

DESCRIPTION

TITLE OF THE INVENTION: COMPOSITION FOR OPTICAL MEMBER,
OPTICAL MEMBER AND IMAGE DISPLAY DEVICE

TECHNICAL FIELD

[0001]

The present invention relates to a composition for optical members and an optical member, formed using the composition for optical members. The present invention also relates to an image display device using the composition for optical members.

[0002]

An optical member to which the present invention is applied is a member used for various optical purposes, and is, for example, an optical film itself, a pressure-sensitive adhesive layer or adhesive layer for optical films, a surface treatment layer laid on an optical film, or a function layer laid on an optical film. Examples of the optical film include a polarizing film, a polarizer, a transparent protective film for polarizers, a retardation film, a light diffusion film, a brightness enhancement film, a lenticular film, a cover window film (front surface plate), a scattering preventing film, and a decorative printed film. The optical film is usable as an optical laminate including a polarizer and a retardation film.

Examples of the surface treatment layer include a hard coat layer, an anti-glare layer, an anti-reflection layer, and a refractive index adjusting layer. Examples of the function layer include an adhesion facilitating layer, an antistatic layer, a blocking preventing layer, an oligomer preventing layer and a barrier layer. In a transparent conductive film having a transparent substrate film and a transparent conductive layer, the above-mentioned optical member is usable as the transparent substrate film, or an intermediate layer between the transparent substrate film and the transparent conductive layer. Examples of the intermediate layer include a refractive index adjusting layer, an adhesion facilitating layer, a hard coat layer, and a crack preventing layer. These optical members can be configured to form an image display device such as a liquid crystal display device (LCD) or an organic EL (electroluminescence) display device (OLED).

BACKGROUND ART

[0003]

In recent years, an optical member has been used in various fields, and has widely been used as, for example, a constituent member of an image display device. An image display device has come to be widely used for various application such as a portable telephone, a car navigation

system, a monitor for personal computers, and a television set. As an optical member used in a case where the image display device is an organic EL display device, a circularly polarizing film (for example, a laminate composed of a polarizing film and a quarter wavelength plate) is arranged on a viewing side surface of an organic EL panel of this device in order to restrain this surface from being viewed like a mirror plane in the state that external light is reflected on a metal electrode (negative electrode) of the device. About the circularly polarizing film laminated on the viewing side surface of the organic EL panel, for example, a decorative panel may be laminated thereon as an optical member. Moreover, a transparent conductive film is used as a transparent electrode film to be configured to form, for example, a touch panel. The circularly polarizing film, the decorative film or some other constituent member of an organic EL display device, or a transparent electrode film or the like is usually laminated through a joining material such as a pressure-sensitive adhesive layer or an adhesive layer as an optical member.

[0004]

In an image display device such as an organic electroluminescent display device, ultraviolet rays radiated thereinto may deteriorate constituent members and

others inside the image display device. Thus, it is known to lay therein a layer containing an ultraviolet absorbent to suppress the deterioration by effect of the ultraviolet rays. Specifically, known is, for example, a transparent double-sided pressure-sensitive-adhesive sheet, for image display device, having at least one ultraviolet absorbing layer, about this sheet the transmittance of a light ray having a wavelength of 380 nm being 30% or less, and the transmittance of visible light each having a wavelength longer than a wavelength of 430 nm being 80% or more (see, for example, Patent Document 1); or a pressure-sensitive adhesive sheet having a pressure-sensitive-adhesive layer containing an acryl-based polymer and a triazine-based ultraviolet absorbent (see, for example, Patent Document 2).

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0005]

Patent Document 1: JP-A-2012-211305

Patent Document 2: JP-A-2013-75978

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006]

The pressure-sensitive adhesive sheet described in each of Patent Documents 1 and 2 is a sheet about which the transmittance of a light having a wavelength of 380 nm is controllable. However, when this pressure-sensitive adhesive sheet is used in an organic electroluminescent display device, its electroluminescent element may be unfavorably deteriorated by a long-term use of the device. Thus, the pressure-sensitive adhesive sheet is not a sufficient pressure-sensitive adhesive sheet. This drawback would be as follows: the pressure-sensitive adhesive sheet described in each of Patent Documents 1 and 2 can absorb the light, the wavelength of which is 380 nm; however, the sheet does not sufficiently absorb light in a wavelength range (from 380 nm to 430 nm) shorter in wavelength than a light emitting range (of wavelength longer than 430 nm) of the organic electroluminescent element, so that the transmitted light unfavorably deteriorate the organic electroluminescent element.

[0007]

It is therefore necessary for suppressing the deterioration of the organic electroluminescent element to, in an organic element display device, use a layer which suppresses transmission of light in a wavelength range (from 380 nm to 430 nm) shorter in wavelength than a light emitting range (of wavelength longer than 430 nm) of such

an organic electroluminescent element, which ensures the transmittance of visible light within the light emitting range of the organic electroluminescent element, and which has high transparency. Moreover, image display devices are also required to have endurance under severe environmental conditions since the devices are used in a high-temperature and high-humidity environment.

[0008]

An object of the present invention is to provide a composition for optical members which can form an optical member having the following advantages when this member is applied to an image display device: the optical member can restrain its display element from being deteriorated, and is high in transparency and also excellent in endurance under severe environmental conditions.

[0009]

Another object of the present invention is to provide an optical member formed using the composition, and an image display device using the optical member.

MEANS FOR SOLVING THE PROBLEMS

[0010]

In order to solve the above-mentioned problems, the inventors have repeatedly made eager investigations to find out a composition for optical members described below, and

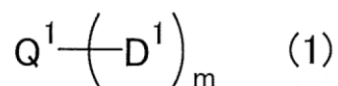
then have achieved the present invention.

[0011]

The present invention relates to a composition for optical members, comprising a base polymer, and a compound represented by general formula (1).

[0012]

[Formula 1]



[0013]

In the general formula (1),

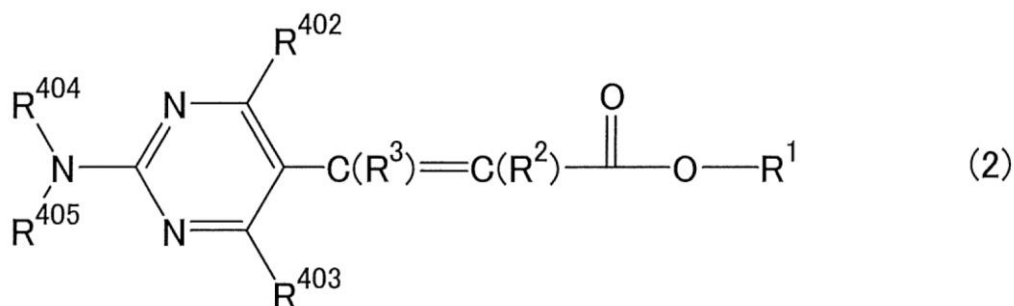
m represents an integer of 1 to 6;

Q¹ represents a hydrogen atom when m is 1, and represents a bivalent to hexavalent linking group when m is from 2 to 6; and

D¹ represents a group in which one hydrogen atom has left a compound represented by general formula (2), and when m is from 2 to 6, a plurality of D¹s may be wholly the same, or different from each other.

[0014]

[Formula 2]



[0015]

In the general formula (2), R¹ represents a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent, R² represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, -C(O)-R⁷ or -SO₂-R⁸ wherein R⁷ represents a hydroxyl group or -OR⁷¹, and R⁸ represents a halogen atom, a hydroxyl group, -OR⁸¹, -NR⁸²R⁸³, or -R⁸⁴ wherein R⁷¹ and R⁸¹ to R⁸⁴ may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent;

R³ represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent;

R⁴⁰² and R⁴⁰³ may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group optionally having a substituent, an aryl group optionally having a substituent, -NR⁴⁰⁶R⁴⁰⁷, -OR⁴⁰⁸, a cyano group, -

C(O)R⁴⁰⁹, -O-C(O)R⁴¹⁰, or -C(O)OR⁴¹¹, and

R⁴⁰⁴ to R⁴¹¹ may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent, and R⁴⁰⁴, R⁴⁰⁵, and a nitrogen atom to which R⁴⁰⁴ and R⁴⁰⁵ are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

[0016]

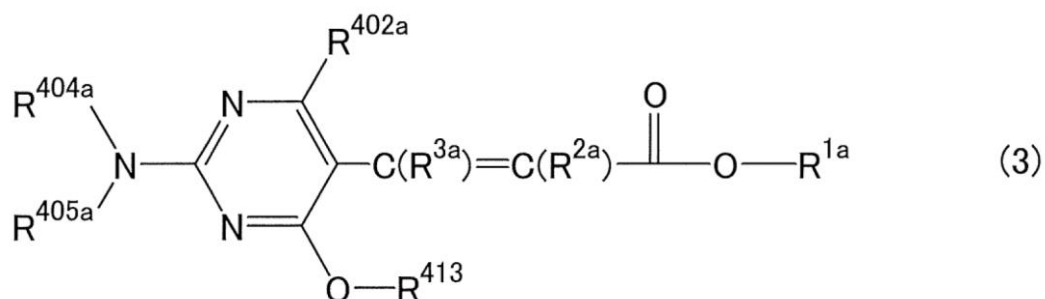
In the present invention, m in the general formula (1) is preferably 1 or 2.

[0017]

In the composition for optical members of the present invention, the compound represented by the general formula (1) is preferably a compound represented by general formula (3).

[0018]

[Formula 3]



[0019]

In the general formula (3), R^{1a} represents a hydrogen

atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{2a} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, -C(O)-R^{7a} or -SO₂-R^{8a} wherein R^{7a} represents a hydroxyl group or -OR^{71a}, and R^{8a} represents a halogen atom, a hydroxyl group, -OR^{81a}, -NR^{82a}R^{83a} or -R^{84a} wherein R^{71a} and R^{81a} to R^{84a} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3a} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

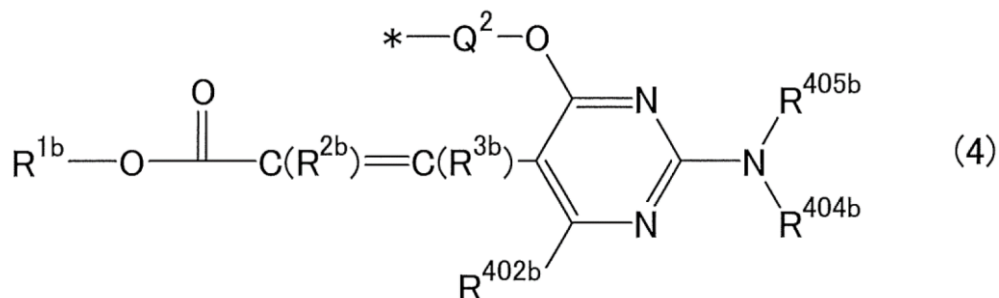
R^{402a} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, -NR^{406a}R^{407a}, -OR^{408a}, a cyano group, -C(O)R^{409a}, -O-C(O)R^{410a}, or -C(O)OR^{411a}, and R^{404a} to R^{411a} may be the same or different, and each represents a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an

aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404a} , R^{405a} , and a nitrogen atom to which R^{404a} and R^{405a} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent, and

R^{413} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by general formula (4).

[0020]

[Formula 4]



[0021]

In the general formula (4), Q^2 represents a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, * represents a moiety which is to be bonded to the general formula (3),

R^{1b} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally

having a substituent, R^{2b} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7b}$, or $-SO_2-R^{8b}$ wherein R^{7b} represents a hydroxyl group or $-OR^{71b}$, R^{8b} represents a halogen atom, a hydroxyl group, $-OR^{81b}$, $-NR^{82b}R^{83b}$, or $-R^{84b}$ wherein R^{71b} and R^{81b} to R^{84b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3b} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{402b} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406b}R^{407b}$, $-OR^{408b}$, a cyano group, $-C(O)R^{409b}$, $-O-C(O)R^{410b}$, or $-C(O)OR^{411b}$, and R^{404b} to R^{411b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404b} , R^{405b} , and a nitrogen atom to which R^{404b} and R^{405b} are bonded may form a four-membered

to eight-membered nitrogen-containing heterocycle optionally having a substituent.

[0022]

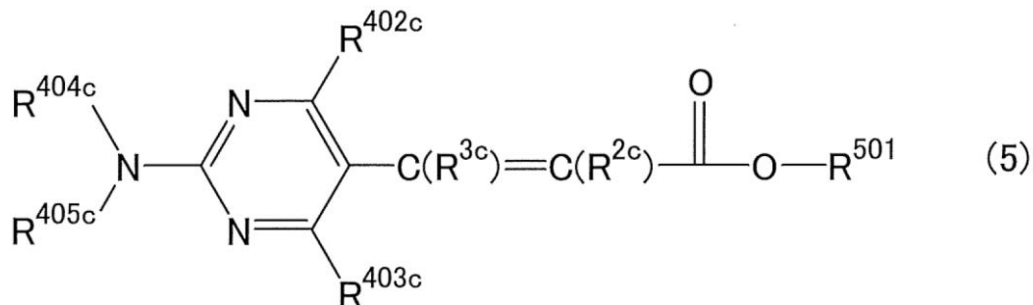
For an embodiment of the present invention, R^{413} is preferably a group represented by the general formula (4).

[0023]

In the composition for optical members of the present invention, the compound represented by the general formula (1) is preferably a compound represented by general formula (5).

[0024]

[Formula 5]



[0025]

In the general formula (5), R^{2c} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-\text{C}(\text{O})-\text{R}^{7c}$ or $-\text{SO}_2-\text{R}^{8c}$ wherein R^{7c} represents a hydroxyl group or $-\text{OR}^{71c}$, and R^{8c} represents a halogen atom, a hydroxyl group, $-\text{OR}^{81c}$, $-\text{NR}^{82c}\text{R}^{83c}$, or $-\text{R}^{84c}$ wherein R^{71c} and R^{81c} to R^{84c} may be the same or different, and each represent a hydrogen atom, an alkyl

group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3c} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

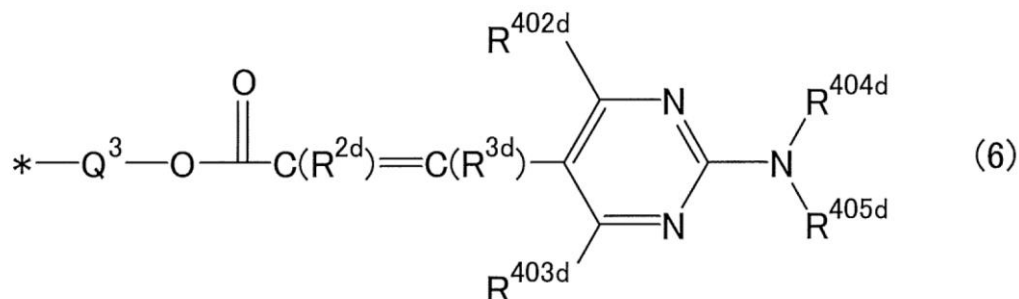
R^{402c} and R^{403c} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406c}R^{407c}$, $-OR^{408c}$, a cyano group, $-C(O)R^{409c}$, $-O-C(O)R^{410c}$, or $-C(O)OR^{411c}$, and R^{404c} to R^{411c} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404c} , R^{405c} , and a nitrogen atom to which R^{404c} and R^{405c} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent, and

R^{501} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by general

formula (6).

[0026]

[Formula 6]



[0027]

In the general formula (6), Q^3 represents a bivalent hydrocarbon group having 1 to 20 carbon atoms, and optionally having a substituent, * represents a moiety which is to be bonded to the general formula (5),

R^{2d} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7d}$, or $-SO_2-R^{8d}$, wherein R^{7d} represents a hydroxyl group or $-OR^{71d}$, and R^{8d} represents a halogen atom, a hydroxyl group, $-OR^{81d}$, $-NR^{82d}R^{83d}$, or $-R^{84d}$ wherein R^{71d} , and R^{81d} to R^{84d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3d} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and

optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{402d} and R^{403d} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406d}R^{407d}$, $-OR^{408d}$, a cyano group, $-C(O)R^{409d}$, $-O-C(O)R^{410d}$, or $-C(O)OR^{411d}$, and R^{404d} to R^{411d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404d} , R^{405d} , and a nitrogen atom to which R^{404d} and R^{405d} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle.

[0028]

For an embodiment of the present invention, R^{501} is preferably a group represented by the general formula (6).

[0029]

In the composition for optical members of the present invention, the compound represented by the general formula (1) is preferably a colorant compound having an absorption spectrum showing an absorption maximum wavelength in a wavelength range from 380 to 430 nm.

[0030]

The composition for optical members of the present invention preferably further comprises an ultraviolet absorbent. The absorption maximum wavelength of the absorption spectrum of the ultraviolet absorbent is preferably present in a wavelength range from 300 nm to 400 nm.

[0031]

The present invention also relates to an optical member, formed using the composition for optical members.

[0032]

The optical member may be used as an optical film.

[0033]

The optical member may be used as a pressure-sensitive adhesive layer or adhesive layer for optical films. The base polymer that the composition, which forms the pressure-sensitive adhesive layer for optical films comprises, is preferably a (meth)acryl-based polymer.

[0034]

The optical member of the present invention is preferably used as a surface treatment layer laid on/over an optical film.

[0035]

In the optical member of the present invention, the optical film is preferably a polarizing film, a polarizer, a transparent protective film for polarizers, or a

retardation film.

[0036]

The present invention relates to an optical laminate, comprising a polarizer, and a retardation film,

the optical laminate being an optical laminate (1) comprising the optical member of the present invention.

[0037]

The present invention also relates to an image display device, comprising an image display section, and the optical member or the optical laminate (1). In the image display device of the present invention, the optical member or the optical laminate (1) is preferably present nearer to a viewing side of the display device than the image display section.

[0038]

The image display device of the present invention is an organic EL display device comprising an optical laminate comprising at least a polarizer and a retardation film in this order from a viewing side of the image display device, and an organic EL panel as the image display section. The optical laminate preferably comprises the optical member, or the optical laminate (1).

[0039]

In a transparent conductive film having a transparent substrate film and a transparent conductive layer, the

optical member of the present invention, is used as the transparent substrate film, or as an intermediate layer located between the transparent substrate film and the transparent conductive layer.

[0040]

In the optical member of the present invention, the intermediate layer is preferably at least one selected from a refractive index adjusting layer, an adhesion facilitating layer, a hard coat layer, and a crack preventing layer.

[0041]

The present invention also relates to a transparent conductive film, comprising a transparent substrate film and a transparent conductive layer, and comprising the optical member as the transparent substrate film, or as an intermediate layer laid between the transparent substrate film and the transparent conductive layer.

[0042]

The present invention relates to an image display device, comprising an image display section, and the transparent conductive film. In the image display device of the present invention, the transparent conductive film is preferably located nearer to a viewing side of the display device than the image display section.

[0043]

The image display device of the present invention is, for example, an organic EL display device comprising an organic EL panel as the image display section.

EFFECT OF THE INVENTION

[0044]

The composition of the present invention for optical members includes, besides a base polymer for forming an optical member, a compound represented by the general formula (1). About this compound, an absorption maximum wavelength of the absorption spectrum is present around 400 nm. Thus, the compound is used suitably for a colorant. The use of a combination of this compound (colorant compound) with an ultraviolet absorbent allows the combination to sufficiently absorb light rays in a band of wavelengths which do not affect a display element of, for example, an organic EL panel, and that the combination sufficiently transmit wavelengths longer than those in the band. Furthermore, the compound represented by the general formula (1) is also excellent in endurance under severe conditions in a high-temperature and high-humidity environment. As a result, an optical member formed using the composition of the present invention for optical members can restrain a display element from being deteriorated by external light, and further has an

excellent weather-deterioration resistance. Thus, the optical member can be made long in lifetime.

BRIEF DESCRIPTION OF THE DRAWINGS

[0045]

Fig. 1 is a sectional view that schematically illustrates an embodiment of an optical laminate to which the optical member of the present invention is applicable.

Fig. 2 is a sectional view that schematically illustrates an embodiment of an organic EL display device to which the optical member of the present invention is applicable.

Fig. 3 is a sectional view that schematically illustrates an embodiment of a transparent conductive film to which the optical member of the present invention is applicable.

MODE FOR CARRYING OUT THE INVENTION

[0046]

<Composition for Optical Members>

Hereinafter, a description will be made about each component that the composition of the present invention for optical members includes. The composition of the present invention for optical members includes, besides a base polymer for forming an optical member, a compound

represented by the general formula (1). The composition of the invention for optical members may include various additives other than the compound represented by the general formula (1) in accordance with a variable use purpose of the composition.

[0047]

<Base Polymer>

The base polymer is appropriately selected in accordance with an article to which the optical member is applied. A resin used for the base polymer is not particularly limited, and examples thereof include thermoplastic resins, photocurable resins, and thermosetting resins. Examples thereof include acrylic resin, polycarbonate resin, polystyrene resin, low-density polyethylene resin, polypropylene resin, polyurethane resin, polyamide resin, polyacetal resin, polyphenylene sulfide resin, polyethylene terephthalate resin, polybutylene terephthalate resin, polycycloolefin resin, polysulfone resin, polyethersulfone resin, fluorine-contained resin, silicone resin, polyester resin, epoxy resin, phenolic resin, and melamine resin. These may be used singly or in any combination of two or more thereof.

[0048]

A specific example of the base polymer that corresponds to the optical article may be any polymer used

for the optical article. The base polymer is a main component included in each optical member, and will be detailed later together with the optical article. A material related to the base polymer is represented also as a well-known notation in the use purpose, which may be of various kinds. In a case where, in the use of, for example, a pressure-sensitive adhesive, this pressure-sensitive adhesive is an acryl-based pressure-sensitive adhesive, a (meth)acryl-based polymer can be recognized as the base polymer of this agent.

[0049]

<Compound Represented by General Formula (1)>

The compound represented by the general formula (1) may be referred to as the compound (1) in the document DESCRIPTION. The same rule is applied to a compound represented by any other formula-number. For example, a compound represented by a general formula (2) may be referred to as a compound (2).

[0050]

When the compound (1) in the present invention has geometric isomers, the compound in the invention includes, in the category thereof, all of the geometric isomers. When the compound (1) in the invention has therein one or more asymmetric carbon atoms, the compound includes, in the category thereof, the following in the invention: all of

compounds in each of which the one carbon atom or each of the carbon atoms is an R-configured carbon atom; compounds in each of which the one carbon atom or each of the carbon atoms is an S-configured carbon atom; and a compound of any combination of two or more of these compounds. The compound in the invention includes, in the category thereof, all of racemic compounds, racemic mixtures, single-enantiomers, and diastereomers of these compounds.

[0051]

In the formula (1), m represents an integer of 1 to 6. When m is from 2 to 6, the compound (1) is favorably improved in heat resistance. In one embodiment of the present invention, m is preferably 1 or 2, more preferably 2.

[0052]

When m is 1, Q¹ represents a hydrogen atom, and when m is from 2 to 6, Q¹ represents a bivalent to hexavalent linking group.

Examples of the bivalent to hexavalent linking group include bivalent to hexavalent hydrocarbon groups that each have 1 to 20 carbon atoms and may each have a substituent, or -SO₂-.

Examples of the bivalent to hexavalent hydrocarbon groups which each have 1 to 20 carbon atoms and may each have a substituent include any linear, branched or cyclic

bivalent to hexavalent alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or any bivalent to hexavalent arylene group having 6 to 20 carbon atoms and optionally having a substituent. Q^1 is preferably a hydrogen atom, or a bivalent linking group.

[0053]

The bivalent linking group is preferably, for example, a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, or $-SO_2-$, and is more preferably a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent. The bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent is preferably any linear, branched or cyclic bivalent alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or any bivalent arylene group having 6 to 20 carbon atoms and optionally having a substituent.

The linear, branched or cyclic bivalent alkyl group having 1 to 20 carbon atoms may be a bivalent alkyl group into which an arylene group that may have, between carbon-carbon atoms thereof, an oxygen atom, a sulfur atom or a substituent is inserted; and is preferably a linear bivalent alkyl group having 1 to 20 carbon atoms and is represented by $-(CH_2)_{k1}-$ in which $k1$ represents an integer of 1 to 20. Examples thereof include methylene, ethylene,

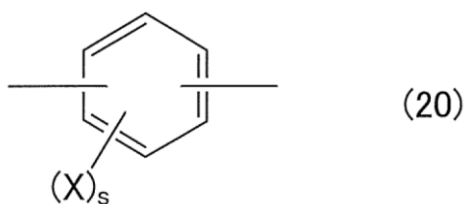
propylene, butylene, pentylene, hexylene, heptylene, octylene and decylene groups. The bivalent linking group is also preferably a bivalent alkyl group substituted with one or more halogen atoms. Examples of this group includes a bistrifluoromethylmethylene group. The number of carbon atoms of the bivalent linear alkyl group is more preferably from 2 to 10 (in the above-mentioned formula, k1 is from 2 to 10), even more preferably from 4 to 8 (in the formula, k1 is from 4 to 8).

[0054]

The bivalent arylene group having 6 to 20 carbon atoms and optionally having a substituent is preferably, for example, a group represented by a general formula (20) illustrated below.

[0055]

[formula 7]



[0056]

In the formula (20), X(s) (each independently) represent(s) a halogen atom, a nitro group, a hydroxyl group, a sulfo group, or an alkyl group having 1 to 3 carbon atoms or alkoxy group having 1 to 3 carbon atoms;

and s represent an integer of 0 to 4. Bonding hands at two positions of the benzene ring may have any one of o-, m- and p-orientations. It is preferred that the benzene ring has no substituent ($s = 0$).

[0057]

In the formula (1), D^1 represents a group in which one hydrogen atom has left the compound (2). The group, in which one hydrogen atom has left the compound (2), may be referred to also as a group obtained by removing one hydrogen atom from the compound (2). The compound (2) contains a nitrogen-containing aromatic ring and an electron-withdrawing group, and contains a methine structure that can function as a colorant. The compound (1) contains such a methine structure to be usable as a colorant compound. When m is from 2 to 6, a plurality of D^1 s may be wholly the same, or different from each other. In an embodiment, it is preferred that plural D^1 s are wholly the same.

A compound about which m is 1 in the general formula (1) is the compound (2). The compound (1), about which m is 1, is referred to also as a monomer compound. A compound (1) about which m is from 2 to 6 is a compound having a dimer- to hexamer-structure obtained by linking two to six groups in each of which a hydrogen atom has left the compound (2) to each other through the linking group

(Q¹). The compounds (1) about which m is from 2 to 6 may be referred to also as dimer to hexamer compounds.

About D¹, a group in which one hydrogen atom has left R¹, R⁴⁰³ or R⁴⁰⁴ (a group that R¹ has left when R¹ is a hydrogen atom) in the compound (2), more preferably a group in which one hydrogen atom has left R¹ or R⁴⁰³. In other words, in the general formula (1), Q¹ is bonded preferably to a moiety of R¹, R⁴⁰³ or R⁴⁰⁴ in the general formula (2), more preferably to a moiety of R¹ or R⁴⁰³.

[0058]

In the formula (2), R¹ represents a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent. The alkyl group optionally having a substituent is, for example, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent. The aryl group optionally having a substituent is, for example, an aryl group having 6 to 20 carbon atoms and optionally having a substituent. In the formula (2), -C(O)-O-R¹ is an electron-withdrawing group. R¹ is preferably an alkyl group having 1 to 20 carbon atoms and optionally having a substituent or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, more preferably an alkyl group having 1 to 20 carbon atoms and optionally having a substituent.

[0059]

R^2 represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group (CF_3 group), a heterocycle-containing group, or $-C(O)-R^7$ or $-SO_2-R^8$. R^7 represents a hydroxyl group or $-OR^{71}$, and R^8 represents a halogen atom, a hydroxyl group, $-OR^{81}$, $-NR^{82}R^{83}$, or $-R^{84}$. R^{71} and R^{81} to R^{84} may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent.

[0060]

Examples of the heterocycle-containing group in R^2 include pyrrole, pyridine, quinoline, pyrimidine, pyridazine, pyrazine, imidazole, benzimidazole, triazine, triazole and tetrazole rings, and other nitrogen-containing heterocyclic rings; furan and benzofuran rings, and other oxygen-containing heterocyclic rings; thiophene and benzothiophene rings, and other sulfur-containing heterocyclic rings; oxazole and benzoxazole rings, and other heterocyclic rings each containing an oxygen atom and a nitrogen atom; thiazole, benzothiazole, and thiadiazole rings, and other sulfur-containing heterocyclic rings. These rings may each be combined with a carbon ring (for example, a benzene ring) or another heterocyclic ring (for example, a pyridine ring) to form a condensed ring. An oxazole or benzoxazole ring is preferred.

[0061]

In one embodiment of the present invention, the heterocycle-containing group in R^2 is preferably a group in which a hydrogen atom has left carbon (at the 2-position) between nitrogen and oxygen in a benzoxazole or oxazole ring (the group may be referred to also as a group obtained by removing a hydrogen atom therefrom), more preferably a group in which a hydrogen atom has left carbon (at the 2-position) between nitrogen and oxygen in a benzoxazole ring.

When in the formula (1), for example, m is from 2 to 6, R^2 is a group in which a hydrogen atom has left a benzoxazole or oxazole ring, and Q^1 and D^1 are bonded to each other at a moiety of R^2 in the compound (2), R^2 is preferably bonded to Q^1 through a carbon atom other than the carbon atom (at the 2-position) between nitrogen and oxygen of the benzoxazole or oxazole ring.

