid" or "resin layer (B)-forming material") on the translucent base (A); and drying the coated coating liquid to form a coating film, as described above. Further, for example, as described above, the resin layer (B)-forming may further include the step of: curing the coating film. While the curing

may be carried out, for example, after the drying, the present invention is not limited thereto. The curing can be performed, for example, by heating, light irradiation, or the like. The light is not particularly limited, and may be, for example, ultraviolet rays or the like. The light source of the light irradiation is not particularly limited, and may be, for example, a high-pressure mercury lamp or the like.

[0060] The coating liquid (resin layer (B)-forming material) contains, as described above, the resin, the silicon element-containing additive, and the diluting solvent (hereinafter, sometimes simply referred to as a "solvent"). The coating liquid may or may not contain other components other than these. The other components are not particularly limited, and examples thereof include the particles and the thixotropy-imparting agent.

[0061] The solvent is not particularly limited, and various solvents can be used. One kind of the solvents may be used alone or two or more kinds of them may be used in combination. In order to obtain the optical film of the present invention, an optimum solvent type and solvent ratio may be appropriately selected in accordance with the composition of the resin, the kinds of the particles and the thixotropy-imparting agents, and the contents thereof. The solvent is not particularly limited, and examples thereof include alcohols such as methanol, ethanol, isopropyl alcohol (IPA), butanol, t-butyl alcohol (TBA), and 2-methoxyethanol; ketones such as acetone, methylethylketone, methylisobutylketone, and cyclopentanone; esters such as methyl acetate, ethyl acetate, and butyl acetate; ethers such as diisopropyl ether and propyleneglycol monomethylether; glycols such as ethyleneglycol and propyleneglycol; cellosolves such as ethyl cellosolve and butyl cellosolve; aliphatic hydrocarbons such as hexane, heptane, and octane; and aromatic hydrocarbons such as benzene, toluene, and xylene. Further, for example, the solvent may contain a hydrocarbon solvent and a ketone solvent. The hydrocarbon solvent may be, for example, an aromatic hydrocarbon. The aromatic hydrocarbon may be, for example, at least one selected from the group consisting of toluene, o-xylene, m-xylene, p-xylene, ethylbenzene, and benzene. The ketone solvent may be, for example, at least one selected from the group consisting of cyclopentanone, acetone, methyl ethyl ketone, methyl isobutyl ketone, diethyl ketone, cyclohexanone, isophorone, and acetophenone. It is preferable that the solvent include, for example, the hydrocarbon solvent (e.g., toluene) in order to dissolve a thixotropy-imparting agent (e.g., a thickener). The solvent may be, for example, a solvent obtained by mixing the hydrocarbon solvent and the ketone solvent in a mass ratio of 90:10 to 10:90. The mass ratio of the hydrocarbon solvent to the ketone solvent may be, for example, 80:20 to 20:80, 70:30 to 30:70, or 40:60 to 60:40, and the like. In this case, for example, the hydrocarbon solvent may be toluene and the ketone solvent may be methyl ethyl ketone. Further, the solvent may include

toluene, and may further include at least one selected from the group consisting of ethyl acetate, butyl acetate, IPA, methyl isobutyl ketone, methyl ethyl ketone, methanol, ethanol, and TBA.

[0062] In the case where an acrylic film is employed as the translucent base (A) to form an intermediate layer (permeation layer), a good solvent for an acrylic film (acrylic resin) can be suitably used, for example. As a solvent thereof, for example, a solvent containing a hydrocarbon solvent and a ketone solvent may be used as described above. The hydrocarbon solvent may be, for example, an aromatic hydrocarbon. The aromatic hydrocarbon may be, for example, at least one selected from the group consisting of toluene, o-xylene, m-xylene, p-xylene, ethylbenzene, and benzene. The ketone solvent may be, for example, at least one selected from the group consisting of cyclopentanone, acetone, methyl ethyl ketone, methyl isobutyl ketone, diethyl ketone, cyclohexanone, isophorone, and acetophenone. The solvent may be, for example, a solvent obtained by mixing the hydrocarbon solvent and the ketone solvent in a mass ratio of 90:10 to 10:90. The mass ratio of the hydrocarbon solvent to the ketone solvent may be, for example, 80:20 to 20:80, 70:30 to 30:70, or 40:60 to 60:40, and the like. In this case, for example, the hydrocarbon solvent may be toluene and the ketone solvent may be methyl ethyl ketone.

[0063] When triacetyl cellulose (TAC) is used as a translucent base (A), for example, the solvent is not particularly limited, and examples thereof include ethyl acetate, methyl ethyl ketone, MIBK (methyl isobutyl ketone), and cyclopentanone, and only one kind of them may be used or two or more kinds of them may be used in combination. In this case, the solvent may be, for example, a mixed solvent of MIBK and cyclopentanone. The mixing ratio of MIBK and cyclopentanone is not particularly limited, and may be, for example, from 90:10 to 10:90, from 80:20 to 20:80, or from 70:30 to 30:70 in terms of the mass ratio.

[0064] In the case of containing a thixotropy-imparting agent, the anti-glare hard coat layer-forming material (coating liquid) can favorably have thixotropy by selecting a solvent as appropriate. For example, in the case of using organoclay, toluene and xylene can be suitably used alone or in combination. For example, in the case of using oxidized polyolefin, methyl ethyl ketone, ethyl acetate, and propylene glycol monomethyl ether can be suitably used alone or in combination. For example, in the case of using denatured urea, butyl acetate and methyl isobutyl ketone can be suitably used alone or in combination.

[0065] Various leveling agents can be added to the resin layer (B)-forming material. For the purpose of preventing unevenness in coating (causing a surface to be evenly coated), a fluorine-based leveling agent or a silicone-based leveling agent can be used as the leveling agent, for example. The silicone-based leveling agent can also be used for the purpose of containing silicon

as an element in the resin layer (B). In the present invention, a leveling agent can be selected as appropriate according to the case where the surface of the resin layer (B) is required to have anti-smudge properties and the case where an antireflection layer (low refractive index layer) and/or a layer containing interlayer fillers as another layer (C) is formed on the resin layer (B) as

mentioned below.

[0066] The amount of the leveling agent to be added is, for example, 5 parts by weight or less, preferably in the range from 0.01 to 5 parts by weight, relative to 100 parts by weight of the resin.

[0067] A pigment, a filler, a dispersant, a plasticizer, a UV absorber, a surfactant, an antifouling agent, an antioxidant, or the like may be added to the resin layer (B)-forming material to the extent of not impairing functions of the coating liquid. One kind of the additives may be used alone or two or more kinds of them may be used in combination.

[0068] Any of conventionally known photoinitiators described in JP 2008-88309 A can be used in the resin layer (B)-forming material, for example.

[0069] As a method for forming a coating film by coating the resin layer (B)-forming material (coating liquid) on the translucent base (A), a coating method such as a fountain coating method, a die coating method, a spray coating method, a gravure coating method, a roller coating method, or a bar coating method can be used, for example.

[0070] Next, as described above, the coating film is dried and cured to form a resin layer (B).

The drying may be, for example, natural drying, air drying by blowing air, heat drying, or a combination thereof.

[0071] The drying temperature of the resin layer (B)-forming material (coating liquid) may be, for example, in a range from 30 to 200°C. The aforementioned drying temperature may be 40°C or more, 50°C or more, 60°C or more, 70°C or more, 80°C or more, 90°C or more, or 100°C or more, for example, and 190°C or less, 180°C or less, 170°C or less, 160°C or less, 150°C or less, 140°C or less, 135°C or less, 130°C or less, 120°C or less, or 110°C or less. The drying time is not particularly limited, and may be, for example, 30 seconds or longer, 40 seconds or longer, 50 seconds or longer, or 60 seconds or longer, and may be 150 seconds or shorter, 130 seconds or shorter, 110 seconds or shorter, or 90 seconds or shorter.

[0072] The way of curing the coating film is not particularly limited and is preferably ultraviolet curing. The amount of irradiation with the energy radiation source is preferably from 50 to 500 mJ/cm² in terms of accumulative exposure at the ultraviolet wavelength of 365 nm. With the amount of irradiation of at least 50 mJ/cm², the coating film is cured more sufficiently, and the resultant resin layer (B) has a more sufficient hardness. Moreover, with the amount of

irradiation of 500 mJ/cm² or less, the resultant resin layer (B) can be prevented from being colored.

[0073] In the manner as described above, a laminate of the translucent base (A) and the resin layer (B) can be produced. This laminate may be used as the optical film of the present invention as it is, or the one obtained by attaching another layer (C) to the surface of the resin layer (B) facing away from the translucent base (A) by a pressure-sensitive adhesive layer may be used as the optical film of the present invention, for example.

[0074] [3. Optical member and image display device]

The optical member of the present invention is not particularly limited, and may be, for example, a polarizing plate. The polarizing plate is also not particularly limited, and may include, for example, an optical film of the present invention and a polarizer, or may further include other components. Each of the components of the polarizing plate may be bonded by, for example, an adhesive or a pressure-sensitive adhesive.

[0075] The image display device of the present invention is not particularly limited, and any image display device may be used, and examples thereof include a liquid crystal display device and an organic EL display device.

[0076] The image display device of the present invention may be, for example, an image display device having the optical film of the present invention on the viewing side surface, and the image display device may have a black matrix pattern.

[0077] Generally, the translucent base (A) side of the optical film of the present invention can be attached to an optical member used in LCD via a pressure-sensitive adhesive or an adhesive, for example. In order to perform the attachment, the surface of the translucent base (A) may be subjected to any of the above-mentioned surface treatments. As described above, according to the optical film production method of the present invention, the surface profile of the optical film can be freely controlled in a wide range. Therefore, the optical characteristics that can be obtained by laminating the optical film with other optical member using an adhesive, a pressure-sensitive adhesive, or the like are in a wide range corresponding to the surface profile of the optical film.

[0078] The optical member can be, for example, a polarizer or a polarizing plate, for example.

The polarizing plate is generally configured to include a transparent protective film on one or both surfaces of the polarizer. When a transparent protective film is provided on both surfaces of the polarizer, the front and back transparent protective films may be formed of the same material or different materials. Polarizing plates are generally placed on both sides of a liquid crystal cell and is placed so that the absorption axes of two polarizing plates are substantially orthogonal to

each other.

[0079] The configuration of the polarizing plate on which the optical film is laminated is not particularly limited and may be, for example, a configuration obtained by laminating a transparent protective film, the polarizer, and the transparent protective film on the optical film in this order or a configuration obtained by laminating the polarizer and the transparent protective film on the optical film in this order.

[0080] The configuration of the image display device according to the present invention is the same as that of the conventional image display device except that the optical film is disposed in a specific direction. For example, in the case of a LCD, the image display device can be produced by incorporating a driving circuit through appropriately assembling components such as a liquid crystal cell, an optical member such as a polarizing plate, and if necessary, a lighting system (backlight or the like).

[0081] However, the application of the optical film of the present invention is not particularly limited, and can be used for any other application. Examples of the applications include office automation equipment such as a PC monitor, a notebook PC, and a copy machine; portable devices such as a mobile phone, a watch, a digital camera, a personal digital assistant (PDA), and a handheld game machine; home electric appliances such as a video camera, a television set, and a microwave oven; vehicle equipment such as a back monitor, a monitor for a car-navigation system, and a car audio device, display equipment such as an information monitor for stores, security equipment such as a surveillance monitor; and nursing and medical equipment such as a monitor for nursing care and a monitor for medical use.

Examples

[0082] Next, Examples of the present invention are described together with Comparative Examples. The present invention, however, is not limited by the Examples and the Comparative Examples.

[0083] In the following Examples and Comparative Examples, the number of parts of the substance is expressed in parts by mass (parts by weight), unless otherwise specified.

[0084] Example 1

An optical film of the present invention in which a resin layer (hard coat layer) (B) is formed on a translucent base (A) was produced as follows.

[0085] As a resin contained in a hard coat layer, 40 parts by weight of an ultraviolet curable acrylate resin (trade name "M-920", produced by TOAGOSEI CO., LTD., solid content: 100%) and 60 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 3 parts by

weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.12 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 70/30) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (E1).