[0062]

In each of R^1 , R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , the alkyl group optionally having a substituent is, for example, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent. The alkyl group having 1 to 20 carbon atoms and optionally having a substituent is, for example, a linear, branched or cyclic alkyl group having 1 to 20 carbon atoms and optionally having a substituent, which will be detailed later. In one embodiment of the

present invention, the alkyl group having 1 to 20 carbon atoms and optionally having a substituent is preferably a linear, branched or cyclic alkyl group having 4 to 20 carbon atoms and optionally having a substituent. The alkyl group is preferably a sterically bulky branched or cyclic alkyl group having 4 or more carbon atoms, more preferably a cyclic alkyl group having 6 to 20 carbon atoms, in particular preferably a cyclic alkyl group optionally having a linear or branched alkyl group as the substituent. In each of R^1 , R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , the alkyl group having 1 to 20 carbon atoms is preferably, for example, a methyl, ethyl, n-propyl, i-propyl, n-butyl, i-butyl, t-butyl, n-hexyl, cyclohexyl, n-octyl, 2-ethylhexyl, 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group, more preferably, for example, a t-butyl, cyclohexyl, 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group, even more preferably, for example, a 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group.

In each of R^1 , R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , the aryl group optionally having a substituent is, for example, an aryl group having 6 to 20 carbon atoms and optionally having a substituent. The aryl group having 6 to 20 carbon atoms and optionally having a substituent is, for example, an aryl group having 6 to 20 carbon atoms and optionally

having a substituent, which will be detailed later, and is preferably, for example, a phenyl group which may be substituted with an alkyl group (for example, a phenyl, 3-methylphenyl, or 2,6-dimethylphenyl group).

[0063]

R^1 is preferably, for example, a n-butyl, s-butyl, i-butyl, t-butyl, n-pentyl, n-hexyl, cyclohexyl, n-octyl, 2-ethylhexyl, 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group, more preferably, for example, a 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group.

R^2 is preferably a cyano, nitro or trifluoromethyl group, a heterocycle-containing-group, $-C(O)-R^7$ or $-SO_2-R^8$, more preferably a cyano group, a heterocycle-containing-group, or $-C(O)-R^7$, even more preferably a cyano group or $-C(O)-OR^{71}$.

[0064]

R^{71} and R^{81} may be the same or different, and are each preferably, for example, a methyl, ethyl, n-propyl, i-propyl, n-butyl, s-butyl, i-butyl, t-butyl, n-pentyl, n-hexyl, cyclohexyl, n-octyl, 2-ethylhexyl, 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group, more preferably, for example, a 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group. R^{82} is preferably a hydrogen atom. R^{83} is preferably a hydrogen

atom, or a phenyl, 3-methylphenyl or 2,6-dimethylphenyl group. R^{84} is preferably a methyl, ethyl, t-butyl, cyclohexyl, phenyl, or naphthyl group.

[0065]

In the general formula (2), R^3 represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group optionally having a substituent or an aryl group optionally having a substituent.

R^{402} and R^{403} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group optionally having a substituent, an aryl group optionally having a substituent, $-NR^{406}R^{407}$, $-OR^{408}$, a cyano group, $-C(O)R^{409}$, $-O-C(O)R^{410}$, or $-C(O)OR^{411}$.

R^{404} to R^{411} may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, an aryl group optionally having a substituent. R^{404} , R^{405} , and a nitrogen atom to which R^{404} and R^{405} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

[0066]

In each of R^3 , R^{402} and R^{403} , the alkyl group is, for example, a linear, branched or cyclic alkyl group having 1 to 20 carbon atoms.

Specific examples of the linear, branched or cyclic

alkyl group having 1 to 20 carbon atoms include methyl, ethyl, n-propyl, iso-propyl, n-butyl, iso-butyl, sec-butyl, t-butyl, n-pentyl, 2-methylbutyl, 1-methylbutyl, neopentyl, 1,2-dimethylpropyl, 1,1-dimethylpropyl, cyclopentyl, n-hexyl, 4-methylpentyl, 3-methylpentyl, 2-methylpentyl, 1-methylpentyl, 3,3-dimethylbutyl, 2,3-dimethylbutyl, 1,3-dimethylbutyl, 2,2-dimethylbutyl, 1,2-dimethylbutyl, 1,1-dimethylbutyl, 2-ethylbutyl, 1-ethylbutyl, 1,1,2-trimethylbutyl, 1-ethyl-2-methylpropyl, cyclohexyl, n-heptyl, 2-methylhexyl, 3-methylhexyl, 4-methylhexyl, 5-methylhexyl, 2,4-dimethylpentyl, n-octyl, 2-ethylhexyl, 2,5-dimethylhexyl, 2,4-dimethylhexyl, 2,2,4-trimethylpentyl, t-octyl, n-nonyl, 3,5,5-trimethylhexyl, n-decyl, 4-ethyloctyl, 4-ethyl-4,5-dimethylhexyl, 4-t-butylcyclohexyl, n-undecyl, n-dodecyl, 1,3,5,7-tetramethyloctyl, 4-butyl-octyl, 6,6-diethyloctyl, n-tridecyl, 6-methyl-4-butyloctyl, n-tetradecyl, n-pentadecyl, 3,5-dimethylheptadecyl, 2,6-dimethylheptadecyl, 2,4-dimethyl-heptadecyl, 2,2,5,5-tetramethylhexyl, 1-cyclopentyl-2,2-dimethylpropyl, 1-cyclohexyl-2,2-dimethylpropyl, 2,6-di-t-butyl-4-methylcyclohexyl, and n-octadecyl groups.

[0067]

In the alkyl group optionally having a substituent, the substituent is not particularly limited, and examples

thereof include monocyclic or polycyclic aromatic groups having 6 to 10 carbon atoms (such as phenyl and naphthyl groups), linear, branched or cyclic alkoxy groups having 1 to 8 carbon atoms, amino groups, mono- or di-alkylamino groups (having an alkyl having 1 to 8 carbon atoms), halogen atoms, a cyano group, a hydroxyl group, a nitro group, a carboxyl group, alkoxycarbonyl groups having 1 to 8 carbon atoms, acyl groups having 2 to 10 carbon atoms (such as acetyl, propionyl, butyryl, valeryl, pivaloyl, acryloyl, methacryloyl, benzoyl, toluoyl, cinnamoyl, anisoyl, and naphthoyl groups), and acyloxy groups having 2 to 10 carbon atoms.

[0068]

In each of R^3 , R^{402} and R^{403} , the aryl group may be a monocyclic or polycyclic aromatic group having 6 to 20 carbon atoms.

Specific examples of the monocyclic or polycyclic aromatic groups having 6 to 20 carbon atoms include monocyclic aromatic hydrocarbon groups such as a phenyl group; and polycyclic aromatic hydrocarbon groups such as naphthyl, anthracenyl, naphthacenyl, pentacenyl, phenanthrenyl, and pyrenyl groups.

In the aryl group optionally having a substituent, the substituent is not particularly limited, and examples thereof include linear, branched or cyclic alkyl groups

having 1 to 8 carbon atoms, alkoxy groups having 1 to 8 carbon atoms, amino groups, mono- or di-alkylamino groups (each having an alkyl group having 1 to 8 carbon atoms), halogen atoms, a cyano group, a hydroxyl group, a nitro group, halogenated hydrocarbon groups having 1 to 8 carbon atoms, a carboxyl group, and alkoxycarbonyl groups having 1 to 8 carbon atoms. The substituent is preferably a linear, branched or cyclic alkyl group having 1 to 8 carbon atoms. About, for example, phenyl and naphthyl groups each having a substituent, examples thereof include nitrophenyl, cyanophenyl, hydroxyphenyl, methylphenyl, dimethylphenyl, trimethylphenyl, fluorophenyl, chlorophenyl, dichlorophenyl, bromophenyl, methoxyphenyl, ethoxyphenyl, trifluoromethylphenyl, N,N-dimethylaminophenyl, nitronaphthyl, cyanonaphthyl, hydroxynaphthyl, methylnaphthyl, fluoronaphthyl, chloronaphthyl, bromonaphthyl, and trifluoromethylnaphthyl groups.

[0069]

In the formula (2), the four-membered to eight-membered nitrogen-containing heterocycle, which R^{404} , R^{405} , and a nitrogen atom that R^{404} and R^{405} are bonded to each other to form, may be a nitrogen-containing heterocycle containing an oxygen atom. The nitrogen-containing heterocycle may be a nonaromatic nitrogen-containing heterocycle. Examples of the four-membered to eight-

membered nitrogen-containing heterocycle include pyrrolidine, piperidine, piperazine and morpholine rings, and other nonaromatic nitrogen-containing heterocyclic rings.

In the four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent, the substituent is not particularly limited, and examples thereof include linear, branched or cyclic alkyl groups having 1 to 8 carbon atoms, alkoxy groups having 1 to 8 carbon atoms, amino groups, mono- or di-alkylamino groups (each having an alkyl group having 1 to 8 carbon atoms), halogen atoms, a cyano group, a hydroxyl group, a nitro group, halogenated hydrocarbon groups having 1 to 8 carbon atoms, a carboxyl group, and alkoxycarbonyl groups having 1 to 8 carbon atoms. The substituent is preferably a linear, branched or cyclic alkyl group having 1 to 8 carbon atoms.

[0070]

When the alkyl group, the aryl group, the nitrogen-containing heterocycle, the heterocycle or some other cycle has plural substituents and the number of the substituents is two or more, the substituents may be the same or different.

[0071]

In the general formula (2), preferred embodiments of each of the groups will be further described.

R³ is preferably a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or a cyano group, more preferably a hydrogen atom or an alkyl group having 1 to 5 carbon atoms and optionally having a substituent, even more preferably a hydrogen atom, or an alkyl group having 1 to 3 carbon atoms, in particular preferably a hydrogen atom.

[0072]

R⁴⁰² is preferably a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or an alkoxy group, more preferably an alkyl group having 1 to 20 carbon atoms and optionally having a substituent. This group is even more preferably a hydrogen atom, an alkyl group having 1 to 5 carbon atoms and optionally having a substituent, even more preferably a hydrogen atom or an alkyl group having 1 to 3 carbon atoms, in particular preferably a methyl group.

[0073]

R⁴⁰³ is preferably -OR⁴⁰⁸. R⁴⁰⁸ is preferably a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, more preferably a hydrogen atom, or an alkyl group having 1 to 5 carbon atoms and optionally having a

substituent, even more preferably an alkyl group having 1 to 3 carbon atoms, in particular preferably an ethyl group. In one embodiment of the present invention, at least one of R^{402} and R^{403} is preferably a substituent other than any hydrogen atom. More preferably, R^{402} and R^{403} may be the same or different, and are each a substituent other than any hydrogen atom.

[0074]

R^{404} and R^{405} may be the same or different, and are each preferably an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, more preferably an alkyl group having 1 to 10 carbon atoms or an aryl group having 6 to 10 carbon atoms, even more preferably an alkyl group having 1 to 10 carbon atoms, in particular preferably a methyl, ethyl, n-propyl or n-butyl group.

R^{406} , R^{407} , R^{408} , R^{409} , R^{410} and R^{411} may be the same or different, and are each preferably an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

[0075]

The compound about which m is 1 or 2 in the general formula (1) is preferably, for example, a compound

represented by general formula (3) (compound (3)) or a compound represented by the general formula (5) (compound (5)).

[0076]

In one embodiment of the present invention, the compound (1) is preferably the compound (3). The compound (3) is excellent in light resistance to be preferred.

In the general formula (3), R^{1a} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{2a} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7a}$ or $-SO_2-R^{8a}$. R^{7a} represents a hydroxyl group, or $-OR^{71a}$, and R^{8a} represents a halogen atom, a hydroxyl group, $-OR^{81a}$, $-NR^{82a}R^{83a}$ or $-R^{84a}$. R^{71a} and R^{81a} to R^{84a} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

[0077]

Preferred embodiments of R^{1a} are the same given as the preferred embodiments of the group R^1 .

R^{2a} is a cyano group, a heterocycle-containing group,

or $-C(O)-R^{7a}$, more preferably a cyano group, or $-C(O)-OR^{71a}$. Preferred embodiments of R^{71a} , R^{81a} , R^{82a} , R^{83a} and R^{84a} are the same given as the preferred embodiments of the groups R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , respectively.

[0078]

In the formula (3), R^{3a} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

R^{402a} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406a}R^{407a}$, $-OR^{408a}$, a cyano group, $-C(O)R^{409a}$, $-O-C(O)R^{410a}$, or $-C(O)OR^{411a}$; and R^{404a} to R^{411a} may be the same or different, and each represents a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. R^{404a} , R^{405a} , and a nitrogen atom to which R^{404a} and R^{405a} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

Preferred embodiments of R^{3a} , R^{402a} , R^{404a} , R^{405a} , R^{406a} , R^{407a} , R^{408a} , R^{409a} , R^{410a} and R^{411a} are the same given as the

embodiments of the groups R^3 , R^{402} , R^{404} , R^{405} , R^{406} , R^{407} , R^{408} , R^{409} , R^{410} and R^{411} , respectively.

[0079]

In the formula (3), R^{413} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by the general formula (4). R^{413} is preferably an alkyl group having 1 to 5 carbon atoms and optionally having a substituent, or a group represented by the general formula (4), more preferably an alkyl group having 1 to 3 carbon atoms or a group represented by the general formula (4), even more preferably an ethyl group or a group represented by the general formula (4). In one embodiment of the present invention, R^{413} is preferably a group represented by the general formula (4).

[0080]

In the general formula (4), Q^2 represents a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, and * represents a moiety that is to be bonded to the general formula (3). In the general formula (4), Q^2 is bonded to the general formula (3). The bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent in Q^2 , and preferred embodiments thereof are the same given as the

bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent in Q^1 , and the preferred embodiments thereof.

[0081]

In the general formula (4), R^{1b} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent; and R^{2b} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7b}$, or $-SO_2-R^{8b}$. R^{7b} represents a hydroxyl group, or $-OR^{71b}$, and R^{8b} represents a halogen atom, a hydroxyl group, $-OR^{81b}$, $-NR^{82b}R^{83b}$, or $-R^{84b}$. R^{71b} and R^{81b} to R^{84b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

Preferred embodiments of R^{1b} are the same given as the preferred embodiments of the group R^1 .

R^{2b} is preferably a cyano group, a heterocycle-containing group, or $-C(O)-R^{7b}$, more preferably a cyano group or $-C(O)-OR^{71b}$. Preferred embodiments of R^{71b} , R^{81b} , R^{82b} , R^{83b} and R^{84b} are the same given as the preferred embodiments of the group R^{71} , R^{81} , R^{82} , R^{83} and R^{84} ,

respectively.

[0082]

In the general formula (4), R^{3b} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

R^{402b} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406b}R^{407b}$, $-OR^{408b}$, a cyano group, $-C(O)R^{409b}$, $-O-C(O)R^{410b}$, or $-C(O)OR^{411b}$. R^{404b} to R^{411b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. R^{404b} , R^{405b} , and a nitrogen atom to which R^{404b} and R^{405b} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

Preferred embodiments of R^{3b} , R^{402b} , R^{404b} , R^{405a} , R^{406b} , R^{407b} , R^{408b} , R^{409b} , R^{410b} and R^{411b} are the same given as the preferred embodiments of the groups R^3 , R^{402} , R^{404} , R^{405} , R^{406} , R^{407} , R^{408} , R^{409} , R^{410} and R^{411} , respectively.

[0083]

The compound (1) is also preferably the compound (5).

In the formula (5), R^{2c} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7c}$ or $-SO_2-R^{8c}$. R^{7c} represents a hydroxyl group, or $-OR^{71c}$ and R^{8c} represents a halogen atom, a hydroxyl group, $-OR^{81c}$, $-NR^{82c}R^{83c}$, or $-R^{84c}$. R^{71c} and R^{81c} to R^{84c} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. R^{2c} is preferably a cyano group, heterocycle-containing group or $-C(O)-R^{7c}$, more preferably a cyano group, or $-C(O)-OR^{71c}$.

Preferred embodiments of R^{71c} , R^{81c} , R^{82c} , R^{83c} and R^{84c} are the same given as the preferred embodiments of the groups R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , respectively.

[0084]

In the formula (5), R^{3c} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

R^{402c} and R^{403c} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a

substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-\text{NR}^{406\text{c}}\text{R}^{407\text{c}}$, $-\text{OR}^{408\text{c}}$, a cyano group, $-\text{C}(\text{O})\text{R}^{409\text{c}}$, $-\text{O}-\text{C}(\text{O})\text{R}^{410\text{c}}$, or $-\text{C}(\text{O})\text{OR}^{411\text{c}}$, and $\text{R}^{404\text{c}}$ to $\text{R}^{411\text{c}}$ may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. $\text{R}^{404\text{c}}$, $\text{R}^{405\text{c}}$, and a nitrogen atom to which $\text{R}^{404\text{c}}$ and $\text{R}^{405\text{c}}$ are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

Preferred embodiments of $\text{R}^{3\text{c}}$, $\text{R}^{402\text{c}}$, $\text{R}^{403\text{c}}$, $\text{R}^{404\text{c}}$, $\text{R}^{405\text{c}}$, $\text{R}^{406\text{c}}$, $\text{R}^{407\text{c}}$, $\text{R}^{408\text{c}}$, $\text{R}^{409\text{c}}$, $\text{R}^{410\text{c}}$ and $\text{R}^{411\text{c}}$ are the same given as the preferred embodiments of the groups R^3 , R^{402} , R^{403} , R^{404} , R^{405} , R^{406} , R^{407} , R^{408} , R^{409} , R^{410} and R^{411} , respectively.

[0085]

In the general formula (5), R^{501} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by the general formula (6). R^{501} is preferably an alkyl group having 1 to 20 and optionally having a substituent (for example, a methyl, ethyl, t-butyl, cyclohexyl, 4-t-butylcyclohexyl, or 2,6-di-t-butyl-4-methylcyclohexyl group), an aryl group having 6 to 20

carbon atoms and optionally having a substituent (for example, a phenyl, methylphenyl, dimethylphenyl, or trimethylphenyl group), or a group represented by the general formula (6). In one embodiment of the present invention, R^{501} is preferably a group represented by the general formula (6).

[0086]

In the general formula (6), Q^3 represents a bivalent hydrocarbon group having 1 to 20 carbon atoms, and optionally having a substituent, and * represents a moiety which is to be bonded to the general formula (5). In the general formula (6), Q^3 is bonded to the general formula (5). In Q^3 , the bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, and preferred embodiments thereof are the same given as the bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, and the preferred embodiments thereof in the group Q^1 . In one embodiment, Q^3 is more preferably a bivalent aryl group represented by the general formula (20) in which s is 0.

[0087]

In the general formula (6), R^{2d} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^{7d}$, or $-SO_2-R^{8d}$. R^{7d} represents a hydroxyl group, or $-OR^{71d}$, and R^{8d}

represents a halogen atom, a hydroxyl group, $-OR^{81d}$, $-NR^{82d}R^{83d}$, or $-R^{84d}$. R^{71d} , and R^{81d} to R^{84d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

R^{2d} is preferably a cyano group, a heterocycle-containing group, or, $-C(O)-R^{7d}$, more preferably a cyano group, or $-C(O)-OR^{71d}$. Preferred embodiments of R^{71d} , R^{81d} , R^{82d} , R^{83d} and R^{84d} are the same given as the preferred embodiments of the groups R^{71} , R^{81} , R^{82} , R^{83} and R^{84} , respectively.

[0088]

R^{3d} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent.

R^{402d} and R^{403d} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406d}R^{407d}$, $-OR^{408d}$, a cyano group, $-C(O)R^{409d}$, $-O-C(O)R^{410d}$, or $-C(O)OR^{411d}$, and R^{404d} to R^{411d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms

and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. R^{404d} , R^{405d} , and a nitrogen atom to which R^{404d} and R^{405d} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle.

Preferred embodiments of R^{3d} , R^{402d} , R^{403d} , R^{404d} , R^{405d} , R^{406d} , R^{407d} , R^{408d} , R^{409d} , R^{410d} and R^{411d} are the same given as the embodiments of the groups R^3 , R^{402} , R^{403} , R^{404} , R^{405} , R^{406} , R^{407} , R^{408} , R^{409} , R^{410} and R^{411} , respectively.

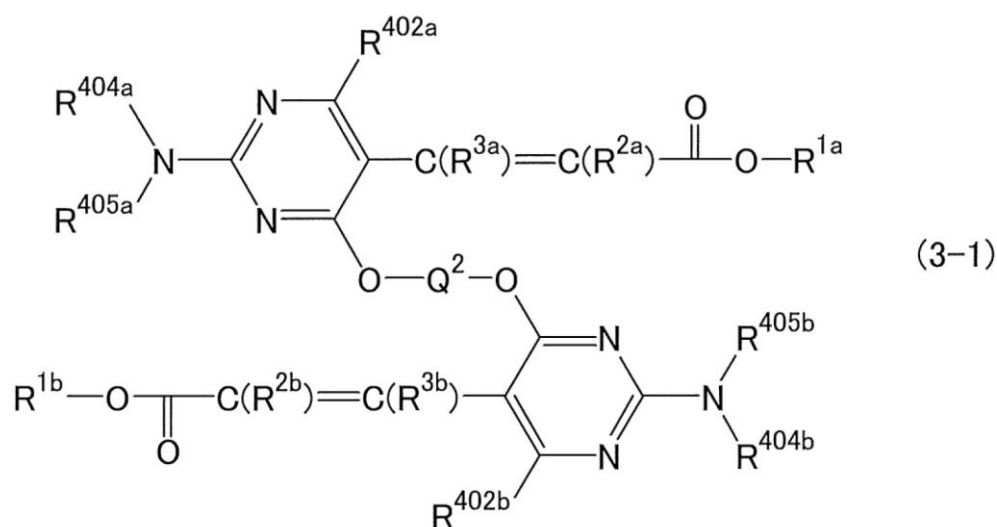
[0089]

When R^{413} is a group represented by the general formula (4), the compound (3) is a compound having a dimer structure about which Q^1 in the general formula (1) is Q^2 (bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent) and the group represented by the general formula (3) and the group represented by the general formula (4) are linked to both sides of this compound through Q^2 . The group represented by the general formula (3) and that represented by the general formula (4) each have a structure containing a methine structure and functioning as a colorant. Such structures each functioning as a colorant have come to have a dimer structure, so that the compound increases in molecular weight not to sublime easily. Thus, the compound is a colorant compound excellent in heat resistance. The

compound (3) about which R^{413} is the group represented by the general formula (4) is a compound represented by a general formula (3-1) illustrated below.

[0090]

[formula 8]



[0091]

In the formula (3-1), R^{1a} , R^{2a} , R^{3a} , R^{402a} , R^{404a} and R^{405a} , and Q^2 , R^{1b} , R^{2b} , R^{3b} , R^{402b} , R^{404b} and R^{405b} have the same meanings as described above, respectively.

[0092]

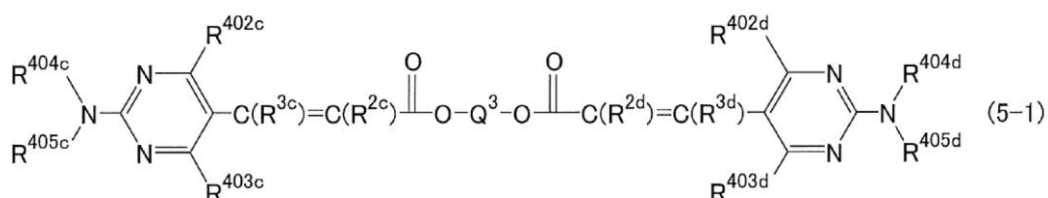
When R^{501} is a group represented by the general formula (6), the compound (5) is a compound having a dimer structure about which Q^1 in the general formula (1) is Q^3 (bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent) and the group represented by the general formula (5) and the group represented by the general formula (6) are linked to both sides of this

compound through Q³. The group represented by the general formula (5) and that represented by the general formula (6) each have a structure containing a methine structure and functioning as a colorant. Such structures each functioning as a colorant have come to have a dimer structure, so that the compound increases in molecular weight not to sublime easily. Thus, the compound is a colorant compound excellent in heat resistance.

The compound (5) about which R⁵⁰¹ is the group represented by the general formula (6) is a compound represented by a general formula (5-1) illustrated below.

[0093]

[formula 9]



[0094]

In the formula (5-1), R^{2c}, R^{3c}, R^{402c}, R^{403c}, R^{404c} and R^{405c}, and Q³, R^{2d}, R^{3d}, R^{402d}, R^{403d}, R^{404d} and R^{405d} have the same meanings as described above.

[0095]

Preferred examples of the compound (1) in the present invention include compounds C1 to C5 produced in the EXAMPLES. Out of the compounds, the compounds C1, C2 and

C5 are preferred since the compounds are high in light resistance. The compounds C1 to C3 are preferred from the viewpoint of high heat resistance thereof. The compounds C1 to C5 are preferred since the compounds are high in solubility in organic solvents. The compounds C1 to C5 are examples of the compound (3).

[0096]

A method for producing the compound (1) in the present invention is not particularly limited, and can be produced by, for example, a method described below. About the method for producing the compound in the invention, a description is made below, giving an example of a synthesizing method thereof. However, the method for producing the compound (1) in the invention is not limited to the method described below. When a reaction that will be described below is conducted, functional groups other than reactive moieties thereof may be protected by appropriate protective groups as required, and then de-protected at an appropriate stage.

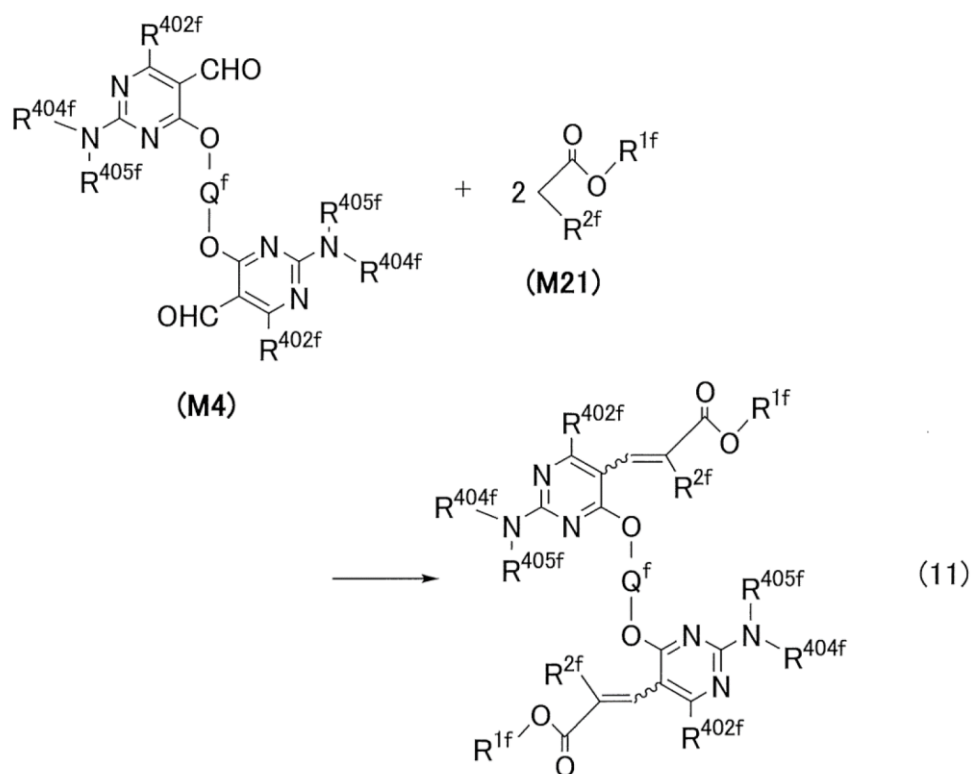
[0097]

In one embodiment of the present invention, the compound represented by the general formula (1) can be synthesized by, for example, a method as described below when the compound is a compound represented by the general formula (11) (compound (11)). The compound (11) is an

example of the compound (1) in the invention, and is a compound about which in the general formula (1) m is 2 (dimer compound). The compound (11) is also an example of a compound about which in the compound (3) R⁴¹³ is a group represented by the general formula (4). The compound (11) is obtained by causing a compound (M4) to undergo a dehydration condensation reaction with a compound (M21) below.

[0098]

[formula 10]



[0099]

In this reaction formula, Q^f represents a bivalent linking group. R^{1f} and R^{2f}, and preferred embodiments

thereof are the same given as the group R^1 and R^2 , and the preferred embodiments thereof, respectively. R^{402f} , R^{404f} and R^{405f} , and preferred embodiments thereof are the same given as the group R^{402} , R^{404} and R^{405} , and the preferred embodiments thereof, respectively. The bivalent linking group in Q^f is the same as given as the bivalent linking group in Q^1 . Q^f is preferably a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent.

[0100]

[formula 11]



[0101]

A wave line represented by the above (the wave line is identical to each of the wave lines in the chemical formula concerned) is a single bond, and shows that steric configurations to which this line is bonded are each independently an E-configuration, a Z-configuration, or a mixture thereof. The same applies hereinafter.

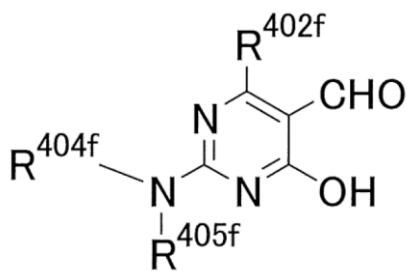
[0102]

The compound (M4) can be yielded, for example, by causing a di-halogenated alkyl compound to react with a compound (M1) represented by a general formula (M1) illustrated below to alkoxylate a hydroxyl group of the

compound (M1). The compound (M1) can be yielded by a method described in Journal of the Chemical Society 1957, 4845.