[0086] A transparent plastic film base (TAC, produced by KONICA MINOLTA, INC., trade name "KC2UA") was prepared as a translucent base (A). Next, the hard coat layer-forming coating liquid (E1) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer (coating). The transparent plastic film base on which this coating layer was formed was conveyed to drying (coating film-forming). Further, in the drying (coating film-forming), the coating layer was dried by heating at 80°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 240 mJ/cm² using a high-pressure mercury lamp (curing) to form a hard coat layer (resin layer (B)) having a thickness of 2.0 μm. In the manner as described above, a hard coat film (optical film) of Example 1 in which the resin layer (B) was formed on the translucent base (A) was obtained.

[0087] Example 2

An optical film of the present invention in which a resin layer (hard coat layer) (B) is formed on a translucent base (A) was produced as follows.

[0088] As a resin contained in a hard coat layer, 40 parts by weight of an ultraviolet curable acrylate resin (trade name "M-920", produced by TOAGOSEI CO., LTD., solid content: 100%) and 60 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 3 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.20 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 70/30) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (E2).

[0089] A transparent plastic film base (TAC, produced by KONICA MINOLTA, INC., trade name "KC2UA") was prepared as a translucent base (A). Next, the hard coat layer-forming coating liquid (E2) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer (coating). The transparent plastic film base on which this

coating layer was formed was conveyed to drying (coating film-forming). Further, in the drying (coating film-forming), the coating layer was dried by heating at 80°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 240 mJ/cm² using a high-pressure mercury lamp (curing) to form a hard coat layer (resin layer (B)) having a thickness of 2.0 μm. In the manner as described above, a hard coat film (optical film) of Example 2 in which the resin layer (B) was formed on the translucent base (A) was obtained.

[0090] Example 3

An optical film of the present invention in which a resin layer (hard coat layer) (B) is formed on a translucent base (A) was produced as follows.

[0091] As a resin contained in a hard coat layer, 50 parts by weight of an ultraviolet curable acrylate resin (trade name "A-DCP", produced by SHIN-NAKAMURA CHEMICAL CO, LTD., solid content: 100%) and 50 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 5 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.20 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 60/40) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (E3).

[0092] A transparent plastic film base (TAC, produced by FUJIFILM Corporation, trade name "TJ25UL") was prepared as a translucent base (A). Next, the hard coat layer-forming coating liquid (E3) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer (coating). The transparent plastic film base on which this coating layer was formed was conveyed to drying (coating film-forming). Further, in the drying (coating film-forming), the coating layer was dried by heating at 60°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 220 mJ/cm² using a high-pressure mercury lamp (curing) to form a hard coat layer (resin layer (B)) having a thickness of 2.5 μm. In the manner as described above, a hard coat film (optical film) of Example 3 in which the resin layer (B) was formed on the translucent base (A) was obtained.

[0093] Example 4

An optical film of the present invention in which a resin layer (hard coat layer) (B) is formed on a translucent base (A) was produced as follows.

[0094] As a resin contained in a hard coat layer, 50 parts by weight of an ultraviolet curable acrylate resin (trade name "A-DCP", produced by SHIN-NAKAMURA CHEMICAL CO, LTD., solid content: 100%) and 50 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 5 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.10 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 60/40) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (E4).

[0095] A transparent plastic film base (TAC, produced by FUJIFILM Corporation, trade name "TJ25UL") was prepared as a translucent base (A). Next, the hard coat layer-forming coating liquid (E4) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer (coating). The transparent plastic film base on which this coating layer was formed was conveyed to drying (coating film-forming). Further, in the drying (coating film-forming), the coating layer was dried by heating at 60°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 220 mJ/cm² using a high-pressure mercury lamp (curing) to form a hard coat layer (resin layer (B)) having a thickness of 2.5 μm. In the manner as described above, a hard coat film (optical film) of Example 4 in which the resin layer (B) was formed on the translucent base (A) was obtained.

[0096] Comparative Example 1

An optical film in which a resin layer (hard coat layer) is formed on a translucent base was produced as follows.

[0097] As a resin contained in a hard coat layer, 40 parts by weight of an ultraviolet curable acrylate resin (trade name "M-920", produced by TOAGOSEI CO., LTD., solid content: 100%) and 60 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 3 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.01 parts by weight of a leveling agent (trade name "PC4100", produced by DIC Corporation, solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 72/28) so that the solid concentration became 25% to prepare a hard coat layer-forming coating liquid (C1).

[0098] A transparent plastic film base (TAC, produced by KONICA MINOLTA, INC., trade name "KC2UA") was prepared as a translucent base. Note that this translucent base (transparent plastic film base) is the same as the translucent base (A) of Example 1. Next, the hard coat layer-forming coating liquid (C1) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer. The transparent plastic film base on which this coating layer was formed was conveyed to drying. Further, in the drying, the coating layer was dried by heating at 80°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 240 mJ/cm² using a high-pressure mercury lamp to form a hard coat layer having a thickness of 2.0 μm. In the manner as described above, a hard coat film of Comparative Example 1 in which the hard coat layer was formed on the translucent base was obtained.

[0099] Comparative Example 2

An optical film in which a resin layer (hard coat layer) is formed on a translucent base was produced as follows.

[0100] As a resin contained in a hard coat layer, 40 parts by weight of an ultraviolet curable acrylate resin (trade name "M-920", produced by TOAGOSEI CO., LTD., solid content: 100%) and 60 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 3 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF Co., Ltd.) and 0.10 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 70/30) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (C2).

[0101] A transparent plastic film base (TAC, produced by KONICA MINOLTA, INC., trade name "KC2UA") was prepared as a translucent base. Note that this translucent base (transparent plastic film base) is the same as the translucent base (A) of Example 1. Next, the hard coat layer-forming coating liquid (C2) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer. The transparent plastic film base on which this coating layer was formed was conveyed to drying. Further, in the drying, the coating layer was dried by heating at 80°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 240 mJ/cm² using a high-pressure mercury lamp to form a hard coat layer having a thickness of 2.0 μm. In the manner as described above, a hard coat film of Comparative Example 2 in which the

hard coat layer was formed on the translucent base was obtained.

[0102] Comparative Example 3

An optical film in which a resin layer (hard coat layer) is formed on a translucent base was produced as follows.

5 [0103] As a resin contained in a hard coat layer, 40 parts by weight of an ultraviolet curable acrylate resin (trade name "M-920", produced by TOAGOSEI CO., LTD., solid content: 100%) and 60 parts by weight of an ultraviolet curable acrylate resin (trade name "UV-1700TL", produced by Mitsubishi Chemical Corporation., solid content: 80%) were prepared. 3 parts by weight of a photopolymerization initiator (trade name "OMNIRAD907", produced by BASF
10 Co., Ltd.) and 0.50 parts by weight of a leveling agent (trade name "LE-303", produced by KYOEISHA CHEMICAL Co., LTD., solid content: 40%) were mixed per 100 parts by weight of the resin solid content of the resin. This mixture was diluted with a MIBK/cyclopentanone mixed solvent (weight ratio: 70/30) so that the solid concentration became 30% to prepare a hard coat layer-forming coating liquid (C3).

15 [0104] A transparent plastic film base (TAC, produced by KONICA MINOLTA, INC., trade name "KC2UA") was prepared as a translucent base. Note that this translucent base (transparent plastic film base) is the same as the translucent base (A) of Example 1. Next, the hard coat layer-forming coating liquid (C3) was applied (coated) on one surface of the transparent plastic film base using a bar coater to form a coating layer. The transparent plastic film base on which this
20 coating layer was formed was conveyed to drying. Further, in the drying, the coating layer was dried by heating at 80°C for 1 minute to form a coating film. Thereafter, the coating film was cured by being irradiated with ultraviolet rays having an accumulated light amount of 240 mJ/cm² using a high-pressure mercury lamp to form a hard coat layer having a thickness of 2.0 μm. In the manner as described above, a hard coat film of Comparative Example 3 in which the
25 hard coat layer was formed on the translucent base was obtained.

[0105] [Measurement of ratio of number of silicon atoms]

With respect to the optical film (hard coat film) of each of Examples and Comparative Examples, the ratio of the number of silicon atoms to the sum of the number of atoms of carbon, nitrogen, oxygen, and silicon in the resin layer (B) or the resin layer of Comparative Example at
30 a depth of 1 nm from the surface facing away from the translucent base (A) or the translucent base of Comparative Example was measured by the XPS measurement according to the following measurement method.

(XPS measurement)

The ratio of the number of silicon (Si) atoms in the hard coat resin layer in the hard coat

film of Examples and Comparative Examples at a depth of 1 nm range from the surface facing away from the translucent base was measured by XPS (X-ray Photoelectron Spectroscopy). XPS is also called ESCA (Electron Spectroscopy for Chemical Analysis). As a measurement condition, a hard coat film as a measurement sample was cut out into 5 mm × 5 mm square, and then fixed to a sample stage with a Mo (molybdenum) plate, and measured under the conditions shown below. Specifically, first, the measurement sample was subjected to wide scan measurement under the following measurement conditions to perform a qualitative analysis. Further, a narrow scan measurement was performed on C (carbon), N (nitrogen), O (oxygen), and Si (silicon), and F (fluorine) at a depth of 1 nm, and a ratio (%) of Si (silicon) atoms was calculated with the total number of all atoms of C (carbon), N (nitrogen), O (oxygen), Si (silicon), and F (fluorine) being set to 100%.

XPS measurement conditions:

Measurement sample: hard coat film 5 mm × 5 mm square

Apparatus; Quantera SXM produced by ULVAC-PHI

X-Ray Source; Monochrome Al Ka.

Xray Setting; 200 μmφ [15kV, 30W]

Optoelectronic extraction angle; 10 degrees to the sample surface (analysis depth: 1 nm)

Binding energy correction; correction of C-C bond-derived peak in C1s spectrum to 285.0 eV

[0106] [Check of cissing]

The hard coat films (optical films) of Examples and Comparative Examples were cut into 440 mm×1000 mm squares to obtain measurement samples. Whether these measurement samples cause cissing (display unevenness) was checked by the following measurement methods: orange light reflection test, Z light reflection test, point light source transmission test, and fiber light reflection test. As a result, the optical film causing no cissing in all of the following measurement methods was determined to be "causing no cissing", and the optical film causing cissing in one or more measurement methods was determined to be "causing cissing".

[0107] <Cissing check method: orange light reflection test>

The hard coat coating surface of the hard coat film (the surface on the side at which the resin layer (B) was formed on the translucent base (A) or the surface on the side at which the resin layer was formed on the translucent base of the Comparative Examples; the same applies hereinafter), which was a measurement sample, was irradiated with orange light (model number "FNA-35", produced by Funatech Co. Ltd.) in parallel from a position 300 mm away therefrom. Then, the hard coat coating surface was checked from the position 300 mm away from the center

of the hard coat coating surface at an angle of 45 degrees from the measurement sample, and the sample in which the cissing (display unevenness) was visible was determined to be "causing cissing" and the sample in which the cissing was not visible was determined to be "causing no cissing".

5 [0108] <Cissing check method: Z light reflection test>

The hard coat coating surface of the hard coat film, which was a measurement sample, was irradiated with Z-light (model number "Z-208", produced by YAMADA DENKI CO., LTD.) from a position 400 mm away therefrom at an angle of 45 degrees. Then, the hard coat coating surface was checked from the position 300 mm away from the center of the hard coat coating surface at an angle of 45 degrees from the measurement sample (90 degrees from the light source), and the sample in which the cissing (display unevenness) was visible was determined to be "causing cissing" and the sample in which the cissing was not visible was determined to be "causing no cissing".

[0109] <Cissing check method: point light source transmission test>

15 The hard coat coating surface of the hard coat film, which was a measurement sample, was irradiated with a point light source (model number "L8425-01", produced by Hamamatsu Photonics Co., Ltd.) from a position 560 mm away from the center of the hard coat coating surface at an angle of 45 degrees. The transmitted light of the irradiation light transmitted through the measurement sample was projected on a white board provided at a position 1050 mm away from the point light source. That is, the light irradiation and the transmitted light projection were performed in a state where the measurement sample was sandwiched between the point light source and the white board. The transmitted light projected on the whiteboard was visually checked under this condition, and the sample in which the cissing (display unevenness) was visible was determined to be "causing cissing" and the sample in which the cissing was not visible was determined to be "causing no cissing".