[0103]

[formula 12]



(M1)

[0104]

In the general formula (M1), R^{402f}, R^{404f} and R^{405f} have the same meanings as described above.

The compound (11) can also be yielded by causing the compound (M1) to undergo a dehydration condensation reaction with the compound (M21) and then alkoxyate the resultant compound to turn the compound into a dimer.

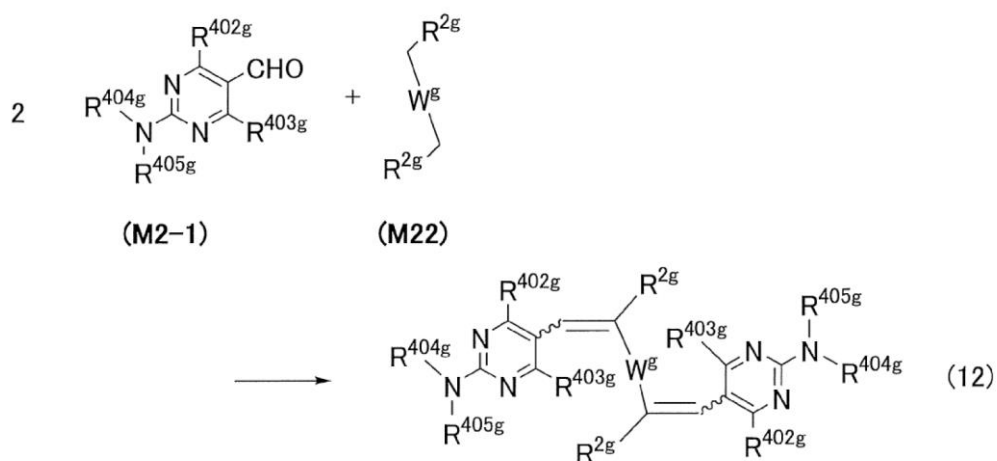
[0105]

When the compound represented by the general formula (1) is a compound represented by a general formula (12) illustrated below (compound (12)), the compound can be synthesized by, for example, a method as described below. The compound (12) is an example of the compound (1) in the present invention, and is a dimer compound. The compound

(12) is also an example of a compound about which R^{501} in the compound (5) is a group represented by the general formula (6). The compound (12) is yielded by causing a compound (M22) to undergo a dehydration condensation reaction with a compound (M2-1) below.

[0106]

[formula 13]



[0107]

In this reaction formula, R^{2g} and preferred embodiments thereof are the same as given as the group R^{2c} and the preferred embodiments thereof. W^g represents $-C(O)-O-Q^g-O-C(O)-$ wherein Q^g represents a bivalent linking group. The bivalent linking group as Q^g is the same given as the bivalent linking group as Q^1 . Q^g is preferably a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent. R^{402g} , R^{403g} , R^{404g} and R^{405g} , and preferred embodiments thereof are the same given as the groups R^{402} , R^{403} , R^{404} and R^{405} , and the preferred embodiments

thereof, respectively.

The compound (M2-1), and a compound (M2-2) illustrated below can each be yielded, for example, by alkoxyating a hydroxyl group of the compound (M1).

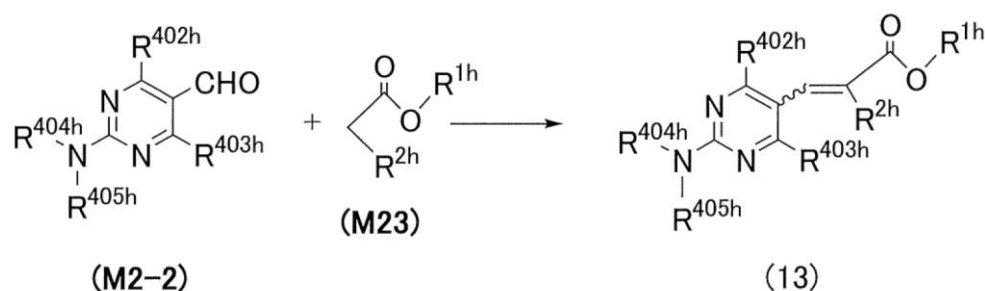
The compound (12) can also be yielded by causing the compound (M21) to undergo a dehydration condensation reaction with the compound (M2-1), and then linking two of the resultant molecules to each other through R^{1f} s thereof to produce a dimer as W^g .

[0108]

When the compound represented by the general formula (1) is a compound represented by a general formula (13) illustrated below (compound (13)), the compound can be synthesized by, for example, a method as described below. The compound (13) is an example of the compound (1) in the present invention, and is a monomer compound (in the general formula (1), m is 1). The compound (13) is also an example of a compound about which in the compound (3), R^{413} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent. The compound (13) can be yielded by causing a compound (M23) to undergo a dehydration condensation reaction with the compound (M2-2) below.

[0109]

[formula 14]



[0110]

In the formula, R^{402h} , R^{403h} , R^{404h} and R^{405h} , and preferred embodiments thereof are the same given as the groups R^{402} , R^{403} , R^{404} and R^{405} , and the preferred embodiments thereof, respectively. R^{1h} and R^{2h} , and preferred embodiments thereof are the same given as the groups R^1 and R^2 , and the preferred embodiments thereof, respectively.

[0111]

The isolation or purification of each of the products in the above-mentioned producing methods can be attained by an appropriate combination of methods used in any ordinary organic synthesis, such as filtration, extraction, cleaning, drying, concentration, crystallization, and various chromatography. Any intermediate therein may be supplied to a next reaction without being especially purified.

[0112]

The compound (1) in the present invention usually has an absorption maximum wavelength in the range of 360 to 430

nm. When the compound has an absorption maximum wavelength in the range of 360 to 430 nm, the compound can selectively absorb ultraviolet rays and blue light rays. The compound (1) in the present invention has an absorption maximum wavelength preferably in the range of 370 to 420 nm, more preferably in that of 380 to 400 nm. About the compound (1) in the present invention, the gram absorption coefficient thereof is preferably 30 or more at 400 nm. The absorption maximum wavelength, and the gram absorption coefficient are measurable by methods described in the item EXAMPLES.

The compound (1) in the present invention is usually good in solubility in organic solvents.

[0113]

The compound (1) in the present invention is preferably a compound soluble in the following organic solvent:

Examples of the organic solvent include aromatic hydrocarbons (for example, toluene, and xylene), ketones (for example, methyl ethyl ketone, acetone, cyclohexanone, 2-heptanone, and 3-heptanone), ethers (for example, propylene glycol monomethyl ether acetate, methyl cellosolve acetate, ethyl cellosolve acetate, and propylene glycol monomethyl ether), esters (for example, methyl 3-ethoxypropionate, ethyl 3-ethoxypropionate, ethyl lactate,

ethyl acetate, butyl acetate, and methyl 3-methoxypropionate); and mixed solvents of two or more of these solvents.

The compound (1) is dissolved in one or more of the organic solvents in a proportion that is preferably 0.1% or more by mass, for example, 0.1% by mass or more and 50% by mass or less, more preferably 1% by mass or more and 40% by mass or less, even more preferably 3% by mass or more and 30% by mass or less of the organic solvent(s). More preferably, the solubility of the compound in the organic solvent(s) is in such a range at 20°C. When the solubility in the organic solvent(s) is in such a range, the compound (1) in the present invention is favorably good in producibility when the compound is used to produce an optical member.

[0114]

About the compound (1) in the present invention, the thermal decomposition temperature thereof is preferably 200°C or higher, more preferably 210°C or higher, and is, for example, preferably from 250 to 400°C. The thermal decomposition temperature is measurable, using an instrument for thermogravimetry.

[0115]

The compound (1) in the present invention usually has an absorption maximum wavelength in the range of 360 to 430

nm, and can effectively absorb a light ray having a wavelength in this range. The compound (1) in the invention can effectively absorb a light ray having a wavelength around 400 nm. In one embodiment, the compound (1) in the invention can be improved in heat resistance when the compound is a dimer- to hexamer-compound (m is from 2 to 6 in the general formula (1)). In a preferred embodiment of the invention, the compound (1) in the invention is excellent in solubility in organic solvents. Thus, the compound (1) in the invention is used suitably for, for example, optical members.

[0116]

<Colorant Compound>

The compound (1), which has an absorption maximum wavelength in the range of 360 to 430 nm, is usable as a colorant compound. Out of such compounds (1), a colorant compound is suitably used which has an absorption spectrum having an absorption maximum wavelength in the wavelength band of 380 to 430 nm. More preferably, the absorption maximum wavelength of the absorption spectrum of the colorant compound is present in the wavelength band of 380 to 420 nm. In the present invention, the use of a combination of such a colorant compound with the above-mentioned ultraviolet absorbent allows the combination to sufficiently absorb light rays in a band that does not

affect light emission of an organic EL element (the wavelength of the band: 380 to 430 nm), and further that the combination sufficiently transmits light rays in a light-emitting-band of the organic EL element (which has wavelengths longer than 430 nm). Consequently, the use enables to restrain the organic EL element from being deteriorated by external light. Moreover, the colorant compound is not particularly limited as far as the compound has the above-mentioned wavelength property. The compound is preferably a material which neither has fluorescent nor phosphorescent performance (photoluminescence) not to hinder display characteristics of the organic EL element. [0117]

The half value width of the colorant compound is not particularly limited, and is preferably from 80 nm or less, more preferably from 5 nm to 70 nm, even more preferably from 10 nm to 60 nm. When the half value width of the colorant compound is in any one of these ranges, favorably, a resultant layer containing the colorant compound sufficiently absorbs light in the range that does not affect the light emission of the organic electroluminescent element while a control can be made to cause this layer to transmit light rays having wavelengths longer than 430 nm sufficiently. The method for measuring the half value width is according to a method described below.

<Method of Measuring Half Value Width>

Using an ultraviolet-visible spectrophotometer (U-4100, manufactured by Hitachi High-Tech Science Corp.), the half value width of a colorant compound was measured from a transmission/absorption spectrum of a solution of the colorant compound under conditions described below. From the spectral spectrum, which is a spectral spectrum obtained by making a measurement to adjust the concentration of the solution to set the absorbance thereof to 1.0 at the absorption maximum wavelength, the interval (full width at half maximum) between two wavelength points showing 50% of the peak value of the spectrum was gained. The resultant value was defined as the half value wavelength of this colorant compound.

(Measurement Conditions)

Solvent: toluene or chloroform,

Cell: quartz cell, and

Optical path length: 10 mm.

[0118]

The compound (1), especially the colorant compounds, may be used singly or in the form of a mixture of two or more thereof. The content of the whole of the compound (1) is preferably from about 0.01 to 10 parts by weight, more preferably from about 0.02 to 5 parts by weight for 100 parts by weight of the base-polymer (or the monomer

component, from which the base-polymer is made). When the addition amount of the compound (1), especially the colorant compound(s) is set into any one of these ranges, the compound (1) can sufficiently absorb light rays in the range that does not affect the light emission of the organic electroluminescent element. Thus, the use of the pressure-sensitive-adhesive layer, which is made of the pressure-sensitive-adhesive composition, favorably makes it possible for deterioration of the organic electroluminescent element to be suppressed.

[0119]

<Ultraviolet Absorbent>

The ultraviolet absorbent is not particularly limited. Examples thereof include any triazine-based ultraviolet absorbent, any benzotriazole-based ultraviolet absorbent, any benzophenone-based ultraviolet absorbent, any oxybenzophenone-based ultraviolet absorbent, any salicylate-based ultraviolet absorbent, and any cyanoacrylate-based ultraviolet absorbent. These may be used singly or in any combination of two or more thereof. Among these absorbents, any triazine-based ultraviolet absorbent and any benzotriazole-based ultraviolet absorbent are preferred. The ultraviolet absorbent is preferably an ultraviolet absorbent selected from the group consisting of triazine-based ultraviolet absorbents each having, in a

single molecule thereof, 2 hydroxyl groups or less, and benzotriazole-based ultraviolet absorbents each having, in a single molecule thereof, one benzotriazole skeleton since the ultraviolet absorbent is good in dissolubility into the monomer(s) used to form the acryl-based pressure-sensitive-adhesive composition when the acryl-based pressure-sensitive-adhesive composition is used as optical members, and further the ultraviolet absorbent is high in ultraviolet absorbing ability at wavelengths around 380 nm. [0120]

Specific examples of the triazine-based ultraviolet absorbent, which has, in a single molecule thereof, 2 hydroxyl groups or less, include 2,4-bis-[[4-(4-ethylhexyloxy)-4-hydroxy]-phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine (TINOSORB S, manufactured by BASF), 2,4-bis[2-hydroxy-4-butoxyphenyl]-6-(2,4-dibutoxyphenyl)-1,3,5-triazine (TINUVIN 460, manufactured by BASF), a reaction product (TINUVIN 400, manufactured by BASF) produced from 2-(4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine-2-yl)-5-hydroxyphenyl and [(C10-C16 (mainly C12-C13) alkyloxy)methyl]oxirane, 2-[4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine-2-yl]-5-[3-(dodecyloxy)-2-hydroxypropoxy]phenol), a reaction product (TINUVIN 405, manufactured by BASF) produced from 2-(2,4-dihydroxyphenyl)-4,6-bis-(2,4-dimethylphenyl)-1,3,5-

triazine and a (2-ethylhexyl) ester of glycidic acid, 2-(4,6-diphenyl-1,3,5-triazine-2-yl)-5-[(hexyl)oxy]-phenol (TINUVIN 1577, manufactured by BASF), 2-(4,6-diphenyl-1,3,5-triazine-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]-phenol (ADK STAB LA46, manufactured by ADEKA Corp.), and 2-(2-hydroxy-4-[1-octyloxycarbonylethoxy]phenyl)-4,6-bis(4-phenylphenyl)-1,3,5-triazine (TINUVIN 479, manufactured by BASF).

[0121]

Examples of the benzotriazole-based ultraviolet absorbent having, in a single molecule thereof, one benzotriazole skeleton include 2-(2H-benzotriazol-2-yl)-6-(1-methyl-1-phenylethyl)-4-(1,1,3,3-tetramethylbutyl)phenol (TINUVIN 928, manufactured by BASF), 2-(2-hydroxy-5-tert-butylphenyl)-2H-benzotriazole (TINUVIN PS, manufactured by BASF), an esterified product (TINUVIN 384-2, manufactured by BASF) produced from benzenepropanoic acid and 3-(2H-benzotriazol-2-yl)-5-(1,1-dimethylethyl)-4-hydroxy(C7-9 side chain and straight chain alkyl), 2-(2H-benzotriazol-2-yl)-4,6-bis(1-methyl-1-phenylethyl)phenol (TINUVIN 900, manufactured by BASF), 2-(2H-benzotriazol-2-yl)-6-(1-methyl-1-phenylethyl)-4-(1,1,3,3-tetramethylbutyl)phenol (TINUVIN 928, manufactured by BASF), a reaction product (TINUVIN 1130, manufactured by BASF) produced from methyl-3-(3-(2H-benzotriazol-2-yl)-5-t-

butyl-4-hydroxyphenyl)propionate/polyethylene glycol 300, 2-(2H-benzotriazol-2-yl)-p-cresol (TINUVIN P, manufactured by BASF), 2-(2H-benzotriazol-2-yl)-4-6-bis(1-methyl-1-phenylethyl)phenol (TINUVIN 234, manufactured by BASF), 2-[5-chloro(2H)-benzotriazole-2-yl]-4-methyl-6-(tert-butyl)phenol (TINUVIN 326, manufactured by BASF), 2-(2H-benzotriazol-2-yl)-4,6-di-tert-pentylphenol (TINUVIN 328, manufactured by BASF), 2-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol (TINUVIN 329, manufactured by BASF), a reaction product (TINUVIN 213, manufactured by BASF) produced from methyl 3-(3-(2H-benzotriazol-2-yl)-5-tert-butyl-4-hydroxyphenyl)propionate and polyethylene glycol 300, 2-(2H-benzotriazol-2-yl)-6-dodecyl-4-methylphenol (TINUVIN 571, manufactured by BASF), 2-[2-hydroxy-3-(3,4,5,6-tetrahydrophthalimide-methyl)-5-methylphenyl]benzotriazole (SUMISORB 250, manufactured by Sumitomo Chemical Co., Ltd.), and 2-(2-hydroxy-3-tert-butyl-5-methylphenyl)-5-chlorobenzotriazole (SeeSorb 703, manufactured by Shipro Kasei Kaisha Ltd., or KEMISORB 73, manufactured by Shipro Kasei Kaisha Ltd.).

[0122]

Examples of the benzophenone-based ultraviolet absorbent (benzophenone-based compound), or the oxybenzophenone-based ultraviolet absorbent (oxybenzophenone-based compound) include 2,4-

dihydroxybenzophenone, 2-hydroxy-4-methoxybenzophenone, 2-hydroxy-4-methoxybenzophenone-5-sulfonic acid (anhydride and trihydrate), 2-hydroxy-4-octyloxybenzophenone, 4-dodecyloxy-2-hydroxybenzophenone, 4-benzyloxy-2-hydroxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone, 2,2'-dihydroxy-4,4-dimethoxybenzophenone, 2,2',4,4'-tetrahydroxybenzophenone (SeeSorb 106, manufactured by Shipro Kasei Kaisha Ltd.), and 2,2'-dihydroxy-4-methoxybenzophenone (KEMISORB 111, manufactured by Chemipro Kasei Kaisha Ltd.).

[0123]

Examples of the salicylate-based ultraviolet absorbent (salicylate-based compound) include phenyl-2-acryloyloxybenzoate, phenyl-2-acryloyloxy-3-methylbenzoate, phenyl-2-acryloyloxy-4-methylbenzoate, phenyl-2-acryloyloxy-5-methylbenzoate, phenyl-2-acryloyloxy-3-methoxybenzoate, phenyl-2-hydroxybenzoate, phenyl-2-hydroxy-3-methylbenzoate, phenyl-2-hydroxy-4-methylbenzoate, phenyl-2-hydroxy-5-methylbenzoate, phenyl-2-hydroxy-3-methoxybenzoate, 2,4-di-tert-butylphenyl-3,5-di-tert-butyl-4-hydroxybenzoate (TINUVIN 120, manufactured by BASF).

[0124]

Examples of the cyanoacrylate-based ultraviolet absorbent (cyanoacrylate-based compound) include alkyl-2-

cyanoacrylate, cycloalkyl-2-cyanoacrylate, alkoxyalkyl-2-cyanoacrylate, alkenyl-2-cyanoacrylate, and alkynyl-2-cyanoacrylate.

[0125]

The absorption maximum wavelength of the absorption spectrum of the ultraviolet absorbent is present preferably in a wavelength range of 300 nm to 400 nm, more preferably in a wavelength range of 300 nm to 380 nm. The absorption maximum wavelength denotes the following when plural absorption maximums are present within a wavelength range from 300 nm to 460 nm in a spectroscopic absorption spectrum of a compound: a wavelength of an absorption maximum showing the largest absorbance, among these absorption maximums. The method for measuring the absorption maximum wavelength is same as the measuring method for a colorant-based compound.

[0126]

The above-mentioned ultraviolet absorbents may be used singly, or in the form of a mixture of two or more thereof. The total content of the absorbent(s) is preferably from about 0.1 to 8 parts by weight, more preferably about 0.2 to 6 parts by weight for 100 parts by weight of the base-polymer (or the monomer component, from which the base-polymer is made). When the addition amount of the ultraviolet absorbent(s) is set in any one of these

ranges, favorably, the optical member can sufficiently exhibit an ultraviolet absorbing function. When the base polymer of the optical member is, for example, an acryl-based polymer, it is preferred that the acryl-based polymer is polymerized by ultraviolet rays since polymerization is not hindered.

[0127]

<Other Additives>

The pressure-sensitive-adhesive composition of the present invention for the optical member may contain, besides the above-mentioned components, an appropriate additive in accordance with the use of the composition.

[0128]

<Preparation of Composition for Optical Members>

The composition of the present invention for optical members may be prepared by mixing at least a base polymer for forming an optical member, an ultraviolet absorbent, and a compound represented by the general formula (1). The composition may be prepared, for example, by kneading the ultraviolet absorbent and the compound (1) into the base polymer, or dissolving these components into a solvent. Moreover, the compound may be prepared by blending the ultraviolet absorbent and the compound (1) beforehand into a monomer component for forming the base polymer, and then polymerizing the blend to yield a polymer. In the

formation of the optical member, a solvent may be appropriately incorporated into the composition for optical members, and various additives corresponding to the optical member may be incorporated into the composition. The solvent is not particularly limited, and examples thereof include the above-mentioned organic solvents.

[0129]

The composition of the present invention for optical members can be formed into an optical member that may be of various types by a method that corresponds to the optical member and may be of various types. Examples of the forming method include a method of shaping the composition for optical members by, for example, injection molding, compression molding or extrusion molding; and a method of applying a substrate which will be detailed later with the composition of the present invention for optical members to form an optical member. A method for the applying is, for example, a method of forming a coating film onto the substrate by an applying method such as dip coating, air knife coating, curtain coating, roller coating, wire bar coating, gravure coating, spin coating, or extrusion coating.

[0130]

<Optical Member>

The optical member is, for example, an optical film.

Specific examples of the optical film usable as the optical member of the present invention include a transparent protective film for polarizers, a retardation film, an optical diffusion film, a light condensing film, a brightness enhancement film, a lenticular film, a cover window film (front surface plate), a scattering preventing film, and a decorative printed film.

[0131]

The optical member may be a pressure-sensitive adhesive layer or an adhesive layer used in an optical film. The pressure-sensitive adhesive layer or adhesive layer is usable in the state of being laid on an optical film such as a polarizing film, a polarizer, a transparent protective film for polarizers, a retardation film, an optical diffusion film, a light condensing film, a brightness enhancement film, a lenticular film, a cover window film (front surface plate), a scattering preventing film, or a decorative printed film. The optical film is usable as an optical laminate including a polarizer and a retardation film.

[0132]

The optical member may be, for example, a surface treatment layer laid on an optical film. The surface treatment layer may be, for example, a hard coat layer, an anti-reflection layer, an anti-glare layer, an anti-

reflection layer, or a refractive index adjusting layer. The surface treatment layer is usable in the state of being laid on an optical film such as a polarizing film, a polarizer, a transparent protective film for polarizers, a retardation film, an optical diffusion film, a light condensing film, a brightness enhancement film, a lenticular film, a cover window film (front surface plate), a scattering preventing film, or a decorative printed film. [0133]

The optical member may be, for example, a function layer laid on an optical film. Examples of the function layer include an adhesion facilitating layer, an antistatic layer, a blocking preventing layer, an oligomer preventing layer, and a barrier layer, and is usable in the state of being laid onto an optical film such as a polarizing film, a polarizer, a transparent protective film for polarizers, a retardation film, an optical diffusion film, a light condensing film, a brightness enhancement film, a lenticular film, a cover window film (front surface plate), a scattering preventing film, or a decorative printed film. [0134]

In a transparent conductive film having a transparent substrate film and a transparent conductive layer, the above-mentioned optical member is usable as the transparent substrate film, or an intermediate layer between the

transparent substrate film and the transparent conductive layer. Examples of the intermediate layer include a refractive index adjusting layer, an adhesion facilitating layer, a hard coat layer, and a crack preventing.

[0135]

<Image Display Device>

The image display device of the present invention has an image display section, and the above-defined optical member. Typical examples of the image display device having an image display section include a liquid crystal display device, and an organic electroluminescence (EL) display device. The optical member is preferably located nearer to the viewing side outer surface of the device than to the image display section thereof.

[0136]

For example, the organic EL display device has, as its image display section, an organic EL panel, and includes, on a viewing side of the organic EL panel, an optical laminate including at least a polarizer, and a retardation film in this order from the viewing side of the device. The optical member of the present invention is usable as, for example, a member configured to form the optical laminate.

[0137]

Hereinafter, an optical member containing a compound

represented by the general formula (1) in the present invention will be described, giving, as a typical example thereof, a case where this optical member is used in an optical laminate used in an organic EL display device. The optical laminate includes a polarizer and a retardation film.

[0138]

As illustrated in Fig. 1, example of an optical laminate 1 is an optical laminate in which a pressure-sensitive-adhesive or adhesive layer 2/a transparent protective film 3/a polarizer 4/a retardation film 5/a pressure-sensitive-adhesive layer 6 are laminated onto each other in this order from the viewing side of the optical laminate. The optical laminate 1 may be an optical laminate in which a pressure-sensitive-adhesive or adhesive layer 2/a (viewing side) transparent protective film 3/a polarizer 4/an organic electroluminescent panel side transparent protective film/an interlayer pressure-sensitive-adhesive layer (or adhesive layer)/a retardation film 5/an (organic electroluminescent panel side) pressure-sensitive-adhesive layer 6 are laminated onto each other in this order from the viewing side. Besides these layers, the optical laminate may include, for example, functional layers such as a hard coat layer, an anti-glare layer and anti-reflection layer, a sensor layer, and a pressure-

sensitive-adhesive layer or adhesive layer for laminating any two of these layers onto each other. The transparent protective film 4/the polarizer 5 may be called a polarizing film. An optical member containing a compound represented by the general formula (1) in the present invention is usable as a member or layer that may be of various types and is configured to form the optical laminate. The optical laminate is preferably an optical laminate (1) including an optical member containing a compound represented by the general formula (1) in the present invention.

[0139]

(1-1) Pressure-Sensitive-Adhesive or Adhesive Layer 2

In the present invention, the "adhesive layer" denotes a pressure-sensitive-adhesive layer or an adhesive layer.

[0140]

(1-1-1) Adhesive Layer

The adhesive layer may be a layer including any appropriate adhesive. Examples of the adhesive include natural rubber adhesives, α -olefin-based adhesives, urethane resin-based adhesives, ethylene/vinyl acetate resin emulsion adhesives, ethylene/vinyl acetate resin-based hot-melt adhesives, epoxy resin-based adhesives, vinyl chloride resin solvent-type adhesives, chloroprene

rubber-based adhesives, cyanoacrylate-based adhesives, silicone-based adhesives, styrene-butadiene solvent-type adhesives, nitrile rubber-based adhesives, nitrocellulose-based adhesives, reactive hot-melt adhesives, phenolic resin-based adhesives, modified silicone-based adhesives, polyester-based hot-melt adhesives, polyamide resin hot-melt adhesives, polyimide-based adhesives, polyurethane resin hot-melt adhesives, polyolefin resin hot-melt adhesives, polyvinyl acetate solvent-type adhesives, polystyrene resin solvent-type adhesives, polyvinyl alcohol-based adhesives, polyvinyl pyrrolidone resin-based adhesives, polyvinyl butyral-based adhesives, polybenzimidazole adhesives, polymethacrylate resin solvent-type adhesives, melamine resin-based adhesives, urea resin-based adhesives, and resorcinol-based adhesives. Such adhesives may be used singly or in the form of a mixture of two or more thereof. The base-polymer may be used a base-polymer which is adapted for a kind of an adhesive agent.

[0141]

When the adhesives are classified in accordance with the bonding form thereof, the adhesives may, for example, thermosetting adhesives and hot-melt adhesives. Such adhesives may be used singly, or in any combination of two or more thereof.

[0142]

The thermosetting adhesives are each heated to be thermally cured to be solidified to express adhering strength. Examples of the thermosetting adhesives include epoxy-based thermosetting adhesives, urethane-based thermosetting adhesives, and acryl-based thermosetting adhesives. The curing temperature of the thermosetting adhesives is, for example, from 100 to 200°C.

[0143]

The hot-melt adhesives are each heated to be melted or softened to adhere thermally onto an adherend, and then cooled to be solidified to be bonded to the adherend. Examples of the hot-melt adhesives include rubber-based hot-melt adhesives, polyester-based hot-melt adhesives, polyolefin-based hot-melt adhesives, ethylene-vinyl acetate resin-based hot-melt adhesives, polyamide resin hot-melt adhesives, and polyurethane resin hot-melt adhesives. The softening temperature (according to a ring and ball method) of the hot-melt adhesives is, for example, from 100 to 200°C. The melt viscosity of the hot-melt adhesives is, for example, from 100 to 30000 mPa·s at 180°C.

[0144]

The thickness of the adhesive layer is not particularly limited, and is, for example, preferably from about 0.01 to 10 μm , more preferably from about 0.05 to 8

μm.

[0145]

(3-1-2) Pressure-Sensitive-Adhesive Layer

The species of the pressure-sensitive-adhesive composition from which the pressure-sensitive-adhesive layer is made, is not particularly limited. Examples of the species of the pressure-sensitive-adhesive composition include rubbery, acryl-based, silicone-based, urethane-based, vinyl alkyl ether-based, polyvinyl alcohol-based, polyvinyl pyrrolidone-based, polyacrylamide-based, and cellulose-based pressure-sensitive adhesives. Among these pressure-sensitive adhesives, acryl-based pressure-sensitive adhesives are preferred since the pressure-sensitive-adhesives are excellent in optical transparency, and show pressure-sensitive-adhesive properties of appropriate tackiness, cohesive property and adhesion, and be excellent in weather resistance, heat resistance and others. The base-polymer may be used a base-polymer which is adapted for a kind of a pressure-sensitive-adhesive. In the present invention, the pressure-sensitive-adhesive composition is preferably an acryl-based pressure-sensitive-adhesive composition including, as its base polymer, a (meth)acryl-based polymer.