25 [0110] <Cissing check method: fiber light reflection test>

The hard coat coating surface of the hard coat film, which was a measurement sample, was irradiated with fiber light (model number: "INS-1303-103" (custom), produced by Meck Corporation) from a position 400 mm away from the center of the hard coat coating surface at an angle of 45 degrees. Then, the hard coat coating surface was checked from the position 300 mm away from the center of the hard coat coating surface at an angle of 45 degrees from the measurement sample (90 degrees from the light source), and the sample in which the cissing (display unevenness) was visible was determined to be "causing cissing" and the sample in which the cissing was not visible was determined to be "causing no cissing".

[0111] [Production of hard coat film (optical film) having another layer (C)]

A surface protective film with a pressure-sensitive adhesive "E-MASK (trade name)" produced by Nitto Denko Corporation, as another layer (C) and a pressure-sensitive adhesive layer, was attached to the hard coat film (optical film) of each of Examples and Comparative
5 Examples to produce the hard coat film (optical film) having another layer (C). Three kinds of the surface protective films "E-MASK (trade name)" were produced as follows: (1), (2), and (3). As for each of the hard coat films (optical films) of the Examples and Comparative Examples, three kinds of hard coat films (optical films) having another layer (C) corresponding to the following "E-MASKs (trade name)" (1) (2) (3) were produced. Note that, as for the measurement
10 of the characteristics of the "ring mark", "contamination", and "stop mark" to be described below, the same measurement results were obtained for any of the three kinds of hard coat films corresponding to the "E-MASKs (trade name)" (1) (2) (3) described below.

[0112] [Production method of E-MASK (1)]

An E-MASK (1) was produced in the following manner.

15 [0113] (Production of coating agent)

A dispersion containing 25% of polyester resin (trade name "Binarol MD-1480", produced by Toyobo Co., Ltd.) (aqueous dispersion of saturated copolymerized polyester resin) (binder dispersion)) was prepared as a binder. Further, an aqueous dispersion (sliding agent dispersion) of carnauba wax (wax ester) as a sliding agent was prepared. Further, an aqueous
20 solution (trade name "Baytron P", produced by H.C.Starck GmbH) (conductive polymer aqueous solution) containing 0.5% of poly(3,4-dioxythiophene) (PEDOT) as a conductive polymer and 0.8% of polystyrene sulfonate (number-average molecular weight 150,000) (PSS) was prepared.

[0114] To a mixed solvent obtained by mixing water and ethanol in a mass ratio of 1:1, 100 parts of the binder dispersion in a solid content, 30 parts of the sliding agent dispersion in a solid
25 content, 50 parts of the conductive polymer aqueous solution in a solid content, and a melamine-based crosslinking agent were added, and the mixture was stirred for about 20 minutes to mix sufficiently. In this manner, a coating agent of about 0.15% NV was produced.

[0115] (Formation of topcoat layer)

A transparent polyethylene terephthalate (PET) film having a thickness of 38 μm , a
30 width of 30 cm, and a length of 40 cm, one surface (first surface) of which was subjected to corona treatment, was prepared. The coating agent was applied to the corona-treated surface of the PET film with a bar coater and heated to 130°C for 2 minutes to dry. In this manner, a base (a base with a topcoat) having a transparent topcoat layer having a thickness of 10 nm on the first surface of the PET film was produced.

[0116] (Production of pressure-sensitive adhesive composition)

To a 4 necked flask equipped with a stirring blade, a thermometer, a nitrogen gas introduction pipe, and a condenser, 200 parts by weight of 2-ethylhexylacrylate, 8 parts by weight of 2-hydroxyethylacrylate, 0.4 parts by weight of 2,2'-azobisisobutyronitrile as a polymerization initiator, and 312 parts by weight of ethyl acetate as a solvent were charged, and nitrogen gas was introduced while being gently stirred, and a polymerization reaction was carried out while keeping the liquid temperature in the flask at around 65°C for 6 hours to produce an acrylic polymer solution (40% by weight). The acrylic polymer had a weight average molecular weight of 540,000, a glass transition temperature (Tg) of -68°C, and an acid value of 0.0.

[0117] The acrylic polymer solution (40% by weight) was diluted with ethyl acetate to 20% by weight. Then, relative to 100% by weight of the solid content in this solution, 0.3 parts by weight of polyoxyethylene nonylpropenylphenyl ether ammonium sulfate (trade name "Aqualon HS-10", manufactured by DKS Co., Ltd.), which is an anionic surfactant, 3 parts by weight of isocyanurate of hexamethylenediisocyanate (trade name "CORONATE HX", produced by Nippon Polyurethane Industry Co., Ltd.) as a crosslinking agent, and 0.03 parts by weight of dilubutyltin dilaurate (trade name "OL-1", produced by Tokyo Fine Chemical CO., LTD., 0.5% by weight of ethyl acetate solution) as a crosslinking catalyst were added, and 3 parts by weight of acetylacetone as a crosslinking retardant was added relative to the total amount of the solvent, and the mixture was stirred, thereby producing an acrylic pressure-sensitive adhesive composition.

[0118] [Production of E-MASK (1)]

A release sheet, in which one side of a PET film was subjected to a release treatment with a silicone-based release treatment agent, was provided. The acrylic pressure-sensitive adhesive composition was coated on a release surface (a surface subjected to the release treatment) of this release sheet, and dried at 130°C for 1 minute to form an acrylic pressure-sensitive adhesive layer (pressure-sensitive adhesive layer) having a thickness of 10 µm. The acrylic pressure-sensitive adhesive layer was bonded to the other surface of the base with the topcoat (the second surface on which the topcoat layer is provided), and then cured (aged) for 3 days at 50°C and 15% RH, thereby obtaining an E-MASK (1) which is a surface protective film (pressure-sensitive adhesive sheet). This surface protective film (E-MASK (1)) has the base with the topcoat as another layer (C), and has the acrylic pressure-sensitive adhesive layer as the pressure-sensitive adhesive layer.