[0146]

The acryl-based pressure-sensitive-adhesive

composition preferably includes, for example, a partially polymerized product of one or more monomer components which include an alkyl (meth)acrylate, and/or a (meth)acryl-based polymer yielded from the monomer component(s). The acryl-based pressure-sensitive-adhesive composition may include a colorant compound (furthermore, an ultraviolet absorbent).

[0147]

(Partially Polymerized Product of Monomer Component(s), and (Meth)Acryl-based Polymer)

The above-mentioned acryl-based pressure-sensitive-adhesive composition includes a partially polymerized product of one or more monomer component(s) which include an alkyl (meth)acrylate, and/or a (meth)acryl-based polymer yielded from the monomer component(s).

[0148]

The alkyl (meth)acrylate is, for example, an alkyl (meth)acrylate having a linear or branched alkyl group of 1 to 24 carbon atoms at an ester end. Such alkyl (meth)acrylates may be used singly or in any combination of two or more thereof. The wording "alkyl (meth)acrylate" denotes an alkyl acrylate and/or an alkyl methacrylate. The word "(meth)" in the present invention has substantially the same meaning.

[0149]

The alkyl (meth)acrylate may be the above-mentioned

alkyl (meth)acrylate having a linear or branched alkyl group of 1 to 24 carbon atoms. Thereamong, preferred is an alkyl (meth)acrylate having an alkyl group of 1 to 9 carbon atoms, more preferred is an alkyl (meth)acrylate having a branched alkyl group of 4 to 9 carbon atoms. These alkyl (meth)acrylates are each favorable since the resultant pressure-sensitive-adhesive layer easily takes a balance between its adhesive properties. Specific examples of the alkyl (meth)acrylate having a branched alkyl group of 4 to 9 carbon atoms, include n-butyl (meth)acrylate, s-butyl (meth)acrylate, t-butyl (meth)acrylate, isobutyl (meth)acrylate, n-pentyl (meth)acrylate, isopentyl (meth)acrylate, isohexyl (meth)acrylate, isoheptyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, isooctyl (meth)acrylate, and isononyl (meth)acrylate. These may be used singly or in any combination of two or more.

[0150]

In the present invention, the proportion of the above-mentioned alkyl (meth)acrylate having an alkyl group of 1 to 24 carbon atoms at an ester end, is preferably 40% or more by weight, more preferably 50% or more by weight, even more preferably 60% or more by weight of the whole of one or more monofunctional monomer components from which the (meth)acryl-based polymer is made.

[0151]

The above-mentioned monomer component(s) may include, as one of the monofunctional monomer components, a copolymerizable monomer other than the alkyl (meth)acrylate. The copolymerizable monomer is usable as the rest of the monomer component(s) that is other than the alkyl (meth)acrylate.

[0152]

As the copolymerizable monomer, the monomer component(s) may include, for example, a cyclic nitrogen-containing monomer. It is allowable to use, as the cyclic nitrogen-containing monomer, a monomer having a polymerizable functional group having an unsaturated double bond, such as a (meth)acryloyl group or vinyl group, and further having a cyclic nitrogen structure without any especial limitation. The cyclic nitrogen structure is preferably a cyclic structure having therein one or more nitrogen atoms. Examples of the cyclic nitrogen-containing monomer include lactam-based vinyl monomers such as N-vinylpyrrolidone, N-vinyl- ϵ -caprolactam, and methylvinylpyrrolidone; vinyl monomers each having a nitrogen-containing heterocyclic ring such as vinylpyridine, vinylpiperidone, vinylpyrimidine, vinylpiperazine, vinylpyrazine, vinylpyrrole, vinylimidazole, vinyloxazole, and vinylmorpholine. Other examples thereof include (meth)acrylic monomers each

containing a heterocyclic ring such as a morpholine ring, a piperidine ring, a pyrrolidine ring, or a piperazine ring. Specific examples thereof include N-acryloylmorpholine, N-acryloylpiperidine, N-methacryloylpiperidine, and N-acryloylpyrrolidine. Among these cyclic nitrogen-containing monomers, lactam-based vinyl monomers are preferred.

[0153]

In the present invention, the proportion of the cyclic nitrogen-containing monomer is preferably from 0.5 to 50% by weight, more preferably from 0.5 to 40% by weight, even more preferably from 0.5 to 30% by weight of the whole of the monofunctional monomer component(s) from which the (meth)acryl-based polymer is made.

[0154]

The monomer component(s) used in the present invention may include, as one of the monofunctional monomer components, a hydroxyl-group-containing monomer. It is allowable to use, as the hydroxyl-group-containing monomer, a monomer having a polymerizable functional group having an unsaturated double bond, such as a (meth)acryloyl group or vinyl group, and further having a hydroxyl group with especial limitation. Examples of the hydroxyl-group-containing monomer include hydroxylalkyl (meth)acrylates such as 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl

(meth)acrylate, 2-hydroxybutyl (meth)acrylate, 3-hydroxypropyl (meth)acrylate, 4-hydroxybutyl (meth)acrylate, 6-hydroxyhexyl (meth)acrylate, 8-hydroxyoctyl (meth)acrylate, 10-hydroxydecyl (meth)acrylate, and 12-hydroxylauryl (meth)acrylate; and hydroxyalkylcycloalkane (meth)acrylates such as (4-hydroxymethylcyclohexyl)methyl (meth)acrylate. Other examples thereof include hydroxyethyl (meth)acrylamide, allyl alcohol, 2-hydroxyethyl vinyl ether, 4-hydroxybutyl vinyl ether, and diethylene glycol monovinyl ether. These monomers may be used singly or in combination. Thereamong, hydroxyalkyl (meth)acrylates are preferred.

[0155]

In the present invention, since the pressure-sensitive-adhesive composition is heightened in adhering strength and cohesive strength, the proportion of the hydroxyl-group-containing monomer is preferably 1% or more by weight, more preferably 2% or more by weight, even more preferably 3% or more by weight of the whole of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made. However, if the proportion of the hydroxyl-group-containing monomer is too large, the pressure-sensitive-adhesive layer may be hardened to be lowered in adhering strength. Moreover, the pressure-sensitive adhesive may become too high in

viscosity or may be gelatinized. Thus, the proportion of the hydroxyl-group-containing monomer is preferably 30% or less by weight, more preferably 27% or less by weight, even more preferably 25% or less by weight of the whole of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made.

[0156]

The monomer component(s), from which the (meth)acryl-based polymer is made, may contain, as one of the monofunctional monomers, any other functional-group-containing monomer. The other functional-group-containing monomer is, for example, a carboxyl-group-containing monomer or a monomer having a cyclic ether group.

[0157]

It is allowable to use, as the carboxyl-group-containing monomer, a monomer having a polymerizable functional group having an unsaturated double bond, such as a (meth)acryloyl group or vinyl group, and further having a carboxyl group without any especial limitation. Examples of the carboxyl-group-containing monomer include (meth)acrylic acid, carboxyethyl (meth)acrylate, carboxypentyl (meth)acrylate, itaconic acid, maleic acid, fumaric acid, crotonic acid, and isocrotonic acid. These monomers are usable singly or in combination. Itaconic acid and maleic acid are each usable in the form of an

anhydride thereof. Thereamong, acrylic acid and methacrylic acid are preferred, and acrylic acid is particularly preferred. For the monomer component(s) used in the production of the (meth)acryl-based polymer in the present invention, the carboxyl-group-containing monomer is arbitrarily usable. However, the carboxyl-group-containing monomer may not be used.

[0158]

It is allowable to use, as the monomer having a cyclic ether group, a monomer having a polymerizable functional group having an unsaturated double bond, such as a (meth)acryloyl group or vinyl group, and further having a cyclic ether group such as an epoxy group or oxetane group without any especial limitation. Examples of the epoxy-group-containing monomer include glycidyl (meth)acrylate, 3,4-epoxycyclohexylmethyl (meth)acrylate, and 4-hydroxybutyl (meth)acrylate glycidyl ether. Examples of the oxetane-group-containing monomer include 3-oxetanylmethyl (meth)acrylate, 3-methyl-oxetanylmethyl (meth)acrylate, 3-ethyl-oxetanylmethyl (meth)acrylate, 3-butyl-oxetanylmethyl (meth)acrylate, and 3-hexyl-oxetanylmethyl (meth)acrylate. These monomers may be used singly or in combination.

[0159]

In the present invention, the proportion of the

carboxyl-group-containing monomer or the monomer having a cyclic ether group is preferably 30% or less by weight, more preferably 27% or less by weight, even more preferably 25% or less by weight of the whole of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made.

[0160]

Among the monomer components, from which the (meth)acryl-based polymer in the present invention is made, the copolymerizable monomer is, for example, an alkyl (meth)acrylate represented by $\text{CH}_2=\text{C}(\text{R}^1)\text{COOR}^2$ wherein R^1 represents hydrogen or a methyl group, and R^2 represents a substituted alkyl group of 1 to 3 carbon atoms, or a cyclic alkyl group.

[0161]

About the substituted alkyl group of 1 to 3 carbon atoms as R^2 , its substituent is preferably an aryl group of 3 to 8 carbon atoms or an aryloxy group of 3 to 8 carbon atoms. The aryl group is not limited, and is preferably a phenyl group.

[0162]

Examples of the monomer represented by $\text{CH}_2=\text{C}(\text{R}^1)\text{COOR}^2$ include phenoxyethyl (meth)acrylate, benzyl (meth)acrylate, cyclohexyl (meth)acrylate, 3,3,5-trimethylcyclohexyl (meth)acrylate, and isobornyl (meth)acrylate. These

monomers may be used singly or in combination.

[0163]

In the present invention, the proportion of the (meth)acrylate represented by $\text{CH}_2=\text{C}(\text{R}^1)\text{COOR}^2$ may be 50% or less by weight of the whole of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made, and is preferably 45% or less by weight, more preferably 40% or less by weight, even more preferably 35% or less by weight thereof.

[0164]

The following may also be used as other copolymerizable monomer: vinyl acetate, vinyl propionate, styrene, α -methyl styrene; glycol acrylate-based monomers such as polyethylene glycol (meth)acrylate, polypropylene glycol (meth) acrylate, methoxy ethylene glycol (meth)acrylate, and methoxy polypropylene glycol (meth)acrylate; acrylate-based monomers such as tetrahydrofurfuryl (meth)acrylate, fluorine (meth)acrylate, silicone (meth)acrylate, and 2-methoxyethyl acrylate; and amide-group-containing monomers, amino-group-containing monomers, imide-group-containing monomers, N-acryloylmorpholine, and vinyl ether monomers. Furthermore, the following may also be used as the copolymerizable monomer: terpene (meth)acrylate, dicyclopentanyl (meth)acrylate, or any other monomer having a cyclic

structure.

[0165]

Furthermore, the copolymerizable monomer may be, for example, a silicon-atom-containing silane-based monomer. Examples of the silane-based monomer include 3-acryloxypropyltriethoxysilane, vinyltrimethoxysilane, vinyltriethoxysilane, 4-vinylbutyltrimethoxysilane, 4-vinylbutyltriethoxysilane, 8-vinyl-octyltrimethoxysilane, 8-vinyloctyltriethoxysilane, 10-methacryloyloxydecyltrimethoxysilane, 10-acryloyloxydecyltrimethoxysilane, 10-methacryloyloxydecyltriethoxysilane, and 10-acryloyloxydecyltriethoxysilane.

[0166]

The monomer component(s), from which the (meth)acryl-based polymer in the present invention is made, may optionally include a polyfunctional monomer beside the above-exemplified monofunctional monomers, so as to adjust the cohesive strength of the pressure-sensitive adhesive.

[0167]

The polyfunctional monomer is a monomer having at least two polymerizable functional groups each having an unsaturated double bond such as a (meth)acryloyl group or vinyl group. Examples thereof include ester compounds of a polyhydric alcohol with (meth)acrylic acid such as

(poly)ethylene glycol di(meth)acrylate, (poly)propylene glycol di(meth)acrylate, neopentyl glycol di(meth)acrylate, pentaerythritol di(meth)acrylate, pentaerythritol tri(meth)acrylate, dipentaerythritol hexa(meth)acrylate, 1,2-ethylene glycol di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, 1,12-dodecanediol di(meth)acrylate, trimethylolpropane tri(meth)acrylate, and tetramethylolmethane tri(meth)acrylate; and allyl (meth)acrylate, vinyl (meth)acrylate, divinylbenzene, epoxy acrylate, polyester acrylate, urethane acrylate, butyl di(meth)acrylate, and hexyl di(meth)acrylate. Thereamong, the following is preferably usable: trimethylolpropane tri(meth)acrylate, hexanediol di(meth)acrylate, or dipentaerythritol hexa(meth)acrylate. Such polyfunctional monomers may be used singly or in combination of two or more thereof.

[0168]

The use amount of the polyfunctional monomer(s), which is varied in accordance with the molecular weight thereof, the number of functional groups thereof and others, is preferably 3 parts or less by weight, more preferably 2 parts or less by weight, even more preferably 1 part or less for 100 parts by weight of the whole of the monofunctional monomer(s). The lower limit thereof is not particularly limited, and is preferably 0 parts or more by

weight, more preferably 0.001 part or more by weight. When the use amount of the polyfunctional monomer(s) is in any one of these ranges, the pressure-sensitive-adhesive composition can be improved in adhering strength.

[0169]

For the production of the (meth)acryl-based polymer, a known producing method is appropriately selectable, examples thereof including solution polymerization, ultraviolet (UV) polymerization, other radial ray polymerizations, bulk polymerization, emulsion polymerization, and various other radical polymerizations. The resultant (meth)acryl-based polymer may be any one of a random copolymer, a block copolymer, a graft copolymer and others.

[0170]

In the present invention, a partially polymerized product of the monomer component(s) is also preferably usable.

[0171]

When the (meth)acryl-based polymer is produced by a radical polymerization, the polymerization can be conducted by adding, to the monomer component(s), a polymerization initiator, a chain transfer agent, an emulsifier, and others that are used in the radical polymerization. The polymerization initiator, the chain transfer agent, the

emulsifier, and the others, which are used in the radical polymerization, are not particularly limited, and may be appropriately selected to be used. The weight-average molecular weight of the (meth)acryl-based polymer is controllable in accordance with the respective use amounts of the polymerization initiator and the chain transfer agent, and conditions for the reaction. Correspondingly to the species of these substances, the use amounts are appropriately adjusted.

[0172]

For example, in the solution polymerization, a used polymerization solvent is, for example, ethyl acetate or toluene. In a specific example of the solution polymerization, reaction is conducted in the presence of an added polymerization initiator under a gas flow of an inert gas such as nitrogen usually under reaction conditions of a temperature of about 50 to 70°C and a period of about 5 to 30 hours.

[0173]

Examples of a thermal polymerization initiator used in, for example, the solution polymerization include, but are not limited to, azo initiators such as 2,2'-azobisisobutyronitrile, 2,2'-azobis-2-methylbutyronitrile, 2,2'-azobis(2-methylpropionic acid) dimethyl, 4,4'-azobis-4-cyanovaleric acid, azobisisovaleronitrile,

2,2'-azobis(2-amidinopropane)dihydrochloride, 2,2'-azobis[2-(5-methyl-2-imidazoline-2-yl)propane]dihydrochloride, 2,2'-azobis(2-methylpropionamidine)disulfate, 2,2'-azobis(N,N'-dimethyleneisobutylamidine), and 2,2'-azobis[N-(2-carboxyethyl)-2-methylpropionamidine]hydrate (VA-057, manufactured by Wako Pure Chemical Industries, Ltd.); persulfates such as potassium persulfate and ammonium persulfate; peroxide initiators such as di(2-ethylhexyl)peroxydicarbonate, di(4-tert-butylcyclohexyl)peroxydicarbonate, di-sec-butylperoxydicarbonate, tert-butylperoxyneodecanoate, tert-hexylperoxypivalate, tert-butylperoxypivalate, dilauroyl peroxide, di-n-octanoyl peroxide, 1,1,3,3-tetramethylbutylperoxy-2-ethyl hexanoate, di(4-methylbenzoyl) peroxide, dibenzoyl peroxide, tert-butylperoxyisobutylate, 1,1-di(tert-hexylperoxy)cyclohexane, tert-butylhydroperoxide, and hydrogen peroxide; and redox system initiators of a combination of a peroxide and a reducing agent, such as a combination of a persulfate and sodium hydrogen sulfite and a combination of a peroxide and sodium ascorbate.

[0174]

Such polymerization initiators may be used singly or in the form of a mixture of two or more thereof. The

amount of the initiator(s) is preferably about 1 part or less by weight, more preferably from about 0.005 to 1 part by weight, even more preferably from about 0.02 to 0.5 part by weight for 100 parts by weight of the whole of the monomer component(s).

[0175]

When 2,2'-azobisisobutyronitrile is used as the polymerization initiator or one of the polymerization initiators, the use amount of the polymerization initiator is preferably about 0.2 part or less by weight, more preferably from about 0.06 to 0.2 part by weight for 100 parts by weight of the whole of the monomer component(s).

[0176]

Examples of the chain transfer agent include laurylmercaptan, glycidylmercaptan, mercaptoacetic acid, 2-mercaptoethanol, thioglycolic acid, 2-ethylhexyl thioglycolate, and 2,3-dimercapto-1-propanol. Such chain transfer agents may be used singly or in the form of a mixture of two or more thereof. The content of the whole of the agent(s) in the monomer component(s) is about 0.3 part or less by weight for 100 parts by weight of the whole of the monomer component(s).

[0177]

When the emulsion polymerization is conducted, examples of the emulsifier used therein include anionic

emulsifiers such as sodium laurylsulfate, ammonium laurylsulfate, sodium dodecylbenzenesulfonate, ammonium polyoxyethylene alkyl ether sulfate, and sodium polyoxyethylene alkyl phenyl ether sulfate; and nonionic emulsifiers such as polyoxyethylene alkyl ethers, polyoxyethylene alkyl phenyl ethers, polyoxyethylene fatty acid esters, and polyoxyethylene-polyoxypropylene block polymers. These emulsifiers may be used singly, or in any combination of two or more thereof.

[0178]

Specific examples of a reactive emulsifier include AQUALONs HS-10, HS-20, KH-10, BC-05, BC-10, and BC-20 (each manufactured by Dai-Ichi Kogyo Seiyaku Co., Ltd.); and ADEKA REASOAP SE10N (manufactured by ADEKA Corp.) as an emulsifier to which a radical polymerizable functional group such as a propenyl group or allyl ether group is introduced. The use amount of the emulsifier(s) is preferably 5 parts or less by weight for 100 parts by weight of the whole of the monomer component(s).

[0179]

When the (meth)acryl-based polymer is produced by a radial ray polymerization, the above-mentioned monomer component(s) is/are polymerized by radiating an electron beam, ultraviolet rays (UV), or other radial rays to the monomer component(s). In this way, the polymer can be

produced. Thereamong, an ultraviolet polymerization is preferred. Hereinafter, a description will be made about the ultraviolet polymerization, which is a preferred embodiment among the radial polymerizations.

[0180]

When the ultraviolet polymerization is conducted, a photopolymerization initiator is preferably incorporated into the monomer component(s) since the incorporation produces an advantage that the polymerization period can be shortened.

[0181]

The photopolymerization initiator may be a photopolymerization initiator (B) having an absorption band in wavelengths less than 400 nm. The photopolymerization initiator (B) preferably has no absorption band in wavelengths from 400 nm or more. The photopolymerization initiator (B) is not particularly limited as far as the initiator is an initiator which is irradiated with ultraviolet rays to generate radicals to initiate photopolymerization, and which has an absorbing band in wavelengths less than 400 nm. Any one of such photopolymerization initiators that are ordinarily used is preferably usable. For example, any one of the following is usable: any benzoin ether-based photopolymerization initiator, any acetophenone-based photopolymerization

initiator, any α -ketol-based photopolymerization initiator, any optically active oxime-based photopolymerization initiator, any benzoin-based photopolymerization initiator, any benzil-based photopolymerization initiator, any benzophenone-based photopolymerization initiator, any ketal-based photopolymerization initiator, any thioxanthone-based photopolymerization initiator, and any acylphosphine oxide-based photopolymerization initiator.

[0182]

Specific examples of the benzoin ether-based photopolymerization initiator include benzoin methyl ether, benzoin ethyl ether, benzoin propyl ether, benzoin isopropyl ether, benzoin isobutyl ether, 2,2-dimethoxy-1,2-diphenylethane-1-one, and anisole methyl ether.

[0183]

Examples of the acetophenone-based photopolymerization initiator include 2,2-diethoxyacetophenone, 2,2-dimethoxy-2-phenylacetophenone, 1-hydroxycyclohexyl phenyl ketone, 4-phenoxydichloroacetophenone, and 4-t-butyl-dichloroacetophenone.

[0184]

Examples of the α -ketol-based photopolymerization initiator include 2-methyl-2-hydroxypropiophenone, and 1-

[4-(2-hydroxyethyl)phenyl]-2-hydroxy-2-methylpropane-1-one.

[0185]

An example of the optically active oxime-based photopolymerization initiator is 1-phenyl-1,2-propanedione-2-(O-ethoxycarbonyl)-oxime.

[0186]

An example of the benzoin-based photopolymerization initiator is benzoin.

[0187]

Examples of the benzil-based photopolymerization initiator include benzil.

[0188]

Examples of the benzophenone-based photopolymerization initiator include benzophenone, benzoylbenzoic acid, 3,3'-dimethyl-4-methoxybenzophenone, polyvinylbenzophenone, and α -hydroxycyclohexyl phenyl ketone.

[0189]

Examples of the ketal-based photopolymerization initiator include benzyl dimethyl ketal.

[0190]

Examples of the thioxanthone-based photopolymerization initiator include thioxanthone, 2-chlorothioxanthone, 2-methylthioxanthone, 2,4-dimethylthioxanthone, isopropylthioxanthone, 2,4-

dichlorothioxanthone, 2,4-diethylthioxanthone, 2,4-diisopropylthioxanthone, and dodecyl thioxanthone.

[0191]

Examples of the acylphosphine oxide-based photopolymerization initiator include 2,4,6-trimethylbenzoyl-diphenyl-phosphine oxide, and bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide.

[0192]

Such photopolymerization initiators (B), which each have an absorbing band in wavelengths less than 400 nm, may be used singly or in any combination of two or more thereof. The photopolymerization initiator(s) (B), which has/have an absorbing band in wavelengths less than 400 nm, may be added to the pressure-sensitive-adhesive composition as far as the advantageous effects of the present invention are not damaged. The addition amount thereof is preferably from about 0.005 to 0.5 parts by weight, more preferably from about 0.02 to 0.1 part by weight for 100 parts by weight of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made.

[0193]

When the pressure-sensitive-adhesive layer includes the colorant compound (furthermore, the ultraviolet absorbent) and ultraviolet polymerization is performed therefor, it is preferred to form this layer by

ultraviolet-polymerizing, for example, an ultraviolet-ray curing-type acryl-based pressure-sensitive-adhesive composition which includes one or more monomer components including the above-mentioned alkyl (meth)acrylate and/or a partially polymerized product of the monomer component(s), and which also includes the colorant compound (furthermore, the ultraviolet absorbent) and one or more photopolymerization initiators. The pressure-sensitive-adhesive layer, which is formed by ultraviolet-polymerizing the ultraviolet-ray curing-type acryl-based pressure-sensitive-adhesive composition, can also be formed as a layer as thick as 150 μm or more. Thus, pressure-sensitive-adhesive layers having a thickness in a broad range can be favorably formed.

[0194]

The photopolymerization initiator(s) at this time preferably include(s) a photopolymerization initiator (A) having an absorption band in wavelengths of 400 nm or more. In a case where ultraviolet polymerization is performed when the pressure-sensitive-adhesive composition contains the colorant compound (furthermore, the ultraviolet absorbent), the colorant compound (furthermore, the ultraviolet absorbent) unfavorably absorbs ultraviolet rays so that the polymerization may not be sufficiently attained. However, the photopolymerization initiator (A),

which has an absorption band in wavelengths from 400 nm or more, allows to attain the polymerization sufficiently even when the composition contains the colorant compound (furthermore, the ultraviolet absorbent).

[0195]

Examples of the photopolymerization initiator (A), which has an absorbing band in wavelengths of 400 nm or more, include bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide (IRGACURE 819, manufactured by BASF), and 2,4,6-trimethylbenzoyl-diphenyl-phosphine oxide (LUCIRIN TPO, manufactured by BASF).

[0196]

Such photopolymerization initiators (A), which each have an absorbing band in wavelengths of 400 nm or more, may be used singly or in the form of a mixture of two or more thereof.

[0197]

The addition amount of the photopolymerization initiator(s) (A), which (each) has/have an absorbing band in wavelengths of 400 nm or more, is not particularly limited, and is preferably smaller than that of the colorant compound (furthermore, the ultraviolet absorbent). The addition amount is preferably from about 0.005 to 1 part by weight, more preferably from about 0.02 to 0.8 part by weight for 100 parts by weight of the monofunctional

monomer(s), from which the (meth)acryl-based polymer is made. When the addition amount of the photopolymerization initiator(s) (A) is in any one of these ranges, the ultraviolet polymerization can be favorably advanced.

[0198]

When the pressure-sensitive-adhesive layer includes the colorant compound (furthermore, the ultraviolet absorbent) and ultraviolet polymerization is performed therefor, it is preferred to add a photopolymerization initiator (B) having an absorption band in wavelengths less than 400 nm earlier to the monomer component(s); irradiate ultraviolet rays thereto to yield a partially polymerized product (prepolymer composition) of the monomer component(s), in which the monomer component(s) has/have been partially polymerized; and then add, to this product, the above-mentioned photopolymerization initiator (A), which has an absorption band in wavelengths of 400 nm or more, and the colorant compound (furthermore, the ultraviolet absorbent) to ultraviolet-polymerize the resultant. When the photopolymerization initiator (A), which has an absorption band in wavelengths of 400 nm or more, is added to the partially polymerized product (prepolymer composition) of the monomer component(s), in which the monomer component(s) has/have been partially polymerized, it is preferred to attain this addition after

the photopolymerization initiator is dissolved into the monomer(s).

[0199]

A rubber-based polymer is preferable as a base-polymer, besides the acryl-based polymer. The rubber-based polymer includes: a conjugated diene-based polymer obtained by polymerizing one kind of conjugated diene compound, a conjugated diene-based copolymer obtained by polymerizing two or more kinds of conjugated diene compounds, and a conjugated diene-based copolymer obtained by copolymerizing a conjugated diene compound and an aromatic vinyl compound. The hydrogenated products thereof are also preferably usable. The diene-based copolymers may be random copolymers or may be block copolymers. In addition, a diene-based copolymer may be obtained by copolymerizing a compound except the conjugated diene compound and the aromatic vinyl compound.

[0200]

Specific examples of such conjugated diene-based (co)polymer include a butadiene rubber (BR), an isoprene rubber (IR), a styrene-butadiene copolymer (SBR), a butadiene-isoprene-styrene random copolymer, an isoprene-styrene random copolymer, a styrene-isoprene block copolymer (SIS), a butadiene-styrene copolymer, a styrene-ethylene-butadiene block copolymer (SEBS), and an

acrylonitrile-butadiene rubber (NBR). The (co) polymers may be used alone or in combination thereof. Thereamong, an isoprene-styrene copolymer is preferred. In addition, hydrogenated products thereof may be suitably used.

[0201]

(Silane Coupling Agent)

Furthermore, the pressure-sensitive-adhesive composition of the present invention may contain a silane coupling agent. The blend amount of the silane coupling agent is preferably 1 part or less by weight, more preferably from 0.01 to 1 part by weight, even more preferably from 0.02 to 0.6 part by weight for 100 parts by weight of the base-polymer (for example, the above (meth)acryl-based polymer).

[0202]

Examples of the silane coupling agent include epoxy-group-containing silane coupling agents such as 3-glycidoxypropyltrimethoxysilane, 3-glycidoxypropyltriethoxysilane, 3-glycidoxypropylmethyldiethoxysilane, and 2-(3,4-epoxycyclohexyl)ethyltrimethoxysilane; amino-group-containing silane coupling agents such as 3-aminopropyltrimethoxysilane, N-2-(aminoethyl)-3-aminopropylmethyldimethoxysilane, 3-triethoxysilyl-N-(1,3-dimethylbutylidene)propylamine, and N-phenyl- γ -

aminopropyltrimethoxysilane; (meth)acrylic-group-containing silane coupling agents such as 3-acryloxypropyltrimethoxysilane, and 3-methacryloxypropyltriethoxysilane; and isocyanate-group-containing silane coupling agents such as 3-isocyanatopropyltriethoxysilane.

[0203]

(Crosslinking Agent)

The pressure-sensitive-adhesive composition of the present invention may contain a crosslinking agent. Examples of the crosslinking agent include isocyanate-based crosslinking agents, epoxy-based crosslinking agents, silicone-based crosslinking agents, oxazoline-based crosslinking agents, aziridine-based crosslinking agents, silane-based crosslinking agents, alkyl-etherified melamine-based crosslinking agents, metal chelate-based crosslinking agents, and peroxide crosslinking agents. These crosslinking agents may be used singly or in any combination of two or more thereof. Thereamong, isocyanate-based crosslinking agents are preferred.

[0204]

The crosslinking agents may be used singly or in the form of a mixture of two or more thereof. The content of the whole of the crosslinking agent(s) is preferably 5 parts or less by weight, more preferably from 0.01 to 5

parts by weight, even more preferably from 0.01 to 4 parts by weight, in particular preferably from 0.02 to 3 parts by weight for 100 parts by weight of the monofunctional monomer component(s), from which the (meth)acryl-based polymer is made.

[0205]

The isocyanate-based crosslinking agents each denote a compound having, in a single molecule thereof, two or more isocyanate groups (the groups may be isocyanate-reproducing type functional groups yielded by protecting isocyanate groups temporarily with a blocking agent or temporarily through, for example, multimer conversion thereof). Examples of the isocyanate crosslinking agents include aromatic isocyanates such as tolylene diisocyanate and xylene diisocyanate; alicyclic isocyanates such as isophorone diisocyanate; and aliphatic isocyanates such as hexamethylene diisocyanate.

[0206]

More specific examples thereof include lower aliphatic polyisocyanates such as butylene diisocyanate and hexamethylene diisocyanate; alicyclic isocyanates such as cyclopentylene diisocyanate, cyclohexylene diisocyanate, and isophorone diisocyanate; aromatic diisocyanates such as 2,4-tolylene diisocyanate, 4,4'-diphenylmethane diisocyanate, xylylene diisocyanate, and polymethylene

polyphenyl isocyanate; isocyanate adducts such as a trimethylolpropane-tolylene diisocyanate trimer adduct (trade name: CORONATE L, manufactured by NIPPON POLYURETHANE INDUSTRY CO., LTD.), a trimethylolpropane-hexamethylene diisocyanate trimer adduct (trade name: CORONATE HL, manufactured by NIPPON POLYURETHANE INDUSTRY CO., LTD.), and an isocyanurate of hexamethylene diisocyanate (trade name: CORONATE HX, manufactured by NIPPON POLYURETHANE INDUSTRY CO., LTD.); a trimethylolpropane adduct of xylylene diisocyanate (trade name: D110N, manufactured by Mitsui Chemicals, Inc.) and a trimethylolpropane adduct of hexamethylene diisocyanate (trade name: D160N, manufactured by Mitsui Chemicals, Inc.); polyether polyisocyanate and polyester polyisocyanate; adducts thereof with various polyols; and polyisocyanates polyfunctionalized with an isocyanurate bond, a biuret bond, an allophanate bond, or the like.

[0207]

(Other Additives)

The pressure-sensitive-adhesive composition of the present invention may contain, besides the above-mentioned components, an appropriate additive in accordance with the use of the composition. Examples thereof include tackifiers (each made of a material that is in a solid, semi-solid or liquid form at room temperature and that is

made of, for example, a rosin derivative resin, a polyterpene resin, a petroleum resin or an oil-soluble phenol resin); fillers such as hollow glass balloons; plasticizers; antiaging agents; antioxidants; and light stabilizers (HALS).

[0208]

In the present invention, it is preferred to adjust the pressure-sensitive-adhesive composition into a viscosity at which the composition is properly worked, for example, the composition is properly applied onto a substrate. The adjustment of the viscosity of the pressure-sensitive-adhesive composition is attained, for example, by adding, to the composition, for example, a polymer or polyfunctional monomer that may be of various types, such as a tackifying additive, or by polymerizing the monomer component(s) partially in the pressure-sensitive-adhesive composition. The partial polymerization may be performed before or after the addition of the polymer or polyfunctional monomer, which may be of various types and may be a tackifying additive. The viscosity of the pressure-sensitive-adhesive composition is varied in accordance with the quantity of the additive, or other factors. Thus, when the monomer component(s) in the pressure-sensitive-adhesive composition is/are partially polymerized, the polymerization rate thereof cannot be

determined without reservation. As a guide, the polymerization rate is preferably about 20% or less, more preferably from about 3 to 20%, even more preferably from about 5 to 15%. If the polymerization rate is more than 20%, the composition becomes too high in viscosity not to be easily applied onto a substrate.

[0209]

(Method for Forming Pressure-Sensitive-Adhesive Layer)

The method for forming the pressure-sensitive-adhesive layer is not particularly limited, and may be any method usable ordinarily in the present field. Specifically, the pressure-sensitive-adhesive layer may be formed by applying the pressure-sensitive-adhesive composition onto at least a single surface of a substrate, and then drying an applied film made of the pressure-sensitive-adhesive composition or then radiating an active energy ray, such as an ultraviolet ray, onto the composition. The pressure-sensitive-adhesive layer formed on the substrate may also be transferred onto, for example, a polarizing film.

[0210]

The substrate is not particularly limited. Examples thereof include a release film, a transparent resin film substrate, and other various substrates. A polarizing film that will be detailed later is also usable suitably for the

substrate.

[0211]

The constituent material of the release film is, for example, a plastic film such as a polyethylene, polypropylene, polyethylene terephthalate or polyester film, a porous material such as paper, cloth or nonwoven fabric, a net, a foamed sheet or a metal foil piece; a laminate composed of two or more of these examples; or any other appropriate thin sheet piece. The plastic film is preferred since the film is excellent in surface smoothness.

[0212]

Examples of the plastic film include a polyethylene film, a polypropylene film, a polybutene film, a polybutadiene film, a polymethylpentene film, a polyvinyl chloride film, a vinyl chloride copolymer film, a polyethylene terephthalate film, a polybutylene terephthalate film, a polyurethane film, and an ethylene-vinyl acetate copolymer film.

[0213]

The thickness of the release film is usually from about 5 to 200 μm , preferably from about 5 to 100 μm . As required, the release film may be subjected to a release treatment and an anti-pollution treatment with a silicone, fluoride, long-chain alkyl, or fatty acid amide release

agent, a silica powder or the like, or subjected to an antistatic treatment of coating type, kneading and mixing type, vapor-deposition type, or the like. When a surface of the release film is appropriately subjected, particularly, to release treatment such as silicone treatment, long-chain alkyl treatment or fluorine treatment, the release film can be made higher in releasability from the pressure-sensitive adhesive layer.

[0214]

The transparent resin film substrate is not particularly limited, and may be a resin film which has transparency and may be of various types. The resin film is a single-layer film. Examples of the material of the film include polyester-based resins such as polyethylene terephthalate and polyethylene naphthalate, acetate-based resins, polyethersulfone-based resins, polycarbonate-based resins, polyamide-based resins, polyimide-based resins, polyolefin-based resins, (meth)acryl-based resins, polyvinyl chloride-based resins, polyvinylidene chloride resins, polystyrene resins, polyvinyl alcohol-based resins, polyarylate-based resins, and polyphenylene sulfide-based resins. Thereamong, particularly preferred are polyester-based resins, polyimide-based resins and polyethersulfone-based resins.

[0215]

The thickness of the film substrate is preferably from 15 μm to 200 μm , more preferably from 25 μm to 188 μm .
[0216]

The method for applying the pressure-sensitive-adhesive composition onto the substrate is not particularly limited, and may be an appropriate known method, such as roll coating, kiss roll coating, gravure coating, reverse coating, roll brushing, spray coating, dip roll coating, bar coating, knife coating, air knife coating, curtain coating, lip coating, or a die coater.
[0217]

When the pressure-sensitive-adhesive layer is formed by drying an applied film made of the pressure-sensitive-adhesive composition, conditions (temperature and period) for the drying are not particularly limited. The conditions may be appropriately set in accordance with the composition, and the concentration of the pressure-sensitive-adhesive composition, and other factors. The temperature is, for example, from about 60 to 170°C, preferably from 60 to 150°C, and the period is from 1 to 60 minutes, preferably from 2 to 30 minutes.
[0218]

When the pressure-sensitive-adhesive composition is an ultraviolet-ray curing-type pressure-sensitive-adhesive composition and an applied film made of the pressure-

sensitive-adhesive composition is irradiated with ultraviolet rays to form a layer, the illuminance of the radiated ultraviolet rays is preferably 5 mW/cm² or more. If the illuminance of the ultraviolet rays is less than 5 mW/cm², the polymerization reaction period may become long to deteriorate the layer in productivity. The illuminance of the ultraviolet rays is preferably 200 mW/cm² or less. If the illuminance of the ultraviolet rays is more than 200 mW/cm², the photopolymerization initiator is abruptly consumed so that the polymer may be lowered in molecular weight. Consequently, the holding strength may be lowered, particularly, at high temperatures. The integrated value of the ultraviolet rays is preferably from 100 to 5000 mJ/cm².

[0219]

An ultraviolet lamp used in the present invention is not particularly limited, and is preferably an LED lamp. The LED lamp is a lamp lower in radiated heat than other ultraviolet lamps. Thus, the LED lamp allows to control the temperature of the pressure-sensitive-adhesive layer in the polymerization into a low level. Consequently, the polymer can be prevented from being lowered in molecular weight, and the pressure-sensitive-adhesive layer can be prevented from being lowered in cohesive strength. Additionally, when the pressure-sensitive-adhesive

composition is made into a pressure-sensitive adhesive sheet, the holding strength at high temperatures can be made high. Plural ultraviolet lamps may be combined with each other. The ultraviolet rays may be intermittently radiated to set a period when the ultraviolet rays are radiated and a period when no ultraviolet rays are radiated.

[0220]

In the present invention, the final polymerization rate of the monomer component(s) in the ultraviolet-ray curing-type pressure-sensitive-adhesive composition is preferably 90% or more, more preferably 95% or more, even more preferably 98% or more.

[0221]

In the present invention, the wavelength of a peak of the ultraviolet rays radiated to the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition is in a range preferably from 200 nm to 500 nm, more preferably from 300 nm to 450 nm. If the peak wavelength of the ultraviolet rays is more than 500 nm, the photopolymerization initiator may not be decomposed so that no polymerization reaction is initiated. If the peak wavelength of the ultraviolet rays is less than 200 nm, the polymer chain may be cleaved so that the resultant may be lowered in adhesive property.

[0222]

The reaction is hindered by oxygen in air. Thus, in order to shut out oxygen, it is preferred to form, for example, a release film onto an applied film made of the ultraviolet-ray-curing-type acryl-based pressure-sensitive-adhesive composition, or to conduct the photopolymerization reaction in the atmosphere of nitrogen. The release film may be a release film as described above. When the release film is used, this release film may be used, as it is, as a separator for a pressure-sensitive-adhesive layer attached polarizing film.

[0223]

When the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition used in the present invention contains a colorant compound (furthermore, an ultraviolet absorbent), it is preferred to produce the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition by radiating ultraviolet rays to a composition which includes one or more monomer components including an alkyl (meth)acrylate and the photopolymerization initiator (B) (referred to also as "pre-addition polymerization initiator") to produce a partially polymerized product of the monomer component(s), and then adding, to the partially polymerized product of the monomer component(s), a colorant compound (furthermore, an ultraviolet absorbent) and a

photopolymerization initiator (A) having an absorption band in wavelengths of 400 nm or more (referred to also as "post-addition polymerization initiator"). The polymerization rate of the partially polymerized product is preferably about 20% or less, more preferably from about 3 to 20%, even more preferably from about 5 to 15%. Conditions for radiating the ultraviolet rays are as described above.

[0224]

When a pressure-sensitive-adhesive layer is formed as described above, using the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition containing the colorant compound (furthermore, the ultraviolet absorbent), the polymerization rate of the monomer component(s) can be raised and further the pressure-sensitive-adhesive layer that has been finally formed can be improved in ultraviolet absorbing function by polymerizing the component(s) at two stages as described above.

[0225]

The thickness of the pressure-sensitive-adhesive layer is preferably 12 μm or more, more preferably 50 μm or more, even more preferably 100 μm or more, in particular preferably 150 μm or more. The upper limit value of the thickness of the pressure-sensitive-adhesive layer is not particularly limited, and is preferably 1 mm or less. If

the thickness of the pressure-sensitive-adhesive layer is more than 1 mm, the layer does not transmit ultraviolet rays easily so that a long time is required for the polymerization of the monomer component(s). Additionally, problems are caused against the workability of the layer, the winding thereof in the process, and the transportability thereof so that the productivity may be unfavorably poor.

[0226]

The gel fraction in the pressure-sensitive-adhesive layer of the present invention is not particularly limited, and is preferably 35% or more, more preferably 50% or more, even more preferably 75% or more, in particular preferably 85% or more. If the gel fraction in the pressure-sensitive-adhesive layer is small, the layer may undergo problems against the workability and handleability.

[0227]

About the pressure-sensitive-adhesive layer, the haze value is preferably 2% or less, more preferably from 0 to 1.5%, even more preferably from 0 to 1.0% when the thickness thereof is 25 μm . When the haze is in any one of these ranges, the pressure-sensitive-adhesive layer favorably has a high transparency.

[0228]

When the pressure-sensitive adhesive layer is

exposed, the pressure-sensitive adhesive layer may be protected by a release film until it is actually used.

[0229]

(1-2) Polarizing Film

The above-mentioned polarizing film may be a polarizing film having a polarizer, and a transparent protective film on at least one surface of the polarizer.

[0230]

(1-2-1) Polarizer 4

The polarizer is not particularly limited, and may be a polarizer of various types. For example, the polarizer may be a product produced by a process including adsorbing a dichroic material such as iodine or a dichroic dye to a hydrophilic polymer film such as a polyvinyl alcohol-based film, a partially-formalized polyvinyl alcohol-based film, or a partially-saponified, ethylene-vinyl acetate copolymer-based film and uniaxially stretching the film, or may be a polyene-based oriented film such as a film of a dehydration product of polyvinyl alcohol or a dehydrochlorination product of polyvinyl chloride. Among these polarizers, a polarizer including a polyvinyl alcohol-based film and a dichroic material such as iodine is preferred. The thickness of these polarizers is not particularly limited, and is generally from about 5 to 80 μm .

[0231]

The polarizer yielded by dyeing a polyvinyl alcohol based film with iodine, and then stretching the resultant uniaxially may be produced, for example, by immersing a polyvinyl alcohol into an aqueous solution of iodine to dye the polyvinyl alcohol, and then stretching the resultant into a length 3 to 7 times the original length. If necessary, the polyvinyl alcohol may also be immersed in an aqueous solution of potassium iodide or the like optionally containing boric acid, zinc sulfate, zinc chloride, or other materials. If necessary, the polyvinyl alcohol-based film may be further immersed in water for washing before it is dyed. If the polyvinyl alcohol-based film is washed with water, dirt and any anti-blocking agent can be cleaned from the surface of the polyvinyl alcohol-based film, and the polyvinyl alcohol-based film can also be allowed to swell so that unevenness such as uneven dyeing can be effectively prevented. The film may be stretched before, while, or after it is dyed with iodine. The film may also be stretched in an aqueous solution of boric acid, potassium iodide, or the like or in a water bath.

[0232]

In the present invention, a thin polarizer of 10 μm or less thickness may be used. For making the polarizing film thinner, the thickness is preferably from 1 to 7 μm .

Such a thin polarizer is preferred in the point that the polarizer is small in thickness unevenness, excellent in visibility, and small in dimension change to be excellent in endurance and further the thickness of the polarizing film is also made smaller.

[0233]

Typical examples of the thin polarizer include thin polarizing membranes described in JP-A-S51-069644, JP-A-2000-338329, WO2010/100917 pamphlet, WO2010/100917 pamphlet, JP-B1-4751481, and JP-A-2012-73563. These thin polarizing membranes can each be yielded by a producing method including the step of stretching a polyvinyl alcohol-based resin (hereinafter referred to as a PVA-based resin) and a resin substrate for stretching in a laminated state, and the step of dyeing the laminate. This producing method makes it possible to stretch the laminate, even when PVA-based resin layer is thin, without causing any inconvenience, such as breaking, by the stretching based on the supporting of the PVA-based resin layer on the resin substrate for stretching.

[0234]

The thin polarizing membranes are preferably polarizing membranes each yielded by the following producing method, among producing methods including the step of stretching the members concerned in the laminate

state and the step of dyeing the laminate, since the laminate can be stretched into a large stretch ratio to improve the resultant in polarizing performance: a producing method including the step of stretching the laminating in an aqueous solution of boric acid, as is described in WO 2010/100917 pamphlet, WO2010/100917 pamphlet, JP-B1-4751481, or JP-A-2012-073563; and the membranes are in particular preferably membranes each yielded by a producing method including the step of stretching the laminate supplementally in the air before the stretching in the aqueous solution of boric acid, as is described in JP-B1-4751481, or JP-A-2012-073563.

[0235]

(1-2-2) Transparent Protective Film 3

The transparent protective film 3 used in the present invention is a film arranged on the viewing side of the polarizer 4. However, a transparent protective film may be arranged on the organic electroluminescent panel side of the polarizer 4.

[0236]

As the transparent protective film, a transparent protective film that has been conventionally used is appropriately usable. Specific examples of the transparent protective film preferably include transparent protective films made from a material (base-polymer) excellent in

transparency, mechanical strength, thermal stability, water blocking performance, isotropy, and others. Examples of the material include polyester-based polymers such as polyethylene terephthalate, and polyethylene naphthalate; cellulose-based polymers such as diacetylcellulose, and triacetylcellulose; acryl-based polymers such as polymethyl methacrylate; styrene-based polymers such as polystyrene, and acrylonitrile/styrene copolymer (AS resin); and polycarbonate-based polymers. Other examples of the material for forming the transparent protective film include polyethylene, polypropylene, cyclic or norbornene-structure-containing polyolefins, polyolefin-based polymers such as ethylene/propylene copolymer, vinyl chloride-based polymers, amide-based polymers such as nylon and aromatic polyamides, imide-based polymers, sulfone-based polymers, polyethersulfone-based polymers, polyetheretherketone-based polymers, polyphenylene sulfide-based polymers, vinyl alcohol-based polymers, vinylidene chloride-based polymers, vinylbutyral-based polymers, arylate-based polymers, polyoxymethylene-based polymers, and epoxy-based polymers; and blends of two or more of these polymers. The transparent protective film may also be formed in the form of a cured layer of a thermosetting resin or an ultraviolet-ray-curing-type resin of, for example, acryl-based, urethane-based, acrylic urethane-based, epoxy-based

or silicone-based resin.

[0237]

The thickness of the protective film may be appropriately determined, and is generally from about 1 to 500 μm from the viewpoint of the strength, the handleability and other workabilities, the thin film property, and other properties of the film.

[0238]

(1-2-3) Adhesive Layer

The polarizer and the transparent protective film are usually bonded to each other through, for example, a water-based adhesive. Examples of the water-based adhesive include isocyanate-based adhesives, polyvinyl alcohol-based adhesives, gelatin-based adhesives, vinyl-containing latex-based adhesives, water-based polyurethanes, and water-based polyesters. The adhesive for the polarizer and the transparent protective film is, besides these adhesives, an ultraviolet-ray curing-type adhesive, or an electron-beam curing-type adhesive. The electron-beam curing-type adhesive for polarizing films shows an adhesion suitable for the above-mentioned various viewing side transparent protective films. A metal compound filler may be incorporated into the adhesive used in the present invention.

[0239]

(1-2-4) Surface-Treatment-Layer: Functional Layer

A functional layers such as a hard coat layer, anti-reflection layer and sticking-prevention layer may be formed onto the surface of the transparent protective film onto which no polarizer is bonded. A treatment for diffusion or anti-glaring may be applied onto the surface of the transparent protective film onto which no polarizer is bonded.

[0240]

The hard coat layer is preferably a cured coat film made of a curing-type resin such as a melamine-based resin, a urethane-based resin, an alkyd-based resin, an acryl-based resin or a silicone-based resin. The curing-type resin is used as a active energy ray-curable compound which has a functional group containing at least one polymerizable double bond in the molecule. The thickness of the hard coat layer is preferably from 0.1 to 30 μm .

[0241]

A light stabilizer (HALS) and/or an antioxidant may be added to one or more of the function layers.

[0242]

(1-3) Retardation Film 5

As the retardation film, a retardation film satisfying the following relationship is selected in accordance with various use of the polarizing film to be

used: $n_x = n_y > n_z$, $n_x > n_y > n_z$, $n_x > n_y = n_z$, $n_x > n_z > n_y$, $n_z = n_x > n_y$, $n_z > n_x > n_y$, or $n_z > n_x = n_y$ in which n_x represents the refractive index of the film in the slow axis direction thereof; n_y represents the refractive index thereof in the fast axis direction in the plane; and n_z represents the refractive index in the thickness direction. The case of $n_x = n_y$ includes not only a case where n_x and n_y are completely equal to each other but also a case where n_x and n_y are substantially equal to each other. Moreover, the case of $n_y = n_z$ includes not only a case where n_y and n_z are completely equal to each other but also a case where n_y and n_z are substantially equal to each other.

[0243]

In the present invention, the retardation film is preferably a quarter wavelength plate in which $1/4$ wavelength (about 100 nm to 170 nm) is set to the front-surface retardation, so as to be used in the organic electroluminescent display device. When the polarizing film and the quarter wavelength plate are laminated onto each other, the resultant favorably functions as a circularly polarizing film for anti-reflection of the organic electroluminescent display device.

[0244]

Specifically, about external light radiated into this organic electroluminescent display device, the polarizing

film transmits only its linearly polarized component. This linearly polarized ray generally turns to an elliptically polarized ray through the retardation film. When the retardation plate is, particularly, a quarter wavelength plate and further the angle made between the polarizing film and the retardation film is $\pi/4$, the linearly polarized ray turns to a circularly polarized ray.

[0245]

This circularly polarized ray is transmitted through the transparent substrate, transparent electrode and organic thin film in the organic electroluminescent panel, and then reflected on a metal electrode therein to be again transmitted through the organic thin film, transparent electrode and transparent substrate. Subsequently, the ray again turns to a linearly polarized ray through the retardation film. This linearly polarized ray is orthogonal to the polarization direction of the polarizing film, so that this ray cannot be transmitted through the polarizing plate. As a result, a mirror plane of the metal electrode can be completely shielded.

[0246]

Examples of the retardation film include a birefringent film yielded by subjecting a polymer material to uniaxial or biaxial stretching treatment, an aligned film of a liquid crystal polymer, and a product in which an

aligned layer of a liquid crystal polymer is supported on a film.

[0247]

Examples of the polymeric material (base-polymer) include polyvinyl alcohol, polyvinyl butyral, polymethyl vinyl ether, polyhydroxyethyl acrylate, hydroxyethylcellulose, hydroxypropylcellulose, methylcellulose, polycarbonate, polyarylate, polysulfone, polyethylene terephthalate, polyethylene naphthalate, polyether sulfone, polyphenylene sulfide, polyphenylene oxide, polyallyl sulfone, polyamide, polyimide, polyolefin, polyvinyl chloride, cellulose resin, cycloolefin resin; and various binary and ternary copolymers of two or three of these resins, and graft copolymers and blends of two or more of these resins. These polymeric materials are each subjected to, for example, stretching, so as to be turned to an aligned product (stretched film).

[0248]

The liquid crystal polymer (base-polymer) may be a polymer that may be of various main-chain or side-chain types, for example, in which a group (mesogen) of conjugated linear atoms that gives liquid crystal alignment is introduced into a main chain or side chain of a polymer. Specific examples of the main-chain type liquid crystal polymer include a nematic-aligning polyester liquid crystal

polymer, a discotic polymer, and a cholesteric polymer which each have a structure in which a mesogen group is bonded to a main chain through a space moiety for giving bendability. Specific examples of the side-chain type liquid crystal polymer include polymers in each of which a main chain skeleton is a polysiloxane, polyacrylate, polymethacrylate or polymalonate, and the main chain has, as a side chain, a mesogen moiety made of nematic-alignment-supplying para-substituted cyclic compound units to interpose, therebetween, a spacer moiety made of a group of conjugated atoms. These liquid crystal polymers are each obtained, for example, by applying rubbing treatment to an outer surface of a thin film formed on a glass plate and made of, for example, polyimide or polyvinyl alcohol, or by developing a liquid crystal polymer solution onto an aligned surface of obliquely vapor-deposited silicon oxide, and then subjecting the resultant to thermal treatment.

[0249]

(1-4) Pressure-Sensitive Adhesive Layer 6, or Interlayer Pressure-Sensitive Adhesive Layer (or Adhesive Layer)

The pressure-sensitive adhesive layer 6 (pressure-sensitive adhesive layer on the organic EL panel side), which is used in the present invention, may be equivalent to an interlayer pressure-sensitive adhesive layer (or adhesive layer), or the pressure-sensitive adhesive layer

of the above-mentioned pressure-sensitive adhesive/adhesive layer. The pressure-sensitive adhesive layer 6 is preferably, out of such layers, an acryl-based pressure-sensitive adhesive layer formed using a (meth)acryl-based pressure-sensitive adhesive composition containing, as a base polymer thereof, a (meth)acryl-based polymer. The pressure-sensitive adhesive layer 6 is also preferably a rubbery pressure-sensitive adhesive layer formed using a rubbery pressure-sensitive adhesive composition containing, as a base polymer thereof, a rubbery polymer. A method for producing the pressure-sensitive adhesive layer, preferred embodiments thereof, and other factors of the layer may also be equivalent to those of the above-mentioned interlayer pressure-sensitive adhesive layer or the like.

[0250]

The thickness of the pressure-sensitive adhesive layer is not particularly limited, and is preferably from about 10 to 75 μm , more preferably from about 12 to 50 μm .

[0251]

(1-5) Other Layers

The transparent protective film (on the organic EL panel side) is, for example, a film equivalent to the transparent protective film 3. As the first pressure-sensitive adhesive layer (or adhesive layer) on the organic EL panel side, any pressure-sensitive adhesive layer or

adhesive layer in the document DESCRIPTION is preferably usable.

[0252]

<<Transmittance of Optical Member>>

At a wavelength of 380 nm, the transmittance of the optical member (each layers) which is formed by the composition of the present invention is preferably 15% or less, more preferably 10% or less, even more preferably 7% or less, in particular preferably 3% or less. When the transmittance at the wavelength of 380 nm is in any one of the ranges, the optical member can block ultraviolet rays radiated thereinto at a higher level, so that the organic electroluminescent element can be remarkably restrained from being deteriorated.

[0253]

At a wavelength of 400 nm, the transmittance of the optical member (each layers) which is formed by the composition of the present invention is preferably 15% or less, more preferably 10% or less, even more preferably 7% or less, in particular preferably 3% or less. When the transmittance at the wavelength of 400 nm is in any one of the ranges, the optical member can block ultraviolet rays radiated thereinto at a higher level, so that the organic electroluminescent element can be remarkably restrained from being deteriorated.

[0254]

On the other hand, at a wavelength of 440 nm, the transmittance of the optical member (each layers) which is formed by the composition of the present invention is preferably 60% or more, more preferably 75% or more, even more preferably 85% or more. When the transmittance at the wavelength of 440 nm is in any one of the ranges, the optical member can sufficiently transmit light emitted from the organic electroluminescent element, so that the organic electroluminescent display device can favorably ensure a sufficient display performance.

[0255]

<<Transmittance of Optical Laminate>>

At a wavelength of 380 nm, the transmittance of the optical laminate is preferably 9% or less, more preferably 7% or less, even more preferably 5% or less, in particular preferably 3% or less. When the transmittance at the wavelength of 380 nm is in any one of the ranges, the optical laminate can block ultraviolet rays radiated thereinto at a higher level. Thus, favorably, the organic electroluminescent element can be remarkably restrained from being deteriorated.

[0256]

At a wavelength of 400 nm, the transmittance of the optical laminate is preferably 20% or less, more preferably

15% or less, even more preferably 10% or less. When the transmittance at the wavelength of 400 nm is in any one of the ranges, the optical laminate can block ultraviolet rays radiated thereinto at a higher level. Thus, favorably, the organic electroluminescent element can be remarkably restrained from being deteriorated.

[0257]

At a wavelength of 440 nm, the transmittance of the optical laminate is preferably 25% or more, more preferably 30% or more, even more preferably 33% or more. When the transmittance at the wavelength of 440 nm is in any one of the ranges, the optical laminate can sufficiently transmit light emitted from the organic electroluminescent element, so that the organic electroluminescent display device can favorably ensure a sufficient display performance.

[0258]

<<Organic Electroluminescent Display Device>>

The organic electroluminescent display device of the present invention is a display device including an optical laminate 1 and an organic electroluminescent panel, and may include other layers. Specifically, as illustrated in Fig. 2, the display device may be an organic electroluminescent display device 10 in which a cover member 7/a pressure-sensitive-adhesive or adhesive layer 2/a protective film 3/a polarizer 4/a retardation film 5/a pressure-sensitive-

adhesive layer 6/an organic electroluminescent panel 8 are laminated onto each other in this order from the viewing side of the display device. The display device may be an organic electroluminescent display device in which the cover member 7/the pressure-sensitive-adhesive or adhesive layer 2/the (viewing side) protective film 3/the polarizer 4/an organic electroluminescent panel side protective film/an organic electroluminescent panel side first pressure-sensitive-adhesive layer (or adhesive layer)/the retardation film 5/the (organic electroluminescent panel side second) pressure-sensitive-adhesive layer 6/the organic electroluminescent panel 8 are laminated onto each other in this order from the viewing side of the display device. The display device may have a structure including, besides these layers or members, for example, functional layers such as a hard coat layer, an anti-glare layer and anti-reflection layer, a sensor layer, and a pressure-sensitive-adhesive layer or adhesive layer for laminating any two of these layers onto each other.

[0259]

The cover member is not particularly limited, and is preferably a cover member used ordinarily in the present field. Examples thereof include a cover glass, and a cover plastic. The organic electroluminescent panel is not particularly limited, and may be an organic

electroluminescent panel used ordinarily in the present field. An example thereof is a panel having a substrate, plural organic electroluminescent elements arranged side by side on the substrate, a protective layer laid on the organic electroluminescent elements, and a sealing film laid on the protective layer.

[0260]

Hereinafter, a description will be made about a case where an optical member containing a compound represented by the general formula (1) in the present invention is used for a transparent conductive film. The transparent conductive film includes a transparent substrate film, and a transparent conductive layer.