[0119] [Production method of E-MASK (2)]

A surface protective film (E-MASK (2)) was produced by the same production method as that of the E-MASK (1), except that the thickness of the acrylic pressure-sensitive adhesive layer (pressure-sensitive adhesive layer) was changed from 10 μm to 20 μm . This surface protective film (E-MASK (2)) has the base with the topcoat as another layer (C), and has the acrylic pressure-sensitive adhesive layer as the pressure-sensitive adhesive layer

[0120] [Production method of E-MASK (3)]

An E-MASK (3) was produced in the following manner.

[0121] (Production of (meta)acrylic polymer)

To a 4 necked flask equipped with a stirring blade, a thermometer, a nitrogen gas introduction pipe, and a condenser, 100 parts by weight of 2-ethylhexylacrylate (2EHA), 10 parts by weight of 4-hydroxybutylacrylate (4HBA), 0.02 parts by weight of acrylic acid (AA), 0.2 parts by weight of 2,2'-azobisisobutyronitrile as a polymerization initiator, and 157 parts by weight of ethyl acetate were charged, and nitrogen gas was introduced while being gently stirred, and a polymerization reaction was carried out while keeping the liquid temperature in the flask at around 65°C for 6 hours to produce a (meta)acrylic polymer solution (40% by weight). The acrylic polymer had a weight average molecular weight of 540,000 and a glass transition temperature (T_g) of -67°C.

[0122] (Production of acrylic oligomer)

To a 4 necked flask equipped with a stirring blade, a thermometer, a nitrogen gas introduction pipe, a condenser, and a dropping funnel, 100 parts by weight of toluene, 60 parts by weight of dicyclopentanyl methacrylate (DCPMA) (trade name: FA-513M, produced by Hitachi Chemical Company, Ltd.), 40 parts by weight of methyl methacrylate (MMA), and 3.5 parts by weight of methyl thioglycolate as a chain transfer agent were charged. Then, the mixture was stirred for 1 hour under a nitrogen atmosphere at 70°C, 0.2 parts by weight of 2,2'-azobisisobutyronitrile as a polymerization initiator was charged, and the mixture was reacted at 70°C for 2 hours, followed by reaction at 80°C for 4 hours, and then reacted at 90°C for 1 hour to obtain an acrylic oligomer. The weight average molecular weight of the acrylic oligomer was 4,000 and the glass transition temperature (T_g) was 144 °C.

[0123] (Production of pressure-sensitive adhesive solution)

The (meta)acrylic polymer solution (40% by weight) was diluted with ethyl acetate to 20% by weight. Then, relative to 500% by weight (100% by weight in the solid content) of this solution, the acrylic oligomer (solid content: 0.5 parts by weight), 2 parts by weight (solid content: 0.2 parts by weight) of a solution obtained by diluting an organopolysiloxane having an oxyalkylene chain (KF-353, produced by Shin-Etsu Chemical Co., Ltd.), which is a silicone component, with ethyl acetate to 10%, 15 parts by weight (solid content: 0.15 parts by weight) of a solution obtained by diluting lithium

bis(trifluoromethanesulfonyl)imide ($\text{LiN}(\text{CF}_3\text{SO}_2)_2$: LiTFSI, produced by Tokyo Kasei Kogyo Co., Ltd.) as an alkali metal salt (ionic compound), which is an antistatic agent, with ethyl acetate to 1%, 3.5 parts by weight (solid content: 3.5 parts by weight) of isocyanurate of hexamethylene diisocyanate (coronate HX, Nippon Polyurethane Industry Co., Ltd.), which is a trifunctional isocyanate compound, as a crosslinking agent, 0.3 parts by weight (solid content: 0.3 parts by weight) of 1,3-bis(isocyanatomethyl)cyclohexane (Takenate 600, produced by Mitsui Chemicals, Inc.), which is a bifunctional isocyanate compound, and 2 parts by weight (solid content: 0.02 parts by weight) of dibutyltin dilaurate (1% by weight ethyl acetate solution) as a crosslinking catalyst were added, and the mixture was stirred, thereby producing an acrylic adhesive solution.

[0124] (Production of antistatic film)

10 parts by weight of an antistatic agent (MICRO-SOLVER RMD-142, produced by SOLVEX INC., containing tin oxide and polyester resin as main components) was diluted with a mixed solvent consisting of 30 parts by weight of water and 70 parts by weight of methanol to produce an antistatic agent solution.

[0125] The obtained antistatic agent solution was applied to a polyethylene terephthalate (PET) film (thickness: 38 μm) using a bar coater, and the solvent was removed by drying at 130°C for 1 minute to form an antistatic layer (thickness: 0.2 μm), thereby producing an antistatic film.

[0126] [Production method of E-MASK (3)]

The acrylic pressure-sensitive adhesive solution was applied to the surface of the antistatic film opposite to the antistatic-treated surface, and heated at 130°C for 2 minutes to form a pressure-sensitive adhesive layer having a thickness of 15 μm . Then, the silicone-treated surface of a polyethylene terephthalate film (thickness: 25 μm), one surface of which was subjected to silicone treatment, was bonded to the surface of the pressure-sensitive adhesive layer to obtain an E-MASK (3) which is a surface protective film (pressure-sensitive adhesive sheet). This surface protective film (E-MASK (3)) has the antistatic film as another layer (C), and has the acrylic pressure-sensitive adhesive layer as the pressure-sensitive adhesive layer.

[0127] [Measure of water contact angle]

The water contact angle θ_2 of the surface of the pressure-sensitive adhesive layer of the hard coat film (optical film) having another layer (C) produced in the manner as described above was measured by the following measuring method. That is, first, a hard coat film (optical film) having another layer (C) was allowed to stand for 24 hours at room temperature ($24 \pm 2^\circ\text{C}$) and relative humidity ($50 \pm 20\%$), and then another layer (C) was peeled off to expose the pressure-sensitive adhesive layer. Next, using a water contact angle measuring device (trade name "DM-301", produced by Kyowa Interface Science Co., Ltd.), about 4.0 μL of water was dropped on the surface of the pressure-sensitive adhesive layer to which another layer (C) was attached at

room temperature ($24 \pm 2^\circ\text{C}$) and relative humidity ($50 \pm 20\%$) by a droplet method, and the angle between the surface of the adherend and the tangent line to the end of the dropped water droplet 1 second after the dropping was measured to obtain a water contact angle ($^\circ$). Further, the same measurement was carried out at five points in the measurement samples, and the average value of the measurement values at the five points was defined as the water contact angle d_2 ($^\circ$) of the surface of the pressure-sensitive adhesive layer.