[0261]

As illustrated in Fig. 3, a transparent conductive film 20 is, for example, a laminate in which a transparent conductive layer 22/an intermediate layer 23/a transparent substrate film 21 are laminated in this order. The intermediate layer 23 may be laid at will. Examples of the intermediate layer include a refractive index adjusting layer, an adhesion facilitating layer, a hard coat layer, and a cracking preventing layer. The intermediate layer may be at least one selected from these layers. The optical member containing a compound represented by the general formula (1) in the present invention may be used as

the transparent substrate film or intermediate layer for forming the transparent conductive film. In the transparent conductive film 20, an anti-blocking layer 24 may be laid on a side of the transparent substrate film 21 on which the transparent conductive layer 22 is not laid. The anti-blocking layer is usable as an optical member containing a compound represented by the general formula (1) in the present invention.

[0262]

When the transparent conductive film 20 has the intermediate layer 23 and the anti-blocking layer 24, for example, embodiments described below can be given.

Embodiment 1: Transparent conductive layer 22/intermediate layer 23 (refractive index adjusting layer)/transparent substrate film 21/anti-blocking layer 24.

Embodiment 2: Transparent conductive layer 22/intermediate layer 23 (refractive index adjusting layer/hard coat layer)/transparent substrate film 21/anti-blocking layer 24.

Embodiment 3: Transparent conductive layer 22/intermediate layer 23 (crack preventing layer)/transparent substrate film 21/anti-blocking layer 24.

Embodiment 4: Transparent conductive layer

22/intermediate layer 23 (crack preventing layer/adhesion facilitating layer)/transparent substrate film 21/anti-blocking layer 24.

Embodiment 5: Transparent conductive layer

22/intermediate layer 23 (refractive index adjusting layer/hard coat layer/adhesion facilitating layer)/transparent substrate film 21/anti-blocking layer 24.

[0263]

In the transparent conductive film, the optical member containing a compound represented by the general formula (1) in the present invention is preferably used as the transparent substrate film or the intermediate layer configured to form the transparent conductive film. When the optical member containing a compound represented by the general formula (1) in the invention is applied to an anti-blocking layer, the optical member may not unfavorably keep excoiation resistance easily by an inconvenience against close adhesion of anti-blocking particles into the anti-blocking layer.

[0264]

(2-1) Transparent substrate film 21

Examples of the material (base-polymer) used to form the transparent substrate film include, but are not limited to, various transparent plastic materials. Examples of

such materials (base-polymer) include polyester resins such as polyethylene terephthalate and polyethylene naphthalate, acetate resins, polyethersulfone resins, polycarbonate resins, polyamide resins, polyimide resins, polyolefin resins, polycycloolefin resins such as polynorbornene resin, (meth)acryl-based resins, polyvinyl chloride resins, polyvinylidene chloride resins, polystyrene resins, polyvinyl alcohol resins, polyarylate resins, and polyphenylene sulfide resins. Among them, polycycloolefin resins, polyester resins, polycarbonate resins, and polyolefin resins are particularly preferred.

[0265]

The thickness of the transparent substrate film is, generally, preferably from 30 to 250 μm , more preferably from 45 to 200 μm .

[0266]

(2-2) Transparent Conductive Layer 22

The constituent material of the transparent conductive layer is not particularly limited, and may be a metal oxide of at least one metal selected from the group consisting of indium, tin, zinc, gallium, antimony, titanium, silicon, zirconium, magnesium, aluminum, gold, silver, copper, palladium, and tungsten. The metal oxide may optionally include any one of the metal atoms described in this group. Preferred is the use of, for example,

indium oxide including tin oxide (ITO) or tin oxide including antimony (ATO).

[0267]

The thickness of the transparent conductive layer is not particularly limited. In order to render this layer a continuous coat having a good conductivity to set the surface resistance thereof to $1 \times 10^3 \Omega/\square$ or less, the thickness is set preferably to 10 nm or more. If the film thickness is too large, this layer undergoes a lowering in transparency, and others. Thus, the thickness is preferably from 15 to 35 nm, more preferably from 20 to 30 nm.

[0268]

The method for forming the transparent conductive layer is not particularly limited, and may be a method known in the prior art. Specific examples thereof include vacuum evaporation, sputtering, and ion plating methods. In accordance with a required thickness of the film, an appropriate method may also be adopted. After the transparent conductive layer is formed, if necessary, the transparent conductive layer may be crystallized by annealing in the range of 100 to 150° C.

[0269]

(2-3-1) Intermediate Layer 23: Refractive Index-Adjusting Layer

The refractive index-adjusting layer may be made of an inorganic material, an organic material or a mixture of an inorganic material and an organic material. Examples of the inorganic material include NaF (1.3), Na_3AlF_6 (1.35), LiF (1.36), MgF_2 (1.38), CaF_2 (1.4), BaF_2 (1.3), SiO_2 (1.46), LaF_3 (1.55), CeF_3 (1.63), and Al_2O_3 (1.63), wherein each number inside the parentheses is the refractive index of each material. Examples of the organic material include acrylic resins, urethane resins, melamine resins, alkyd resins, siloxane polymers, and organosilane-based condensates. These organic materials may be used as a base-polymer. At least one of these organic materials may be used.

[0270]

The refractive index-adjusting layer may have nano-fine particles having an average particle diameter of 1 nm to 500 nm, preferably 5 to 300 nm. The content of nano-fine particles in the refractive index-adjusting layer is preferably 0.1 to 90% by weight, more preferably 10 to 80% by weight, even more preferably 20 to 70% by weight. By including nano-fine particles in the refractive index-adjusting layer, the refractive index of the refractive index-adjusting layer itself can be easily adjusted.

[0271]

Examples of the inorganic oxide that forms nano-fine

particles include fine particles of silicon oxide (silica), hollow nano-silica, titanium oxide, aluminum oxide, zinc oxide, tin oxide, and zirconium oxide, or the like.

Thereamong, fine particles of silicon oxide (silica), titanium oxide, aluminum oxide, zinc oxide, tin oxide, and zirconium oxide are preferred. These may be used alone, or used in combination of two or more thereof.

[0272]

The thickness of the refractive index-adjusting layer is generally, but not limited to, preferably from 10 to 200 nm, more preferably from 20 to 150 nm, even more preferably from 20 to 130 nm, in view of optical design and the effect of preventing the release of an oligomer from the transparent substrate film.

[0273]

(2-3-2) Intermediate Layer 23: Hard Coat Layer

The hard coat layer is made from a coating liquid containing an organic component (base polymer) and others. The hard coat layer is made from a coating liquid containing an organic component (base polymer) and others. By the formation of the hard coat layer, local and excessive irregularities are buried. This matter allows to make the transparent conductive layer high in surface uniformity to make the transparent conductive film high in bending resistance.

[0274]

The thickness of the hard coat layer is, but not limited to, preferably 0.5 μ m or more and 300 μ m or less, more preferably 0.8 μ m or more and 2 μ m or less.

[0275]

An ultraviolet-ray-curing-type resin, a thermosetting resin, and a thermoplastic resin or the like are used as the organic component without particular limitation. From the viewpoint of a fast processing speed, and suppressing thermal damage of the transparent substrate film, the ultraviolet-ray-curing-type resin is particularly preferably used. For example, a curable compound having at least one of an acrylate group and a methacrylate group which is curable by light (ultraviolet rays) can be used as such an ultraviolet-ray-curing-type resin. Examples of the curable compound include a silicone resin, a polyester resin, a polyether resin, an epoxy resin, an urethane resin, an alkyd resin, a spiroacetal resin, a polybutadiene resin, a polythiol-polyene resin, and oligomers or prepolymers of acrylate and methacrylate or the like of a multifunctional compound such as a polyhydric alcohol. These may be used alone or in a combination of two or more of them.

[0276]

The hard coat layer may contain an inorganic

component. Examples of the inorganic component include fine particles or fine powder made of inorganic oxide such as silicon oxide (silica), titanium oxide, aluminum oxide, zinc oxide, tin oxide, and zirconium oxide or the like. From the viewpoints of the coloring prevention and transparency of the hard coat layer, the inorganic component is preferably nanoparticles having a mode diameter of 1 nm to 100 nm, more preferably nanoparticles having a mode diameter of 5 nm to 80 nm, and still more preferably nanoparticles having a mode diameter of 10 nm to 60 nm. Thus, the mode diameter of the nanoparticles is small, which prevents the scattering of the visible light. Even when the refractive index of the organic component is different from that of the nanoparticles, a large increase in the haze of the hard coat layer is suppressed.

[0277]

In addition to or instead of the nanoparticles, the hard coat layer may contain coarse particles larger in particle diameter than the nanoparticles to attain, for example, the control of the surface irregularities or optical properties of the layer. About the mode diameter of the coarse particles, it is necessary to consider a relationship between the diameter and the thickness of the hard coat layer. However, the particle diameter is preferably from 0.5 to 3.0 μm , more preferably from 1.0 to

2.5 μm , even more preferably from 1.5 to 2.0 μm .

[0278]

In addition to the organic component, the inorganic component and the coarse particles, various additives may be added to a forming material for the hard coat layer. Examples of the additives include a polymerization initiator for curing the organic component to form the hard coat layer, a levelling agent, a pigment, a filler, a dispersing agent, a plasticizer, an ultraviolet absorbent, a surfactant, an antioxidant, and a thixotropic agent. The forming material for the hard coat layer may appropriately contain a solvent.

[0279]

(2-3-3) Intermediate Layer 23: Crack Preventing Layer

The crack preventing layer may be, for example, a layer described as a cured resin layer in JP-A-2017-224269. Also when the transparent substrate film is large in thickness, the crack preventing layer can prevent the transparent conductive layer from being cracked so that the latter layer can exhibit expected electric properties.

[0280]

The thickness of the crack preventing layer is not particularly limited, and is 150 nm or less, more preferably from about 20 to 100 nm, more preferably from 30 to 50 nm from the viewpoint of the moist heat resistance,

the effect of preventing the generation of an oligomer from the transparent resin film 1, and optical properties thereof. When two or more crack preventing layers 2 are laid, the thickness of each of the layers is from about 20 to 60 nm, preferably from 25 to 55 nm.

[0281]

The crack preventing layer may be, for example, a crack preventing layer obtained by curing a resin composition containing an epoxy resin having a weight-average molecular weight of 1500 or more. The epoxy resin is preferably a rubber-modified epoxy resin. This case allows to give toughness and impact resistance suitably to the crack preventing layer. A rubber component for modifying the epoxy resin is not particularly limited, and examples thereof include butadiene rubber, acrylonitrile butadiene rubber, styrene-butadiene rubber, butyl rubber, nitrile rubber, natural rubber, isoprene rubber, chloroprene rubber, ethylene-propylene rubber, urethane rubber, silicone rubber, fluorine-contained rubber, ethylene-vinyl acetate rubber, and epichlorohydrin rubber. Out of the examples, butadiene rubber is preferred from the viewpoint of the toughness and the chemical resistance thereof. Such rubber-modified epoxy resins may be used singly or in any combination of two or more thereof.

[0282]

The resin composition preferably contains a curing promoter. This case allows to advance curing reaction of the epoxy resin promptly and sufficiently to form a cured product layer high in film strength. The curing promoter is not particularly limited, and examples thereof include zinc, copper, iron, antimony and other organic metal salts or metal chelates of an organic acid such as octanoic acid, stearic acid, acetylacetonate, naphthenic acid, or salicylic acid. The curing promoter in particular preferably contains antimony. The antimony-containing curing promoter can advance the curing reaction of the resin composition promptly and sufficiently to form a stronger cured product film efficiently. Such curing promoters may be used singly or in any combination of two or more thereof.

[0283]

The content of the curing promoter(s) is not particularly limited, and is preferably from 0.005 to 5 parts by weight, more preferably from 0.01 to 4 parts by weight, even more preferably from 0.01 to 1 part by weight for the total amount (100 parts by weight) of compounds having an epoxy group and contained in the resin composition. If the content of the curing promoter(s) is below the lower limit, the curing promoting effect may become insufficient.

[0284]

Besides the epoxy resin, for example, the following may be appropriately blended into the resin composition: acrylic resin, urethane resin, amide resin, or silicone resin. Various additives may also be added to the resin composition. Examples of the additives include a levelling agent, a pigment, a filler, a dispersing agent, a plasticizer, an ultraviolet absorbent, a surfactant, an antioxidant, and a thixotropic agent.

[0285]

(2-3-4) Intermediate Layer 23: Adhesion Facilitating Layer

As the base-polymer constitutes the adhesion facilitating layer, examples of the resin that may be used include various resins having a polyester skeleton, a polyether skeleton, a polycarbonate skeleton, a polyurethane skeleton, a silicone resin-based, a polyamide skeleton, a polyimide skeleton, or a polyvinyl alcohol skeleton. These polymer resin may be used alone or in a combination of two or more of them.

[0286]

In the formation of the adhesion facilitating layer, additives may be added to the above-mentioned base polymer. Specifically, for example, a tackifier, an ultraviolet agent, a heat resistant stabilizer, and other stabilizers may be further used. The thickness of the adhesion

facilitating layer is preferably from 0.01 to 20 μm .

[0287]

(2-4) Anti-blocking Layer 24

The anti-blocking layer is a cured product layer of a resin composition including a binder resin (base polymer) and particles, and has, on the outer surface thereof, flat portions and protrusion portions. These portions allows the layer to exhibit handleability and low reflective property at a high level. The thickness of the flat portions of the anti-blocking layer is not particularly limited, and is preferably from 200 nm or more and 30 μm or less, more preferably 500 nm or more and 10 μm or less, even more preferably 800 nm or more and 5 μm or less.

[0288]

The mode diameter of particles can be appropriately set in consideration of the size of the protrusion portion of the outermost surface layer, the thickness of the flat portion of the anti-blocking layer and so on, and is not particularly limited. From the viewpoint of sufficiently imparting blocking resistance to the transparent conductive film and sufficiently suppressing light scattering and so on, the mode diameter of particles is preferably 500 nm or more and 30 μm or less, more preferably 800 nm or more and 20 μm or less, more preferably 1 μm or more and 10 μm or less. The "mode diameter" as used herein refers to a

particle diameter showing a maximum value in the particle distribution, and can be determined by making a measurement under predetermined conditions (Sheath liquid: ethyl acetate, measurement mode: HPF measurement, measurement method: total count) using a flow-type particle image analyzer (manufactured by Sysmex Corporation, trade name "FPIA-3000S"). Particles are diluted to 1.0% by weight with ethyl acetate, and uniformly dispersed using an ultrasonic cleaning machine, and the dispersion thus obtained is used as a measurement sample.

[0289]

The height of the protrusion portions is set, considering, for example, a required slippage of the layer. The height of the protrusion portions, that is, portions projected upward from the flat portions of the anti-blocking layer is controllable in accordance with, for example, the thickness of the flat portions of the anti-blocking layer, and the mode diameter of the particles therein. The height of the protrusion portions is preferably 100 nm or more and 3 μm or less, more preferably 200 nm or more and 2 μm or less, even more preferably 300 nm or more and 1.5 μm or less. When the height of the protrusion portions is set into any one of the ranges, the anti-blocking layer can satisfy anti-blocking performance for the transparent conductive film, and can simultaneously

restrain light scattering and light-polarization-cancelling sufficiently.

[0290]

Particles may be either polydisperse particles or monodisperse particles, but monodisperse particles are preferred when ease of giving a protrusion portion and anti-light scattering performance are considered. In the case of monodisperse particles, the particle diameter of particles and the mode diameter can be considered substantially identical.

[0291]

The content of particles in the anti-blocking layer is preferably 0.01 to 5 parts by weight, more preferably 0.02 to 1 parts by weight, further preferably 0.05 to 0.5 parts by weight based on 100 parts by weight of solid content of the resin composition.

[0292]

As a binder resin of a resin composition that forms the anti-blocking layer, one which is capable of dispersing particles, has a sufficient strength as a film after formation of the anti-blocking layer and has transparency can be used without particular limitation. Examples of the binder resin to be used include a thermosetting resin, a thermoplastic resin, an ultraviolet-ray curing-type resin, an electron-beam curing-type resin and a two-component

mixing type resin, and among them, an ultraviolet-ray curing-type resin is preferred with which a film can be formed efficiently by a simple processing operation of a curing treatment by ultraviolet-ray irradiation.

[0293]

Examples of the ultraviolet-ray curing-type resin include various kinds such as polyester-based, acryl-based, urethane-based, amide-based, silicone-based and epoxy-based ultraviolet-ray curing-type resins, which include ultraviolet-ray curing-type monomers, oligomers and polymers. Examples of the ultraviolet-ray curing-type resin that is preferably used include those having an ultraviolet-ray polymerizable functional group, particularly those containing an acryl-based monomer or oligomer component having 2 or more, particularly 3 to 6 such functional groups. Further, the ultraviolet-ray curing-type resin contains an ultraviolet-ray polymerization initiator.

[0294]

For the resin composition, additives such as a leveling agent, a thixotropy agent, an antistatic agent, a plasticizer, a surfactant, an antioxidant agent, a curing catalyst, and an ultraviolet absorbent can be used in addition to the aforementioned materials. Use of a thixotropy agent is advantageous for formation of

protruding particles in a fine unevenness-shaped surface. It is preferred that the content of these additives is normally about 15 parts or less by weight, preferably 0.01 to 15 parts by weight based on 100 parts by weight of the ultraviolet-ray curing-type resin. The resin composition that forms the anti-blocking layer appropriately may contain a solvent.

[0295]

For particles that are contained in the anti-blocking layer 2, those having transparency, such as various kinds of metal oxides, glass and plastic, can be used without particular limitation. Examples thereof include inorganic particles such as silica, alumina, titanium, zirconia and calcium oxide, crosslinked or uncrosslinked organic particles formed of various kinds of polymers such as polymethyl methacrylate, polystyrene, polyurethane, acryl-based resins, acryl-styrene copolymers, benzoguanamine, melamine and polycarbonate, and silicone-based particles. One kind or two or more kinds of particles can be appropriately selected from the aforementioned particles, and used, but organic particles are preferred. As organic particles, acryl-based resins are preferred in terms of a refractive index.

EXAMPLES

[0296]

Hereinafter, the present invention will be specifically described by way of working examples thereof. However, the invention is not limited by these working examples. In each of the examples, the word "part(s)" and the symbol "%" are part(s) by weight and % by weight, respectively, unless special description thereabout are made.

[0297]

Machines and measuring conditions used when physical properties of yielded compounds in the following description are measured are as follows:

(GC-MS): Gas chromatographic mass spectrometer GCMS-QP2010 Plus (EI method), manufactured by Shimadzu Corp.

(LC/MS): High performance liquid chromatographic mass spectrometer LCMS-2010EV (ESI method), manufactured by Shimadzu Corp.

[0298]

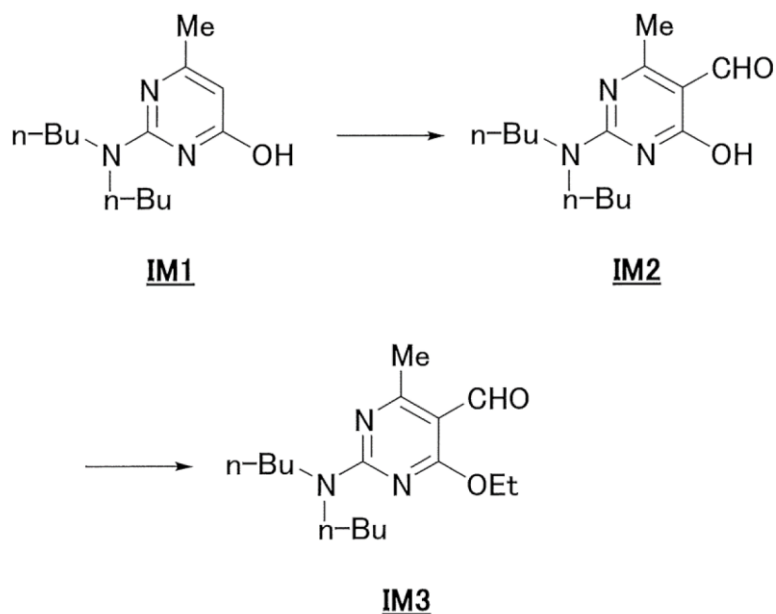
<Production Example 1>

Synthesis of Compounds IM3, IM5 and IM6

A compound IM3 was synthesized by a method described below. A reaction formula therefor is illustrated below.

[0299]

[formula 15]



[0300]

(Synthesis of Compound IM2)

In a 1-L four-necked flask equipped with a condenser and a thermometer, a compound IM1 was yielded in the same way in a synthesis of 2-dimethylamino-4-hydroxy-6-methylpyridine described in Journal of American Chemical Society 1954, 76, 1879 except that a sulfate salt of N,N-dimethylguanidine was substituted with a hydrochloride salt of 1,1-dibutylguanidine described in BE639386. The compound IM1 was used to be formylated by Reimer-Tiemann reaction in accordance with the same procedure as in the method described in Journal of the Chemical Society 1957, 4845 to yield a compound IM2 (18.4 g; yield: 69%).

GC-MS: $m/z = 265 ([M]^+)$

[0301]

(Synthesis of Compound IM3)

In a 100-mL four-necked flask equipped with a condenser and a thermometer, a mixed liquid of the following was stirred at 70°C for 3 hours, and then naturally cooled to room temperature: the compound IM2 (15.8 g), ethyl iodide (14 g) (manufactured by Tokyo Chemical Industry Co., Ltd.), potassium carbonate (14 g), and dimethylformamide (DMF) (60 mL). The reaction liquid was discharged into water (300 mL) and the resultant liquid was subjected to extraction with toluene (300 mL). The organic phase was concentrated under reduced pressure to yield the compound IM3 (17.3 g; yield: 99%).

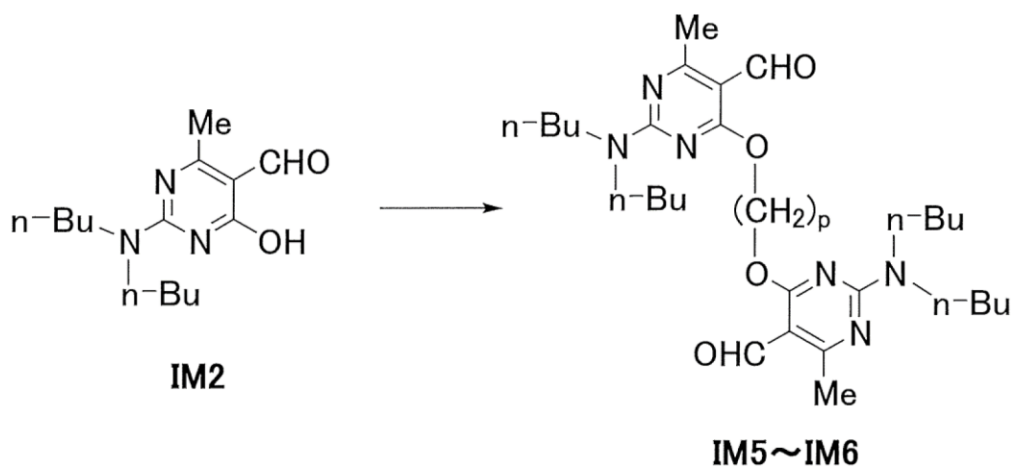
GC-MS: $m/z = 293$ ($[M]^+$)

[0302]

Compounds IM5 and IM6 were synthesized by methods described below. A reaction formula therefor is illustrated below. A compound about which p in a formula illustrated below is 5 is the compound IM5, and one about which p in the formula is 6 is the compound IM6.

[0303]

[formula 16]



[0304]

(Synthesis of Compound IM5)

Into a 50-mL four-necked flask equipped with a condenser and a thermometer were charged the compound IM2 (2.7 g), 1,5-dibromopentane (1.1 g) (manufactured by Tokyo Chemical Industry Co., Ltd.), potassium carbonate (1.7 g) and DMF (20 mL), and the liquid was stirred at 80°C for 2.5 hours. The reaction liquid was discharged into water, and the precipitated crystal was filtrated and taken off. This crystal was washed with methanol to yield 2.1 g of the compound IM5 (yield: 71%).

[0305]

(Synthesis of Compound IM6)

The compound IM6 was yielded (yield: 82%) in the same way in the synthesis of the compound IM5 except that 1,5-dibromopentane was changed to 1,6-dibromohexane (manufactured by Tokyo Chemical Industry Co., Ltd.).

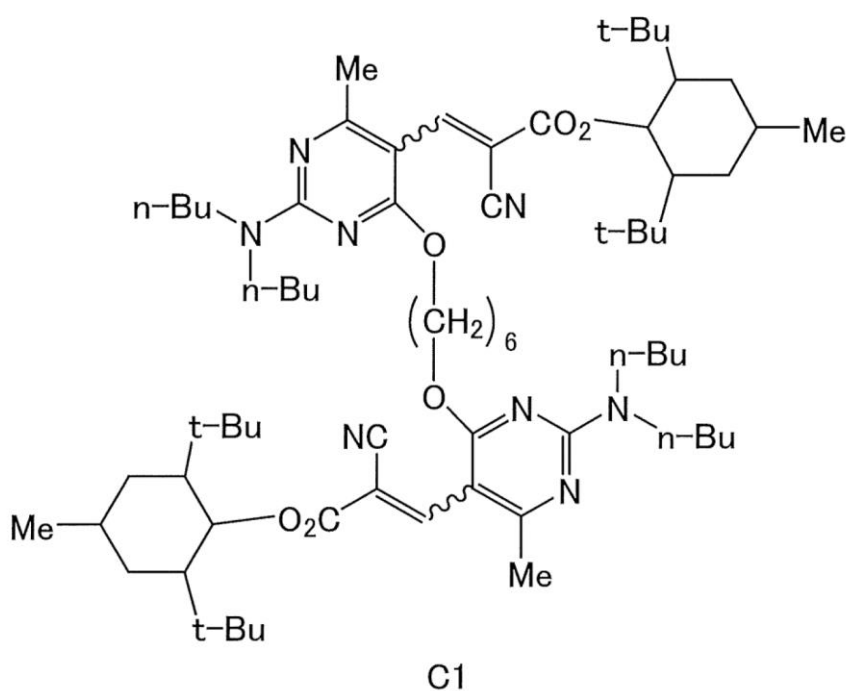
[0306]

<Production Example 2>

Compounds C1 to C5 were synthesized. The compound C1 is a compound represented by a formula illustrated below.

[0307]

[formula 17]

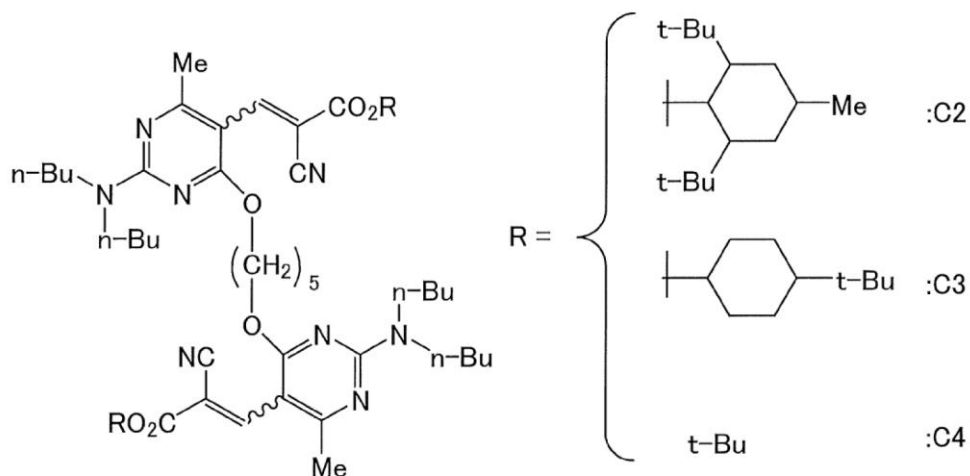


[0308]

Compounds C2 to C4 are compounds represented by formulae illustrated below. In the compound C2, R in the formula is a 2,6-di-*t*-butyl-4-methylcyclohexyl group. In the compound C3, R in the formula is a 4-*t*-butylcyclohexyl group. In the compound C4, R in the formula is a *t*-butyl group.

[0309]

[formula 18]

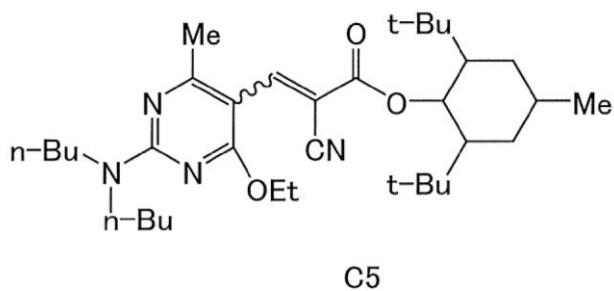


[0310]

The compound C5 is a compound represented by the formula illustrated below.