[0128] Further, in the same manner, the water contact angle d_1 ($^\circ$) of the surface of the resin layer (B) in the optical films (hard coat films) of the Examples and Comparative Examples, in which the pressure-sensitive adhesive layer and another layer (C) were not formed on the surface of the resin layer (B), was measured.

[0129] The measurement results of the water contact angles d_1 and d_2 are shown in Tables 1 to 6 below. As shown in Tables 1 to 6 below, the water contact angle d_2 of the surface of the pressure-sensitive adhesive layer was 90% or less (10% or more reduction) of the water contact angle d_1 of the surface of the resin layer (B) regardless of the use of any of E-MASK (1), E-MASK (2), and E-MASK (3).

[0130] [Table 1]

Water contact angles d_1 ($^\circ$) and d_2 ($^\circ$) of Example 1

d_1 ($^\circ$)	d_2 ($^\circ$)		
	E-MASK (1)	E-MASK (2)	E-MASK (3)
86.8	70.8	67.8	71.2

[0131] [Table 2]

Water contact angles d_1 ($^\circ$) and d_2 ($^\circ$) of Example 2

d_1 ($^\circ$)	d_2 ($^\circ$)		
	E-MASK (1)	E-MASK (2)	E-MASK (3)
89.1	72.7	68.9	72.7

[0132] [Table 3]

Water contact angles d_1 ($^\circ$) and d_2 ($^\circ$) of Example 3

d_1 ($^\circ$)	d_2 ($^\circ$)		
	E-MASK (1)	E-MASK (2)	E-MASK (3)
91.7	80.3	79.2	74.8

[0133] [Table 4]

Water contact angles d_1 ($^\circ$) and d_2 ($^\circ$) of Example 4

d_1 ($^\circ$)	d_2 ($^\circ$)
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d ₁ (°)	E-MASK (1)	E-MASK (2)	E-MASK (3)
91.3	77.6	74.7	75.5

[0134] [Table 5]

Water contact angles d₁(°) and d₂(°) of Comparative Example 2

d ₁ (°)	d ₂ (°)		
	E-MASK (1)	E-MASK (2)	E-MASK (3)
85.7	69.6	65.9	70.7

[0135] [Table 6]

Water contact angles d₁(°) and d₂(°) of Comparative Example 3

d ₁ (°)	d ₂ (°)		
	E-MASK (1)	E-MASK (2)	E-MASK (3)
90.4	76.6	76.2	75.2

5

[0136] [Product SPV test]

With respect to the hard coat film (optical film) having another layer (C) produced as described above, the characteristics of the "ring mark", "contamination", and "stop mark" were measured and evaluated by the following measurement methods. These measurements and evaluations are collectively referred to as a "product SPV test" in the present example.

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[0137] <Ring mark: evaluation method>

The hard coat film (optical film) having another layer (C) was cut into 40 mm×40 mm square to obtain a measurement sample. The translucent base side of this measurement sample was attached to an acrylic plate with a pressure-sensitive adhesive, and then the protective film (another layer (C)) of the measurement sample was once peeled off and reattached with bubbles. This was allowed to stand for a predetermined time (120 hours or 240 hours) at room temperature (24 ± 2°C) and relative humidity (50 ± 20%), and then the protective film was peeled off. Thereafter, whether marks of bubbles were visible was checked.

15

<Ring mark: evaluation criteria>

After leaving for 240 hours, when the ring mark was not visible even outside the dark room, it was determined to be "good", and when the ring mark was visible under the same condition, it was determined to be "poor".

20

[0138] <Contamination: evaluation method>

The hard coat film (optical film) having another layer (C) was cut into 40 mm × 40 mm square to obtain a measurement sample. The translucent base side of this measurement sample was attached to an acrylic plate with a pressure-sensitive adhesive, and charged into an oven at a

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predetermined condition (60°C, 60°C/humidity 90%). As the oven, a thermostat (trade name: PH(H)-202, produced by ESPEC CORP.) or a low temperature thermostat (trade name: PL-2J, produced by ESPEC CORP.) was used. Thereafter, the measurement sample was taken out at a predetermined time (120 hours, 240 hours, or 500 hours) and the protective film (another layer (C)) of the measurement sample was peeled off. The adhesive tape (trade name: "Cellulose Tape Large CT405AP-24", produced by NICHIBAN CO.,LTD.) was attached to the surface of the pressure-sensitive adhesive layer after peeling, and then contamination was visually checked.

<Contamination: evaluation criteria>

After leaving for 500 hours, when the contamination was not visible even outside the dark room, it was determined to be "good", and when the contamination was visible under the same conditions, it was determined to be "poor".

[0139] <Stop mark: evaluation method>

The hard coat film (optical film) having another layer (C) was cut into 25 mm × 100 mm square to obtain a measurement sample. The translucent base side of this measurement sample was attached to an acrylic plate with a pressure-sensitive adhesive, and charged into an oven at a predetermined condition (60°C, 40°C/humidity 92%). As the oven, a thermostat (trade name: PH(H)-202, produced by ESPEC CORP.) or a low temperature thermostat (trade name: PL-2J, produced by ESPEC CORP.) was used. Thereafter, the measurement sample was taken out at a predetermined time (120 hours), and peeling was once stopped when half of the protective film (another layer (C)) of the measurement sample was peeled off, and then the remaining protective film was peeled off. Whether a stop mark (mark of the protective film) was visible was visually checked.

<Stop mark: evaluation criteria >

After leaving for 120 hours, when the stop mark was not visible even outside the dark room, it was determined to be "good", and when the stop mark was visible under the same condition, it was determined to be "poor".

[0140] The silicon atom ratio (Si element ratio) measured as described above, whether to cause cissing, and the results of the product SPV test are summarized in Table 7 below. In Table 7 below, "Si element ratio at 1 nm of HC surface" means a ratio of the number of silicon atoms relative to the sum of the number of atoms of carbon, nitrogen, oxygen, and silicon in the resin layer (B) or the resin layer of Comparative Example at a depth of 1 nm from the surface facing away from the translucent base (A) or the translucent base of Comparative Example.

[0141] [Table 7]

	Comp. Ex. 1	Comp. Ex. 2	Ex. 4	Ex. 1	Ex. 3	Ex. 2	Comp. Ex. 3
Surface modifier type/parts by weight	PC4100 /0.01 parts	LE-303 /0.10 parts	LE-303 /0.10 parts	LE-303 /0.12 parts	LE-303 /0.20 parts	LE-303 /0.20 parts	LE-303 /0.50 parts
Si element ratio at 1 nm of HC surface	1.2%	4.7%	5.2%	5.4%	6.2%	8.5%	9.2%
Cissing	Causing multiple cissing	Causing cissing	Causing no cissing	Causing no cissing	Causing no cissing	Causing no cissing	Causing no cissing
Product SPV test	Ring mark	Good	Good	Good	Good	Good	Poor
	Contamination	Good	Good	Good	Good	Good	Poor
	Stop mark	Good	Good	Good	Good	Good	Poor

[0142] As shown in Table 7, the optical films of Examples satisfying all the requirements of the present invention caused no cissing, and are good in all of the product SPV test results, which showed that the display property defect was suppressed. On the other hand, the Si element ratio was 4.7% in Comparative Example 2, which did not satisfy the condition (5.0 to 9.0%) of the present invention. As a result, although the optical film of Comparative Example 2 was good in the product SPV test result, it caused cissing. Furthermore, the Si element ratio was 9.2% in Comparative Example 3, which did not satisfy the condition (5.0 to 9.0%) of the present invention. As a result, although the optical film caused no cissing, it was poor in the product SPV test result. Furthermore, the Si element ratio of the optical film of Comparative Example 1 was 1.2%, which deviated greatly from the condition (5.0 to 9.0%) of the present invention. As a result, the optical film of Comparative Example 1 caused multiple cissing. Therefore, it was obvious that the optical film of Comparative Example 1 could not withstand practical use without a need for checking the result of the product SPV test, and therefore, the product SPV test was not performed.

Industrial Applicability

[0143] As described above, according to the present invention, it is possible to provide an optical film suppressed or prevented from a display property defect, a method for producing the optical film, an optical member, and an image display device. The application of the optical film of the present invention is not particularly limited, and can be used, for example, for an image display device of any of various uses.

Reference Signs List

[0144]

10, 10': optical film

11: translucent base (A)

12: resin layer (B)

12a: resin layer-forming resin

12b: particle

12c: thixotropy-imparting agent

13: pressure-sensitive adhesive layer

20: another layer (C)

CLAIMS

1. An optical film comprising:
a translucent base (A); and
5 a resin layer (B), wherein
the resin layer (B) is formed on the translucent base (A),
elements constituting the resin layer (B) include silicon, and
the number of atoms in the resin layer (B) at a depth of 1 nm from a surface facing away
from the translucent base (A) satisfies the following equation (1):

10
$$5.0 \leq [(n_{\text{Si}}/n_{\text{total}}) \times 100] \leq 9.0 \quad (1)$$

where in the equation (1), n_{total} represents a sum of the number of atoms of carbon, nitrogen, oxygen, and silicon, and n_{Si} represents the number of silicon atoms.

- 15
2. The optical film according to claim 1, wherein
the resin layer (B) has a thickness from 1.0 to 5.0 μm .
3. The optical film according to claim 1 or 2, wherein
20 the resin layer (B) comprises a surface modifier, and
elements constituting the surface modifier include silicon.
4. The optical film according to claim 3, wherein
the surface modifier comprises a silicon compound having a dimethylsiloxane skeleton.
- 25
5. The optical film according to any one of claims 1 to 4, wherein
the resin layer (B) is formed of a copolymer of an oligomer having a functional group
and a monomer.
- 30
6. The optical film according to any one of claims 1 to 5, wherein
the resin layer (B) is a hard coat layer.
7. The optical film according to any one of claims 1 to 6, wherein
another layer (C) is attached to the surface of the resin layer (B) facing away from the

translucent base (A) by a pressure-sensitive adhesive layer.

8. The optical film according to claim 7, wherein
the pressure-sensitive adhesive layer satisfies the condition of the following equation

5 (2):

$$(d_1 - d_2) / d_1 \geq 0.10 \quad (2)$$

10 where in the equation (2), d_1 represents a water contact angle ($^{\circ}$) of the surface of the resin layer (B) in a case where the pressure-sensitive adhesive layer and the another layer (C) are not formed thereon, and d_2 represents a water contact angle ($^{\circ}$) of a surface of the pressure-sensitive adhesive layer after the another layer (C) is peeled from the pressure-sensitive adhesive layer.

- 15 9. The optical film according to claim 7 or 8, wherein
the another layer (C) is a glass or a resin film.

10. A method for producing the optical film according to any one of claims 1 to 9,
comprising the step of:

20 forming a resin layer (B) on a translucent base (A) so that the resin layer (B) satisfies
the equation (1), wherein

the resin layer (B)-forming comprises the steps of:

coating a resin layer-forming coating liquid on the translucent base (A); and

drying the coated resin layer-forming coating liquid to form a coating film, and

25 the resin layer-forming coating liquid comprises a resin, a silicon element-containing
additive, and a diluting solvent.

11. The method according to claim 10, wherein
the resin layer (B)-forming further comprises the step of:

30 curing the coating film.

12. The method according to claim 10 or 11, wherein
the optical film is the optical film according to claim 3 or 4, and
the silicon element-containing additive is the surface modifier.

13. The method according to any one of claims 10 to 12, wherein
the diluting solvent includes MIBK (methyl isobutyl ketone) and cyclopentanone.
- 5 14. An optical member comprising the optical film according to any one of claims 1 to 9.
15. The optical member according to claim 14, which is a polarizing plate.
16. An image display device comprising:
10 the optical film according to any one of claims 1 to 9; or
the optical member according to claim 14 or 15.