[0311]

[formula 19]

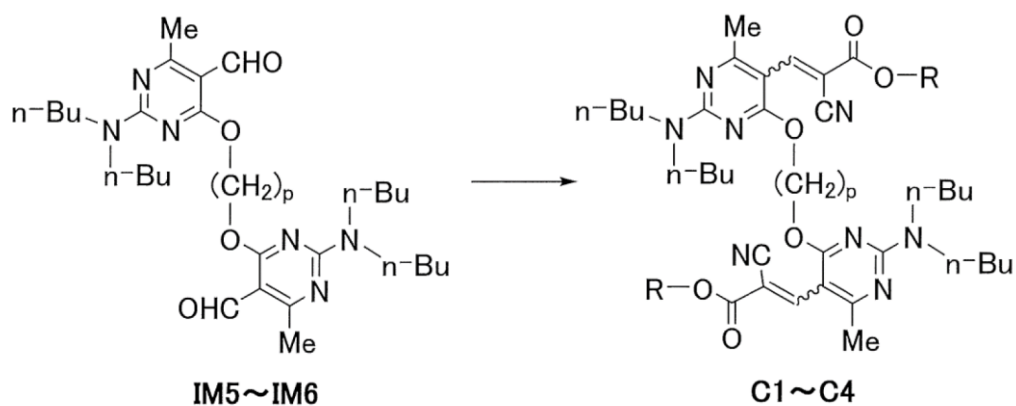


[0312]

A reaction formula through which each of the compounds C1 to C4 was yielded is illustrated below. In Table 1 are shown p in the formula and the corresponding compounds. Respective structures of the compounds IM12, IM13 and IM14 are illustrated below.

[0313]

[formula 20]



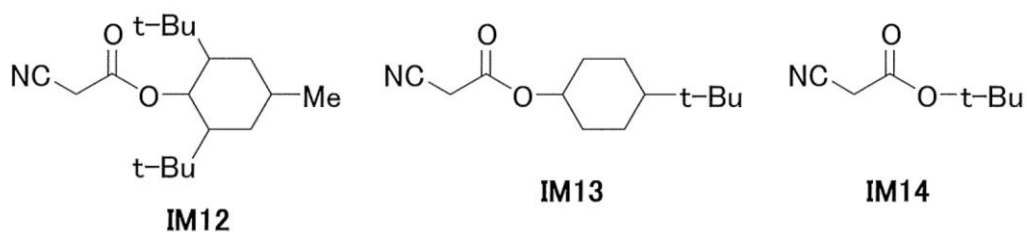
[0314]

[Table 1]

The number of p in formula	IM5 - IM6	IM12 - IM14	C1 - C4
5	Compound IM5	Compound IM12	Compound C2
5	Compound IM5	Compound IM13	Compound C3
5	Compound IM5	Compound IM14	Compound C4
6	Compound IM6	Compound IM12	Compound C1

[0315]

[formula 21]



[0316]

(Synthesis of Compound C1)

In a 50-mL four-necked flask equipped with a condenser and a thermometer, the following were mixed with each other, and the resultant liquid was stirred at 75°C

for 18 hours: the compound IM6 (2.0 g), the compound IM12 (2.0 g) synthesized in the same way as described in JP-A-2000-310841, piperidine (0.06 g) and ethanol (13 mL). The liquid was naturally cooled to room temperature, and the precipitated crystal was filtrated, taken off and washed with ethanol to yield the compound C1 (3.5 g; yield: 93%).

LC-MS: $m/z = 1164$ ($[M+H]^+$)

[0317]

(Synthesis of Compound C2)

The compound C2 was yielded (yield: 81%) in the same way as in the synthesis of the compound C1 except that the compound IM6 was changed to the compound IM5.

LC-MS: $m/z = 1150$ ($[M+H]^+$)

[0318]

(Synthesis of Compound C3)

The compound C3 was yielded (yield: 61%) in the same way as in the synthesis of the compound C1 except that the compound IM6 was changed to the compound IM5, and the compound IM12 was changed to a compound IM13 yielded in the same way as used to synthesize the compound IM12.

LC-MS: $m/z = 1010$ ($[M+H]^+$)

[0319]

(Synthesis of Compound C4)

The compound C4 was yielded (yield: 80%) in the same way as in the synthesis of the compound C1 except that the

compound IM6 was changed to the compound IM5, and the compound IM12 was changed to a compound IM14 (manufactured by Tokyo Chemical Industry Co., Ltd.).

LC-MS: $m/z = 846$ ($[M+H]^+$)

[0320]

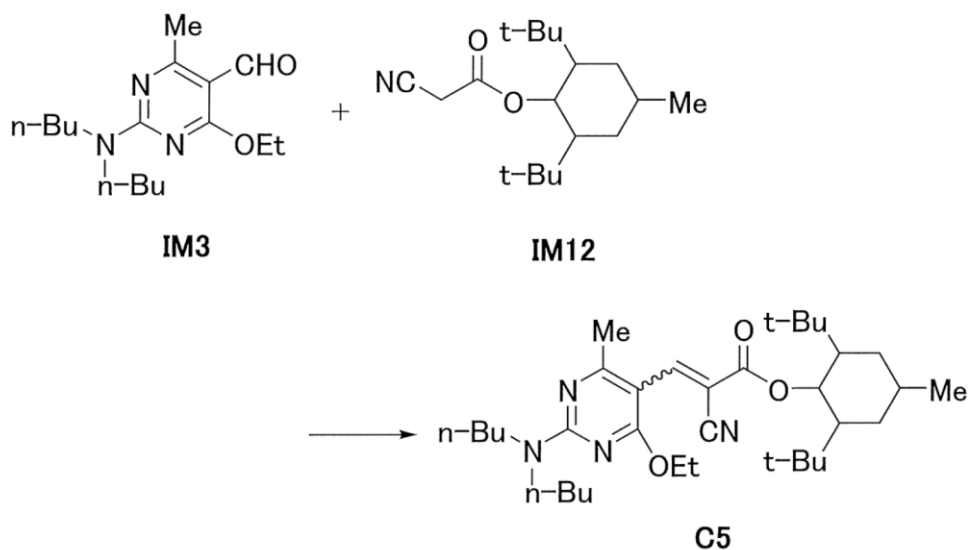
(Synthesis of Compound C5)

In a 25-mL four-necked flask equipped with a condenser and a thermometer, a mixed liquid of the compounds IM3 (1.2 g) and IM12 (1.5 g), piperidine (0.02 g) and ethanol (4 mL) was stirred at 75°C for 1 hour. The liquid was naturally cooled to room temperature, and the precipitated crystal was filtrated, and taken off. The resultant crystal was washed with ethanol to yield 1.9 g (yield: 80%) of the compound C5. A reaction formula therefor is illustrated below.

LC-MS: $m/z = 569$ ($[M+H]^+$)

[0321]

[formula 22]

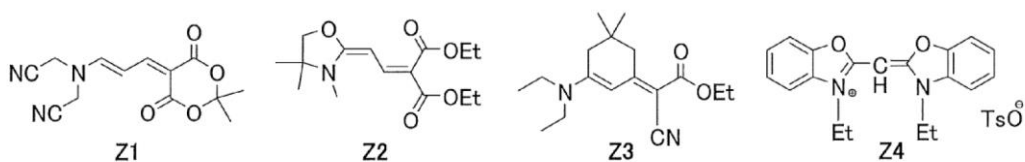


[0322]

<Comparative Production Example (Comparative Example Compound)>

[0323]

[formula 23]



[0324]

(Synthesis of Comparative Example Compound Z1)

A comparative example compound Z1 was yielded in the same way as described in JP-A-2011-184414.

[0325]

(Synthesis of Comparative Example Compound Z2)

A comparative example compound Z2 was yielded in the same way as described in JP-A-2014-194508.

[0326]

(Synthesis of Comparative Example Compound Z3)

[0327]

A comparative example compound Z3 was yielded in the same way as described in JP-A-2009-067973.

(Synthesis of Comparative Example Compound Z4)

A comparative example compound Z4 was yielded in the same way as described in US2986528.

[0328]

About the compounds yielded in each of the production examples, evaluations described below were made. The results are shown in Table 2.

<Spectral Characteristic Test>

The absorption spectrum of each of the compounds was measured in chloroform to make the absorption maximum wavelength ($\lambda_{\max}$), and the gram absorption coefficient thereof at 400 nm. The compound was then evaluated in a criterion described below.

Measuring instrument: Ultraviolet/visible ray spectrophotometer V-560, manufactured by JASCO Corp.

A: The gram absorption coefficient is 30 or more.

B: The gram absorption coefficient is 20 or more and less than 30.

C: The gram absorption coefficient is 10 or more and less than 20.

D: The gram absorption coefficient is less than 10.

[0329]

<Light Resistance Test>

Some of the compounds yielded in the production examples and the comparative production example were each subjected to a light resistance test. Into 5 mL of an 8%-by-weight polymethacrylate solution in toluene was dissolved 10 mg of each of the compounds, and the solution was applied onto a glass substrate by spin coating and then dried to produce a thin film of 1.5 μm in film thickness.

Light from a xenon lamp (142 kLux) was continuously radiated onto the produced thin film for 96 hours. A spectrophotometer was used to measure the transmittance of the thin film before the radiation (zero hours) and after the radiation. In accordance with the following equation (1), the colorant remaining rate thereof was measured:

$$\text{Colorant remaining rate (\%)} = \{(1 - T_1)/(1 - T_0)\} \times 100 \dots (1)$$

wherein T_0 is the transmittance before the radiation from the xenon lamp, T_1 is the transmittance after the radiation from the xenon lamp, and T_0 and T_1 are each from 0 to 1.

The "transmittance" denotes the transmittance of each of the compounds at the absorption maximum wavelength. It is demonstrated that as the compound is higher in colorant remaining rate, the compound is less easily decomposed by

light to be higher in light resistance.

The light resistance is evaluated in accordance with the following criterion:

A: The colorant remaining rate is 65% or more.

B: The colorant remaining rate is 40% or more, and less than 65%.

C: The colorant remaining rate is 10% or more, and less than 40%.

D: The colorant remaining rate is less than 10%.

[0330]

<Heat Resistance>

About some of the compounds yielded in the production examples and the comparative production example, an instrument TGA-50 for thermogravimetry manufactured by Shimadzu Corp. was used to measure a reduction of each of the compounds in weight by thermal decomposition under conditions described below. The temperature at which the weight of the compound was reduced by 1% from the initial weight was measured as the decomposition start temperature thereof.

(Measuring Conditions)

The conditions for the measurement were as follows:
the sample amount: 5 mg, the temperature-raising-rate:
10°C/minute (highest arrival temperature: 400°C),
atmosphere: nitrogen, and flow rate: 10 mL/minute.

The heat resistance was evaluated in accordance with the following criterion on the basis of the decomposition start temperature:

A: 250°C or higher,

B: 210°C or higher, and lower than 250°C, and

C: lower than 210°C.

[0331]

<Solubility Test>

About some of the compounds yielded in the production examples and the comparative production example, the solubility (% by weight) of each of the compounds was measured in each of toluene, methyl ethyl ketone (MEK), and propylene glycol monomethyl ether acetate (PGMEA) at 20°C by the following method:

Each of the compounds was weighed into a glass test tube, and each of the solvents was incorporated therein. The mixed components were stirred at 20°C to dissolve the compound. The state of the solution was visually observed to evaluate the concentration by weight of the compound at which the compound was soluble.

A: The compound is dissolved in a proportion of 3% or more by weight.

B: The compound is dissolved in a proportion of 1% or more and less than 3% by weight.

C: The compound is dissolved in only a proportion of

less than 1%.

[0332]

[Table 2]

Compound name	Absorption maximum wavelength (nm)	400 nm gram absorption coefficient	Light resistance	Heat resistance	Solubility		
					Toluene	MEK	PGMEA
C1	393	A	A	A	A	A	A
C2	393	A	A	A	A	A	A
C3	390	A	-	A	A	A	A
C4	387	A	-	-	A	A	A
C5	394	A	A	B	A	A	A
Z1	363	D	C	B	C	C	C
Z2	372	D	D	B	-	-	-
Z3	402	A	D	-	-	-	-
Z4	382	D	D	A	-	-	-

[0333]

From the results, it is understood that the respective compounds C1 to C5 produced in the production examples have an absorption maximum wavelength around 400 nm, and have a high gram absorption coefficient at 400 nm. These compounds are compounds which can absorb light rays around 400 nm. The compounds C1 to C5 are good in solubility in the organic solvents. Moreover, these compounds are also good in endurance. For example, the compounds C1 and C2 are excellent in all of light resistance, solubility and heat resistance.

[0334]

Production Example 3 (Production of Acryl-based Pressure-Sensitive-Adhesive Composition (a))

As photopolymerization initiators, the following were

blended into a monomer mixture of 76 parts by weight of 2-ethylhexyl acrylate (2EHA), 18 parts by weight of N-vinyl-2-pyrrolidone (NVP), and 16 parts by weight of 2-hydroxyethyl acrylate (HEA): 0.035 part by weight of 1-hydroxycyclohexyl phenyl ketone (trade name: IRGACURE 184, manufactured by BASF, which has an absorption band at wavelengths of 200 nm to 370 nm); and 0.035 part by weight of 2,2-dimethoxy-1,2-diphenylethane-1-one (trade name: IRGACURE 651, manufactured by BASF, which has an absorption band at wavelengths of 200 nm to 380 nm). Thereafter, ultraviolet rays were radiated to the blend until the viscosity (measuring conditions: 10 rpm and a measuring temperature of 30°C, using a BH viscometer and a No. 5 rotor) turned to about 20 Pa·s. In this way, a prepolymer composition in which the monomer components were partially polymerized was yielded (polymerization rate: 9%). Next, to the prepolymer composition were added 0.080 part by weight of hexanediol diacrylate (HDDA); and 0.3 part by weight of a silane coupling agent (trade name: KBM-403, manufactured by Shin-Etsu Chemical Co., Ltd.). These components were then mixed with each other to yield an acryl-based pressure-sensitive-adhesive composition (a).

[0335]

(Production of Pressure-Sensitive Adhesive Composition (A1))

To the acryl-based pressure-sensitive-adhesive composition (a) yielded in Production Example 3 (the amount of one or more monomer components for producing the acryl-based polymer was regarded as 100 parts by weight) were added 0.8 parts by weight of (solid weight) 2,4-bis-[[4-(4-ethylhexyloxy)-4-hydroxy]-phenyl]-6-(4-methoxyphenyl)-1,3,5-triazine (trade name: Tinosorb S, manufactured by BASF Japan Ltd.; "ultraviolet absorbent (b1) in Table 3; absorption maximum wavelength of an absorption spectrum thereof: 346 nm") dissolved to butyl acrylate to give a solid content of 15%; and 0.3 parts by weight of bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide (trade name: Irgacure 819, manufactured by manufactured by BASF Japan Ltd. and having an absorption band at wavelengths from 200 to 450 nm). The resultant was stirred to yield a pressure-sensitive adhesive composition (A1).

[0336]

(Production of Pressure-Sensitive Adhesive Layer (A1))

The pressure-sensitive adhesive composition (A1) was applied onto a release-treatment-applied film of a release film to give a thickness of 100 μm after this composition would be made into a pressure-sensitive adhesive layer. Next, a release film was bonded onto the outer surface of the pressure-sensitive adhesive composition layer. Thereafter, ultraviolet rays were radiated onto the

workpiece under conditions of an illuminance of 6.5 mW/cm², a light quantity of 2000 mJ/cm², and a peak wavelength of 350 nm to cure the pressure-sensitive adhesive composition layer optically. In this way, a pressure-sensitive adhesive layer (A1) was formed. The addition amount of the ultraviolet absorbent was 0.8% by weight of the acryl-based polymer (100% by weight) in the pressure-sensitive adhesive layer (A1).

[0337]

Production Example 4 (Production of Pressure-Sensitive-Adhesive Composition (B1))

Into a separable flask equipped with a thermostat, a stirrer, a reflux condenser, and a nitrogen gas introducing tube were charged 95 parts by weight of butyl acrylate, 5 parts by weight of acrylic acid, 0.2 part by weight of azobisisobutyronitrile as a polymerization initiator, and 233 parts by weight of ethyl acetate, and then nitrogen gas was caused to flow thereinto while the charged components were stirred. In this way, the flask was purged with nitrogen over 1 hour. Thereafter, the flask was heated to 60°C to cause the components to react with each other for 7 hours to yield an acryl-based polymer having a weight-average molecular weight (Mw) of about 1100000.

To the acryl-based polymer solution (the solid content therein was regarded as 100 parts by weight) were

added 0.8 part by weight of trimethylolpropane tolylene diisocyanate (trade name: CORONATE L, manufactured by Nippon Polyurethane Industry Co., Ltd.) as an isocyanate-based crosslinking agent, and 0.1 part by weight of a silane coupling agent (trade name: KBM-403, manufactured by Shin-Etsu Chemical Co., Ltd.) to prepare a pressure-sensitive-adhesive composition (solution).

[0338]

(Production of Pressure-Sensitive Adhesive Layer (B1))

The pressure-sensitive adhesive composition (B1: solution) was applied onto a separator having a thickness of 38 μm (release-film: polyethylene terephthalate-based film having a surface subjected to release treatment) to give a thickness of 15 μm after the composition would be dried. The composition was dried at 100°C for 3 minutes to remove the solvent to yield each pressure-sensitive adhesive layer. Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment.

Hereinafter, the resultant pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B1)". Another release film was bonded to the exposed surface of the pressure-sensitive adhesive layer.

[0339]

Production Example 5

(Production of Pressure-Sensitive Adhesive Layer (B2))

A pressure-sensitive adhesive layer was formed in the same way as in Production Example 4 except that in the production of the pressure-sensitive adhesive layers (B1) in Production Example 4, the applying was performed to set the thickness of the layer to 20 μm after the composition would be dried. Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment. Hereinafter, the resultant pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B2)".

[0340]

Example 1

(Production of Pressure-Sensitive Adhesive Composition (A1-1))

A pressure-sensitive adhesive composition (A1-1) was yielded in the same way as in Production Example 3 except that: in production of the pressure-sensitive adhesive composition (A1) in Production Example 3, the addition amount of bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide (trade name: Irgacure 819, manufactured by BASF Japan Ltd.) was changed to 0.6 parts by weight; and further 0.48 parts by weight of (solid weight) the colorant compound (C5) yielded in Production Example 2 "absorption maximum wavelength of an absorption spectrum thereof: 394 nm; full

width at the half maximum: 48.5 nm" was directly added to the other components, and then the resultant was stirred.

[0341]

(Production of Pressure-Sensitive Adhesive Layer (A1-1))

A pressure-sensitive adhesive layer (A1-1) was formed in the same way as in Production Example 1 except that: the pressure-sensitive adhesive composition (A1-1) was applied onto a release-treatment-applied film of a release film to give a thickness of 100 μm after the pressure-sensitive adhesive layer would be formed. The addition amount of the ultraviolet absorbent and that of the colorant compound (C5) were 0.8% by weight and 0.48% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (A1-1).

[0342]

Example 2

(Production of Pressure-Sensitive Adhesive Composition (A1-2))

A pressure-sensitive adhesive composition (A1-2) was yielded in the same way as in Production Example 3 except that: in the production of pressure-sensitive adhesive composition (A1) in Production Example 3, the ultraviolet absorbent was changed to 1.0 part by weight of (solid weight) 2-(2H-benzotriazole-2-yl)-6-1-(methyl-1-phenylethyl)-4-(1,1,3,3-tetramethylbutyl)phenol (trade

name: Tinuvin 928, manufactured by manufactured by BASF Japan Ltd.; "ultraviolet absorbent b2" in Table 3; absorption maximum wavelength of an absorption spectrum thereof: 349 nm); the addition amount of bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide (trade name: Irgacure 819, manufactured by manufactured by BASF Japan Ltd.) was changed to 0.6 parts by weight; and further 0.5 parts by weight of (solid weight) the colorant compound (C5) yielded in Production Example 2 was directly added to the other components, and then the resultant was stirred.

[0343]

(Production of Pressure-Sensitive Adhesive Layer (A1-2))

A pressure-sensitive adhesive layer (A1-2) was formed in the same way as in Production Example 1 except that: the pressure-sensitive adhesive composition (A1-2) was applied onto a release-treatment-applied film of a release film to give a thickness of 175 μm after the pressure-sensitive adhesive layer would be formed. The addition amount of the ultraviolet absorbent and that of the colorant compound (C5) were 1.0% by weight and 0.50% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (A1-2).

[0344]

Example 3

(Production of Pressure-Sensitive Adhesive Composition (B1-

1))

A pressure-sensitive adhesive composition (solution) was yielded in the same way as in Production Example 4 except that: in the production of the pressure-sensitive adhesive composition (B1) in Production Example 4, together with the isocyanate crosslinking agent and the silane coupling agent, 3.0 parts by weight (solid weight) of 2,2',4,4'-tetrahydroxybenzophenone (trade name: Seesorb 106, manufactured by manufactured by Shipro Kasei Kaisha, Ltd.; "ultraviolet absorbent b3" in Table 3; absorption maximum wavelength of an absorption spectrum thereof: 348 nm) as an ultraviolet absorbent were added to the acryl-based polymer solution (the weight of solid therein was regarded as 100 parts by weight); and further 3.0 parts by weight (solid weight) of the colorant compound (C1) yielded in Production Example 2 "absorption maximum wavelength: 393 nm; full width at the half maximum: 49.5 nm" were added to the other components.

[0345]

(Production of Pressure-Sensitive Adhesive Layer (B1-1))

The pressure-sensitive adhesive composition (B1-1: solution) was applied onto a separator having a thickness of 38 μm (polyethylene terephthalate-based film having a surface subjected to release treatment) to give a thickness of 15 μm after the composition would be dried. The

composition was dried at 100°C for 3 minutes to remove the solvent to yield pressure-sensitive adhesive layer. Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment. Hereinafter, the resultant pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B1-1)". The addition amount of the ultraviolet absorbent and that of the colorant compound (C1) were 3.0% by weight and 3.0% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (B1-1).

[0346]

Example 4

(Production of Pressure-Sensitive Adhesive Composition (B1-2))

A pressure-sensitive adhesive composition (solution) was yielded in the same way as in Production Example 3 except that in the production of the pressure-sensitive adhesive composition (B1-1) in Example 3, instead of the colorant compound (C1) yielded in Production Example 2, 3.0 parts by weight (solid weight) of the colorant compound (C2) yielded in Production Example 2 "absorption maximum wavelength of an absorption spectrum thereof: 393 nm; full width at the half maximum: 49.5 nm" was used.

[0347]

(Production of Pressure-Sensitive Adhesive Layer (B1-2))

A pressure-sensitive adhesive layer was formed in the same way as in Example 3 except that this pressure-sensitive adhesive composition (solution) was used, and the thickness of the composition after the drying thereof was set to 20 μm . Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment. Hereinafter, the pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B1-2)". The addition amount of the ultraviolet absorbent and that of the colorant compound (C2) were 3.0% by weight and 3.0% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (B1-2).

[0348]

Example 5

(Production of Pressure-Sensitive Adhesive Composition (B1-3))

A pressure-sensitive adhesive composition (solution) was yielded in the same way as in Example 3 except that in the production of the pressure-sensitive adhesive composition (B1-1) in Example 3, the ultraviolet absorbent (b3) was not added.

[0349]

(Production of Pressure-Sensitive Adhesive Layer (B1-3))

A pressure-sensitive adhesive layer was formed in the same way as in Example 3 except that this pressure-sensitive adhesive composition (solution) was used, and the thickness of the composition after the drying thereof was set to 20 μm . Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment. Hereinafter, the pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B2-2)". The addition amount of the colorant compound (C2) was 3.0% by weight of the acryl-based polymer (100% by weight) in the pressure-sensitive adhesive layer (B1-3).

[0350]

Comparative Example 2

(Production of Pressure-Sensitive Adhesive Composition (A1-3))

A pressure-sensitive adhesive composition was yielded in the same way as in Example 1 except that: in the production of the pressure-sensitive adhesive composition (A1-1) in Example 1, the use amount of the ultraviolet absorbent b1 was changed to 1.0 part by weight; and instead of the colorant compound (C5) yielded in Production Example 2, 0.45 parts by weight of a colorant compound (C6) ("BONASORB UA3911", manufactured by Orient Chemical Industries Co., Ltd.; absorption maximum wavelength of an absorption spectrum thereof: 395 nm in a solvent

chloroform; full width at the half maximum: 48 nm") were dissolved into N-vinyl-2-pyrrolidone (NVP) to give a concentration of 6% by weight, and then the resultant solution was added to the reaction system.

[0351]

(Production of Pressure-Sensitive Adhesive layer (A1-3))

A pressure-sensitive adhesive layer (A1-3) was formed in the same way as in Example 1, using this pressure-sensitive adhesive composition.

The addition amount of the ultraviolet absorbent and that of the colorant compound (C6) were 1.0% by weight and 0.45% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (A1-3).

[0352]

Comparative Example 3

(Production of Pressure-Sensitive Adhesive Composition (B1-4))

A pressure-sensitive adhesive composition was yielded in the same way as in Example 3 except that: in the production of the pressure-sensitive adhesive composition (B1-1) in Example 3, the use amount of the ultraviolet absorbent b3 was changed to 2.0 parts by weight; instead of the colorant compound (C1) yielded in Production Example 2, 2.5 parts by weight of the colorant compound (C6)

("BONASORB UA3911", manufactured by Orient Chemical Industries Co., Ltd.; absorption maximum wavelength of an absorption spectrum thereof: 395 nm in a solvent chloroform; full width at the half maximum: 48 nm") were dissolved into N,N-dimethylformamide to give a concentration of 10% by weight, and then the resultant solution was added to the reaction system; and the drying temperature was set to 100°C for 3 minutes and 155°C for 5 minutes.

[0353]

(Production of Pressure-Sensitive Adhesive Layer (B1-4))

A pressure-sensitive adhesive layer was formed in the same way as in Example 3 except that this pressure-sensitive adhesive composition (solution) was used, and the thickness of the composition after the drying thereof was set to 20 μm . Thereafter, the layer was heated at 50°C for 48 hours to conduct crosslinking treatment. Hereinafter, the pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B1-4)". The addition amount of the ultraviolet absorbent and that of the colorant compound (C6) were 2.0% by weight and 2.5% by weight of the acryl-based polymer (100% by weight), respectively, in the pressure-sensitive adhesive layer (B1-4).

[0354]

(Evaluations)

About the pressure-sensitive adhesive layers yielded in each of Examples 1 to 5, and Comparative Examples 2 and 3, evaluations described below were made. The results are shown in Tables 3 and 4. In Comparative Example 1, the evaluations were made, using the pressure-sensitive adhesive layers (A1) yielded in Production Example 3.

[0355]

<Measurement of Transmittance and Hue: Initial Values Thereof>

One of the release films of any one of the pressure-sensitive adhesive layers yielded in each of the working examples and the comparative examples was peeled off, and the remnant was bonded to a slide glass piece (trade name: Shiro Kenma No. 1, manufactured by Matsunami Glass Ind., Ltd.; thickness: 0.8 to 1.0 mm; total light ray transmittance: 92%; haze: 0.2%). Furthermore, the other release film was peeled off, and the remnant was bonded to the same slide glass piece and subjected to autoclave treatment (at 50°C and 0.5 MPa for 15 minutes) to produce a test piece having a layer structure of slide glass/pressure-sensitive adhesive layer/slide glass. A spectrophotometer (product name: U4100, manufactured by Hitachi High-Technologies Corp.) was used to measure the produced test piece. The transmittance thereof in a range

from 350 to 780 nm was measured (Table 3 shows the measured value at each of 380 nm, 400 nm, 420 nm, and 440 nm), and the following were also measured: the transmission Y value, the transmission hue (L^* , a^* , b^*) using a D65 light source, and the hue at a viewing angle of 2 degrees.

[0356]

<Reliability Evaluation>

The test piece measured at the initial stage by the above-mentioned method was put in an oven of 85°C temperature and 85% RH for 500 hours to make a heat resistance thereof. In the same way, the test piece was put in an ultraviolet fade tester (device name: ultraviolet fade meter tester U48, manufactured by Suga Test Instruments Co., Ltd.) to radiate ultraviolet rays thereto continuously for 100 hours to make a light resistance test. After the test, in the same way as used in the initial measurements, the test piece was measured about the transmission Y value, and the transmission hue (L^* , a^* , b^*). A calculation was made to gain a variation ΔY in Y value, and a variation ΔE^* in hue before and after the test. When $\Delta Y \leq 0.3$ and $\Delta E^* \leq 1.0$, the test piece is judged to pass the test (OK). When these variation values do not satisfy this condition, the test piece is judged not to pass the test (NG).

[0357]

<Adhesion>

From any one of the pressure-sensitive adhesive layers yielded in each of the working examples and the comparative examples, a sheet piece of 100 mm length and 20 mm width was cut off. Next, one of the release films of the pressure-sensitive adhesive layer was peeled off, and then a PET film (trade name: Lumirror S-10, manufactured by Toray Industries, Inc.; thickness: 25 μ m) was bonded to the release-film-peeled product (backing). Next, the other release film was peeled off, and the remnant was bonded under pressure to a glass plate (trade name: Sodium lime glass #0050, manufactured by Matsunami Glass Ind., Ltd.) as a test plate by one reciprocating movement of a 2-kg roller thereonto. In this way, a sample was produced which had a structure of test plate/pressure-sensitive adhesive layer/PET film. The resultant sample was subjected to autoclave treatment (at 50°C and 0.5 MPa for 15 minutes), and then naturally cooled in an atmosphere of 23°C temperature and 50% R.H. for 30 minutes. After the natural cooling, in accordance with JIS Z0237, a tensile tester (device name: Autograph AG-IS, manufactured by Shimadzu Corp.) was used to peel off the pressure-sensitive adhesive sheet (pressure-sensitive adhesive layer/PET film) from the test plate at a tensile speed of 300 mm/minute and a peeling angle of 180° in an atmosphere of 23°C temperature

and 50% R.H. In this way, the peel adhering strength (N/20-mm) at 180° was measured.

[0358]

<Total Light Ray Transmittance, and Haze>

From any one of the pressure-sensitive adhesive layers yielded in each of the working examples and the comparative examples, one of the release films was peeled off, and the remnant was bonded to a slide glass piece (trade name: Shiro Kenma No. 1, manufactured by Matsunami Glass Ind., Ltd.; thickness: 0.8 to 1.0 mm; total light ray transmittance: 92%; haze: 0.2%). Furthermore, the other release film was peeled off to produce a test piece having a layer structure of pressure-sensitive adhesive layer (A)/slide glass. A haze meter (device name: HM-150, manufactured by Murakami Color Research Laboratory Co., Ltd.) was used to measure the total light ray transmittance and the haze of the test piece in a visible ray band.

[0359]

[Table 3]

	Pressure-sensitive adhesive layer	Pressure-sensitive adhesive composition species	Ultraviolet absorbent		Colorant compound		Sheet thickness (μm)	Evaluation results						
			Species	Addition amount (part(s))	Species	Addition amount (part(s))		380 nm transmittance (%)	400 nm transmittance (%)	420 nm transmittance (%)	440 nm transmittance (%)	Total light ray transmittance (%)	Haze value	Adhering strength [N/20 mm]
Example 1	A1-1	(a)	b1	0.8	C5	0.48	100	0.0	1.8	59.5	90.1	92.3	0.3	15
Example 2	A1-2	(a)	b2	1.0	C5	0.50	175	0.0	0.6	53.8	89.1	92.3	0.3	17
Example 3	B1-1	(b)	b3	3.0	C1	3.0	15	0.0	0.4	43.8	85.6	92.4	0.3	7
Example 4	B1-2	(b)	b3	3.0	C2	3.0	20	0.0	0.5	45.3	85.7	92.4	0.3	9
Example 5	B1-3	(b)	-	-	C2	3.0	20	0.0	0.3	40.1	84.8	92.4	0.3	9
Comparative Example 1	A1	(a)	b1	0.8	-	-	100	9.0	80.6	90.1	91.1	92.3	0.3	15
Comparative Example 2	A1-3	(a)	b1	1.0	C6	0.45	100	0.0	0.1	22.8	78.9	92.3	0.4	14
Comparative Example 3	B1-4	(b)	b3	2.0	C6	2.5	20	0.0	0.1	23.4	79.9	92.3	0.3	9

[0360]

[Table 4]

	Pressure-sensitive adhesive layer	Initial HUE					85°C/85%RH for 500 hrs.							Fade test for 100 hrs.						
		Y	L*	a*	b*	Y	L*	a*	b*	ΔY	ΔE*	Passing or not	Y	L*	a*	b*	ΔY	ΔE*	Passing or not	
Example 1	A1-1	92.1	96.9	-2.5	4.1	92.0	96.7	-2.5	4.2	-0.1	0.23	OK	92.0	96.7	-2.4	4.0	-0.1	0.25	OK	
Example 2	A1-2	92.1	96.9	-2.3	4.4	92.1	96.8	-2.5	4.7	0.0	0.40	OK	92.0	96.8	-2.3	4.1	-0.1	0.30	OK	
Example 3	B1-1	92.2	96.9	-2.6	5.1	92.2	96.9	-2.9	5.6	0.0	0.62	OK	92.1	96.8	-2.8	5.6	-0.1	0.57	OK	
Example 4	B1-2	92.2	96.9	-2.6	5.0	92.2	96.9	-2.6	5.0	0.0	0.06	OK	92.1	96.8	-2.9	5.7	-0.1	0.81	OK	
Example 5	B1-3	92.2	96.8	-2.9	5.5	92.1	96.8	-2.8	5.5	-0.1	0.04	OK	92.1	96.8	-3.2	6.2	-0.1	0.75	OK	
Comparative Example 1	A1	92.1	96.9	-0.1	0.3	92.2	96.9	-0.1	0.7	0.1	0.35	OK	92.2	96.7	-0.5	0.5	0.1	0.46	OK	
Comparative Example 2	A1-3	92.3	97.0	-4.2	7.8	91.7	96.7	-4.0	9.2	-0.6	1.45	NG	92.2	96.9	-0.6	0.7	-0.1	7.91	NG	
Comparative Example 3	B1-4	92.2	96.9	-4.7	8.8	91.8	96.7	-4.2	10.3	-0.5	1.62	NG	92.1	96.8	-0.6	0.4	-0.1	9.31	NG	

[0361]

Hereinafter, each pressure-sensitive-adhesive-layer-attached polarizing film was produced and evaluated.

[0362]

(Cycloolefin polymer film (G))

A cycloolefin polymer film having a thickness of 25 μm (trade name: ZEONOR film, manufactured by Zeon Corp.) was used.

[0363]

(Production of Polarizer (P1))

A polarizer made of a stretched polyvinyl alcohol film impregnated with iodine and having a thickness of 5 μm was used. The single-body transmittance Y value of the polarizer (or a polarizing film having the polarizer on which a protective film is bonded) was 42.4%, and the polarization degree thereof was 99.995.

[0364]

(Acryl-based Resin Film (E))

Resin pellets made of 100 parts by weight of an imidated MS resin described in Production Example 1 in JP-A-2010-284840 were dried at 100.5 kPa and 100°C for 12 hours, and extruded from a uniaxial extruder through its T die at a dice temperature of 270°C to be shaped into a film form (thickness: 80 μm). Furthermore, the film was stretched (into a thickness of 40 μm) in a transporting

direction thereof in an atmosphere of 150°C temperature. Next, the resultant was stretched in a direction orthogonal to the film-transporting direction in an atmosphere of 150°C temperature to yield acryl-based resin film of 20 μm thickness.

[0365]

(Retardation Films (H))

Polycarbonate film having a thickness of 56 μm ("NRF", manufactured by Nitto Denko Corp.; in-plane retardation Re (550): 135 nm) was used.

[0366]

Comparative Example 4

A pressure-sensitive-adhesive-layer-attached polarizing film was produced having a structure of pressure-sensitive adhesive layer (A1)/cycloolefinpolymer film (G)/polarizer (P1)/acryl-based resin film (E)/pressure-sensitive adhesive layer (B1: interlayer adhesive layer)/retardation film (H)/pressure-sensitive adhesive layer (B2).

The used pressure-sensitive adhesive layer (A1) was one of the layers produced in Production Example 3.

The used pressure-sensitive adhesive layer (B1) was one of the layers produced in Production Example 4.

The used pressure-sensitive adhesive layer (B2) was one of the layers produced in Production Example 5.

In the production of the pressure-sensitive-adhesive-layer-attached polarizing film, the individual pressure-sensitive adhesive layers were used to bond the individual films concerned. However, the bonding of the cycloolefin polymer film (G) and the acryl-based resin film (E) on both sides of the polarizer (P1) was attained, using a polyvinyl alcohol-based adhesive.

The resultant pressure-sensitive-adhesive-layer-attached polarizing film was used as an optical laminate used for an organic EL display device, and the pressure-sensitive adhesive layers (A1) and (B2) corresponded, respectively, to the viewing side of the device, and the organic EL panel side of the device.

[0367]

Example 6

In the same way in Comparative Example 4 except that in Comparative Example 4, instead of the pressure-sensitive adhesive layer (A1), one of the pressure-sensitive adhesive layers (A1-1) produced in Example 1 was used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1-1)/cycloolefin polymer film (G)/polarizer/acryl-based resin film (E)/pressure-sensitive adhesive layer (B1)/retardation film (H)/pressure-sensitive adhesive layer (B2).

[0368]

Example 7

In the same way in Comparative Example 4 except that in Comparative Example 4, instead of the pressure-sensitive adhesive layer (B2), one of the pressure-sensitive adhesive layers (B1-2) produced in Example 4 was used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1)/cycloolefin polymer film (G)/polarizer/acryl-based resin film (E)/pressure-sensitive adhesive layer (B1)/retardation film (H)/pressure-sensitive adhesive layer (B1-2).

[0369]

Example 8

In the same way in Comparative Example 4 except that in Comparative Example 4, instead of the pressure-sensitive adhesive layer (A1) and the cycloolefin polymer film (G), one of the pressure-sensitive adhesive layers (A1-1) produced in Example 1 and the surface-treatment-layer-attached protective film (D-1) were used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1-1)/ surface-treatment-layer-attached protective film (D-1)/polarizer (P1)/acryl-based resin film (E)/pressure-sensitive adhesive layer (B1)/retardation film

(H)/pressure-sensitive adhesive layer (B2).

[0370]

The surface-treatment-layer-attached protective film (D-1) is described below. The surface-treatment-layer-attached protective film (D-1) was bonded to the polarizer (P1) with a polyvinyl alcohol-based adhesive, so as to bring a side of the protective film on which a substrate film A described below was present into contact with this polarizer.

[0371]

(Production of Substrate Film A)

A biaxial kneader was used to mix 100 parts by weight of an imidated MS resin described in Production Example 1 of JP-A-2010-284840, and 0.65 part by weight of 6,6',6''-(1,3,5-triazine-2,4,6-triyl)tris(3-hexyloxy-2-methylphenol) (trade name: LA-F70, manufactured by ADEKA Corp.: an "ultraviolet absorbent (b4) in Table 1; the absorption maximum wavelength of its absorption spectrum: 357 nm) with each other at 220°C to produce resin pellets. The resultant resin pellets were dried at 100.5 kPa and 100°C for 12 hours, and then a uniaxial extruder was used to extrude the pellets through a T die at a dice temperature of 270°C to form the pellets into a film form (thickness: 160 μm). Furthermore, the film was stretched (into a thickness of 80 μm) in the transporting direction of the

film in an atmosphere of 150°C temperature. Next, the film was stretched in a direction orthogonal to the film transporting direction in an atmosphere of 150°C temperature to yield a substrate film A ((meth)acryl-based resin film) of 40 µm thickness. The transmittance of the resultant substrate film A was 7% about a light ray having a wavelength of 380 nm, the transmittance thereof was 68% about a light ray having a wavelength of 400 nm, the transmittance thereof was 90% about a light ray having a wavelength of 420 nm, and the transmittance thereof was 91% about a light ray having a wavelength of 440 nm.

[0372]

(Production of Surface-Treatment-Layer-Attached Protective Film (D-1))

The following were incorporated into 100 parts by weight of an ultraviolet-ray-curing-type resin (trade name: UNIDIC 17-806, manufactured by DIC Corp.; solid content: 80%; solvent: butyl acetate) containing 13 parts of triacrylate isocyanurate, 16 parts of pentaerythritol triacrylate, 62 parts of dipentaerythritol hexaacrylate and 9 parts of isophorone diisocyanate polyurethane: 3.0 parts by weight of the colorant compound (C2) yielded in Production Example 2; 5 parts of a levelling agent (trade name: GRANDIC PC-4100, manufactured by DIC Corp.); and 5 parts by weight of bis(2,4,6-trimethylbenzoyl)-

phenylphosphine oxide (trade name: Irgacure 819, manufactured by BSF Japan Ltd., and having an absorption band in wavelengths of 200 to 450 nm) as a photopolymerization initiator. The resultant was diluted with methyl isobutyl ketone to give a solid concentration of 50% to prepare a composition for hard-coat-layer-formation. The composition for hard-coat-layer-formation was applied onto the resultant substrate film A to form a coating layer. The coating layer was heated at 120°C for 1 minute. In a nitrogen atmosphere, a high-pressure mercury lamp was used to radiate ultraviolet rays onto the heated coating layer at an integrated light quantity of 2000 mJ/cm² to cure the coating layer. In this way, a hard coat layer of 8 μm thickness was formed. About the resultant surface-treatment-layer-attached protective film (D-1), the transmittance of a light ray of 380 nm wavelength was 0.2%; that of a light ray of 400 nm wavelength, 3.0%; that of a light ray of 420 nm wavelength, 65%; and that of a light ray of 440 nm wavelength, 89%. The addition amount of the colorant compound (C2) was 0.5% by weight of the total (100% by weight) of the surface-treatment-layer-attached protective film (D-1).

[0373]

Example 9

In the same way in Comparative Example 4 except that

in Comparative Example 4, instead of the acryl-based resin film (E) and the pressure-sensitive adhesive layer (B1), an acryl-based resin film (E-1) and one of the pressure-sensitive adhesive layers (B1-1) produced in Example 3 were used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1) /cycloolefin polymer film (G)/polarizer (P1)/acryl-based resin film (E-1)/pressure-sensitive adhesive layer (B1-1)/retardation film (H)/pressure-sensitive adhesive layer (B2).

[0374]

The acryl-based resin film (E-1) is described just below.

[0375]

(Production of Acryl-based Resin film (E-1))

Into methylene chloride were dissolved 100 parts by weight of an imidated MS resin described in Production Example 1 in JP-A-2010-284840 to produce a dope solution having a concentration of 12% by weight. Thereto were added 1.2 parts by weight of the colorant compound (C1) yielded in Production Example 2 to prepare an acryl-based resin solution. Thereafter, the acryl-based resin solution was applied onto a glass plate subjected to release treatment to give a thickness of 40 μm after the solution would be dried. The resultant was dried at 60°C for 2

minutes and further dried at 100°C for 3 minutes to remove the solvent to yield the acryl-based resin film (E-1) of 40 µm thickness. About the resultant acryl-based resin film (E-1), the transmittance of a light ray of 380 nm wavelength was 0.2%; that of a light ray of 400 nm wavelength, 1.2%; that of a light ray of 420 nm wavelength, 59%; and that of a light ray of 440 nm wavelength, 89%. The addition amount of the colorant compound (C1) was 1.2% by weight of the base polymer (100% by weight) in the acryl-based resin film (E-1).

[0376]

Example 10

In the same way in Comparative Example 4 except that in Comparative Example 4, instead of the acryl-based resin film (E) and the pressure-sensitive adhesive layer (B2), a triacetylcellulose film (F-1) described below and one of the pressure-sensitive adhesive layers (B1-2) produced in Example 4 were used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1) /cycloolefin polymer film (G)/polarizer (P1)/triacetylcellulose film (F-1)/pressure-sensitive adhesive layer (B1)/retardation film (H)/pressure-sensitive adhesive layer (B1-2).

[0377]

The triacetylcellulose film (F-1) is described just

below.

[0378]

(Production of Triacetylcellulose Film (F-1))

Into a mixed solvent preparing by mixing dichloromethane, ethanol and n-butanol with each other at a ratio by weight of 80/15/5 were dissolved 100 parts by weight of a triacetylcellulose film having UV absorption power and a thickness of 40 μm (trade name: KC4UY, manufactured by Konica Minolta, Inc.) while the solvent was stirred. The solution was adjusted to set the concentration of solid therein to 20% by weight. Furthermore, thereto was added 1.0 part by weight of the colorant compound (C5) yielded in Production Example 2 to prepare a triacetylcellulose solution. The solution was applied onto a glass plate subjected to release treatment to give a thickness of 20 μm after the applied solution would be dried. The resultant was dried at 80°C for 3 minutes and subsequently dried at 120°C for 3 minutes to remove the solvent. The resultant layer was peeled off from the glass plate to yield the triacetylcellulose film (F1) of 20 μm thickness. About the resultant triacetylcellulose film (F-1), the transmittance of a light ray of 380 nm wavelength was 0.2%; that of a light ray of 400 nm wavelength, 8.8%; that of a light ray of 420 nm wavelength, 64%; and that of a light ray of 440 nm

wavelength, 90%. The addition amount of the colorant compound (C5) was 1.0% by weight of the base polymer (100% by weight) in the triacetylcellulose film (F-1).

[0379]

Example 11

In the same way in Comparative Example 4 except that in Comparative Example 4, instead of the pressure-sensitive adhesive layer (A1), the cycloolefin polymer film (G), the acryl-based resin film (E) and pressure-sensitive adhesive layer (B1), one of the pressure-sensitive adhesive layers (A1-1) produced in Example 1, the surface-treatment-layer-attached protective film (D-1) produced in Example 8, cycloolefin polymer film (G-1) described below and the pressure-sensitive adhesive layer (B3-1) described below were used to produce a pressure-sensitive-adhesive-layer-attached polarizing film having a structure of pressure-sensitive adhesive layer (A1-1) /surface-treatment-layer-attached protective film (D-1)/polarizer (P1)/cycloolefin polymer film (G-1)/pressure-sensitive adhesive layer (B3-1)/retardation film (H)/pressure-sensitive adhesive layer (B2).

[0380]

The cycloolefin polymer film (G-1) and the pressure-sensitive adhesive layer (B3-1) are described below. The surface-treatment-layer-attached protective film (D1) was

bonded to the polarizer (P1) with a polyvinyl alcohol based adhesive, so as to bring the substrate film A side of the protective film into contact with this polarizer.

[0381]

(Production of Cycloolefin Polymer Film (G-1))

As a resin material, prepared were pellets of a cycloolefin polymer (hydrogenated product of a ring-opened polymer of a norbornene-based monomer; trade name: "ZEONOR 1420R", manufactured by Zeon Corp.; glass transition temperature (T_g): 136°C). The pellets were dried at 100.5 kPa and 100°C for 12 hours. To the resin (weight: 100 parts by weight) were added 1.5 parts by weight of the colorant compound (C2) yielded in Production Example 2, and then a T die-type film melt extrusion molding machine including a uniaxial extruder having a condition involving a die temperature of 260° C was used to yield the cycloolefin polymer resin film (G1) of 20 μm thickness. About the resultant cycloolefin polymer resin film (G1), the transmittance of a light ray of 380 nm wavelength was 2.5%; that of a light ray of 400 nm wavelength, 18%; that of a light ray of 420 nm wavelength, 75%; and that of a light ray of 440 nm wavelength, 91%. The addition amount of the colorant compound (C2) was 1.5% by weight of the base polymer (100% by weight) in the cycloolefin polymer resin film (G-1).

[0382]

(Production of Pressure-Sensitive Adhesive Composition (B3-1))

The following were blended: 100 parts by weight of a styrene/ethylene/propylene/styrene block copolymer (SEPS; trade name: SEPTON 2063, manufactured by Kuraray Co., Ltd.; styrene content: 13%) as a rubbery polymer; 40.4 parts by weight of hydrogenated terphenol (trade name: YS Polystar TH130; manufactured by Yasuhara Chemical Co., Ltd.; softening point: 130°C; hydroxyl value: 60) as a tackifier; 61.7 parts by weight of a petroleum tackifier (trade name: Piccolastic A5, manufactured by the company Eastman Kodak; vinyltoluene-based tackifier; softening point: 5°C); and 21.3 parts by weight of polybutene (trade name: HV-300, manufactured by JX Nikko Nisseki Energy Corp.; weight-average molecular weight: 3000) as a softener. The resultant toluene solution (pressure-sensitive adhesive solution) was adjusted to set the concentration of solid therein to 30% by weight, and further thereto were added 2.0 parts by weight of the colorant compound (C1) yielded in Production Example 2 to prepare the pressure-sensitive adhesive composition (B3-1: solution).

[0383]

(Production of Pressure-Sensitive Adhesive Layer (B3-1))

The pressure-sensitive adhesive composition (B2-1: solution) was applied onto a separator having a thickness of 38 μm (polyethylene terephthalate-based film having a surface subjected to release treatment) to give a thickness of 15 μm after the composition would be dried. The composition was dried at 120°C for 3 minutes to remove the solvent to yield a pressure-sensitive adhesive layer. Hereinafter, the pressure-sensitive adhesive layer will be referred to as the "pressure-sensitive adhesive layer (B3-1)". The addition amount of the colorant compound (C1) was 2.0% by weight of the rubbery polymer (100% by weight) in the pressure-sensitive adhesive layer (B3-1).

[0384]

Example 12

In the same way as in Comparative Example 4 except that in Comparative Example 4, instead of the retardant film (H), a retardant film (H-1) described below was used, and instead of the pressure-sensitive adhesive layer (B2), the pressure-sensitive adhesive layer (B1-2) produced in Example 4 was used, a pressure-sensitive-adhesive-layer-attached polarizing film was prepared which had a structure of pressure-sensitive adhesive layer (A1)/cycloolefin polymer film (G)/polarizer (P1)/acryl-based resin film (E)/pressure-sensitive adhesive layer (B1)/retardant film (H-1)/pressure-sensitive adhesive layer (B1-2).

[0385]

The retardant film (H-1) is described just below.

[0386]

(Production of Retardation Film (H-1))

26.2 Parts by weight of isosorbide (ISB), 100.5 parts by weight of 9,9-[4-(2-hydroxyethoxy)phenyl]fluorene (BHEPF), 10.7 parts by weight of 1,4-cyclohexanedimethanol (1,4-CHDM), 105.7 parts by weight of diphenyl carbonate (DPC), and 0.591 part by weight of (a 0.2 weight % aqueous solution of) cesium carbonate as a catalyst were loaded into a reaction vessel. Under a nitrogen atmosphere, as a first step of a reaction, the heating medium temperature of the reaction vessel was set to 150°C, and the raw materials were dissolved while being stirred as required for about 15 minutes. Next, a pressure in the reaction vessel was increased from normal pressure to 13.3 kPa, and produced phenol was extracted to the outside of the reaction vessel while the heating medium temperature of the reaction vessel was increased to 190°C in 1 hour.

A temperature in the reaction vessel was held at 190°C for 15 minutes. After that, as a second step, the pressure in the reaction vessel was set to 6.67 kPa, the heating medium temperature of the reaction vessel was increased to 230°C in 15 minutes, and the produced phenol was extracted to the outside of the reaction vessel. The

temperature was increased to 250°C in 8 minutes because the stirring torque of a stirring machine increased. In order for the produced phenol to be further removed, the pressure in the reaction vessel was reduced to 0.200 kPa or less. After the stirring torque had reached a predetermined value, the reaction was completed, and a produced reaction product was extruded into water and then pelletized. Thus, a polycarbonate resin including "BHEPF/ISB/1,4-CHDM" of 47.4 mol%/37.1 mol%/15.5 mol% was obtained.

The resultant polycarbonate resin had a glass transition temperature of 136.6°C and a reduced viscosity of 0.395 dL/g. The resultant polycarbonate resin was dried in a vacuum at 80°C for 5 hours. After that, 1.0 parts by weight of a colorant compound (C2) was added to the resultant polycarbonate resin (100 parts by weight of the resin). A polycarbonate resin film having a thickness of 120 µm was produced by using a T die-type film melt extrusion molding machine including a uniaxial extruder having a condition involving a die temperature of 220° C. The resultant polycarbonate resin film was subjected to transverse stretching with a tenter stretching machine to provide a retardation film (H-1) of 50 µm thickness. In the stretching, a stretching ratio was 250%, a stretching temperature was 137 to 139°C.

The resultant retardation film (H1) had an Re(550) of

137 to 147 nm and Δn_{xy} of 0.0027 to 0.0029. The content of the colorant compounded (C2) was 1.0% by weight based on the weight of the base-polymer (100% by weight) in the retardation film (H1-1).

[0387]

(Evaluations)

About the pressure-sensitive-adhesive-layer-attached polarizing films yielded in each of Examples 6 to 12 and Comparative Example 4, evaluations described below were made. The evaluations were made by methods described below. The results are shown in Tables 5 and 6.

[0388]

<Measurement of Transmittance and Hue of Each Pressure-Sensitive-Adhesive-Layer-Attached Polarizing Film: Initial Values Thereof>

One of the release films of any one of the pressure-sensitive adhesive layer-attached polarizing film yielded in each of the working examples and the comparative example was peeled off, and the remnant was bonded to a slide glass piece (trade name: Shiro Kenma No. 1, manufactured by Matsunami Glass Ind., Ltd.; thickness: 0.8 to 1.0 mm; total light ray transmittance: 92%; haze: 0.2%). Furthermore, the other release film was peeled off, and the remnant was bonded to the same slide glass piece and subjected to autoclave treatment (at 50°C and 0.5 MPa for 15 minutes) to

produce a test piece having a layer structure of slide glass/pressure-sensitive adhesive layer-attached polarizing film/slide glass. The test piece was fitted to a measuring tool to cause measuring light to be radiated into the test piece from the pressure-sensitive adhesive layer side (B1 side) of the organic EL display panel side, and then the test piece was measured by an automatic polarizing film measuring instrument (product name: V7100, manufactured by JASCO Corp.). The transmittance thereof in a range from 380 to 780 nm) was measured (Table 5 shows the measured value at each of 380 nm, 400 nm, 420 nm, and 440 nm), and the following were also measured: the single-body transmission Y value, and the single-body hue (L^* , a^* , b^*) thereof.

[0389]

<Reliability Evaluation>

The test piece measured at the initial stage by the above-mentioned method was put in an oven of 85°C temperature for 500 hours to make a heat resistance test thereof. In the same way, the test piece was put in an ultraviolet fade tester(device name: ultraviolet fade meter tester U48, manufactured by Suga Test Instruments Co., Ltd.) to radiate ultraviolet rays thereto continuously from the viewing side pressure-sensitive adhesive layer side (A1 side) of the test piece for 100 hours to make a light

resistance test. After the test, in the same way as used in the initial measurements, the test piece was measured about the single-body Y value, and the single-body hue (L^* , a^* , b^*). A calculation was made to gain a variation ΔY in single-body Y value, and a variation ΔE^* in single-body hue before and after the test. When $\Delta Y \leq 0.5$ and $\Delta E^* \leq 1.0$, the test piece is judged to pass the test (OK). When these variation values do not satisfy this condition, the test piece is judged not to pass the test (NG).

[0390]

[Table 5]

	Layer to which colorant compound was added in pressure-sensitive-adhesive-layer-attached polarizing film						Evaluation results					
	Added position		Thickness (μm)	Ultraviolet absorbent		Colorant Compound		380 nm transmittance (%)	400 nm transmittance (%)	420 nm transmittance (%)	440 nm transmittance (%)	Y (%)
	Symbol	Member		Species amount (parts)	Added amount (parts)	Species amount (parts)	Added amount (parts)					
Example 6	Al-1	Viewing-side pressure-sensitive adhesive layer	100	b1	0.8	C5	0.0	0.1	19.3	37.8	42.1	
Example 7	Bl-2	Panel-side pressure-sensitive adhesive layer	20	b3	3.0	C2	0.0	0.1	19.0	37.5	42.1	
Example 8	Al-1	Viewing-side pressure-sensitive adhesive layer	100	b1	0.8	C5	0.0	0.0	19.0	37.6	42.0	
	D-1	Surface treatment layer	8 (48)	-	-	C2						3.0 (0.5)
Example 9	E-1	Transparent protective film	40	-	-	C1	0.0	0.0	19.5	37.8	42.1	
	Bl-1	Interlayer pressure-sensitive adhesive layer	15	b3	3.0	C1						3.0
Example 10	F-1	Transparent protective film	20	-	-	C5	0.0	0.0	19.8	38.0	42.0	
	Bl-2	Panel-side pressure-sensitive adhesive layer	20	b3	3.0	C2						3.0
Example 11	Al-1	Viewing-side pressure-sensitive adhesive layer	100	b1	0.8	C5	0.0	0.0	9.0	33.8	41.9	
	D-1	Surface treatment layer	8 (48)	-	-	C2						3.0 (0.5)
	G-1	Transparent protective film	20	-	-	C2						1.5
	B3-1	Interlayer pressure-sensitive adhesive layer	15	-	-	C1						2.0
Example 12	H-1	Retardation film	50	-	-	C2	0.0	0.0	19.5	38.2	42.1	
	Bl-2	Panel-side pressure-sensitive adhesive layer	20	b3	3.0	C2						3.0
Comparative Example 4	-		-	-	-	-	0.0	19.8	37.1	39.3	42.1	

[0391]

[Table 6]

	Initial hue				85°C for 500 hrs.								Fade test for 100 hrs.					
	Y	L*	a*	b*	Y	L*	a*	b*	ΔY	ΔE^*	Passing or not	Y	L*	a*	b*	ΔY	ΔE^*	Passing or not
Example 6	41.9	70.8	-3.2	5.9	42.4	71.1	-2.9	6.4	0.46	0.68	OK	41.9	70.5	-3.1	6.1	0.0	0.39	OK
Example 7	41.9	70.8	-3.2	5.9	42.3	71.1	-2.9	6.5	0.41	0.72	OK	41.9	70.5	-3.2	6.1	0.0	0.40	OK
Example 8	42.0	70.8	-3.2	5.8	42.4	71.1	-3.0	6.5	0.40	0.79	OK	42.0	70.5	-3.0	5.8	0.0	0.35	OK
Example 9	41.9	70.8	-3.2	5.9	42.3	71.1	-3.1	6.3	0.41	0.54	OK	41.9	70.5	-3.0	5.9	0.0	0.37	OK
Example 10	41.9	70.8	-3.1	5.8	42.3	71.1	-3.0	6.3	0.43	0.59	OK	41.9	70.5	-3.0	5.8	0.0	0.37	OK
Example 11	41.9	70.8	-4.1	8.2	42.4	71.1	-4.0	8.5	0.46	0.40	OK	41.9	70.6	-4.0	8.5	0.0	0.34	OK
Example 12	41.9	70.8	-3.1	5.8	42.2	71.1	-3.1	6.4	0.30	0.67	OK	41.9	70.4	-3.0	5.8	0.0	0.40	OK
Comparative Example 4	42.0	70.9	-1.5	2.8	42.4	71.1	-1.7	4.4	0.35	1.68	NG	42.0	70.9	-1.4	3.4	0.0	0.65	OK

[0392]

Hereinafter, transparent conductive films were produced and evaluated.

[0393]

Comparative Example 5

(Cycloolefin Polymer Film (Z1))

As a long transparent substrate, prepared was a cycloolefin polymer film (Z1) of 40 μm thickness (COP film: "Zeon ZF16", manufactured by Zeon Corp.).

[0394]

(Formation of Anti-Blocking Layer)

To 100 parts by weight of solid weight an ultraviolet curable hard coat resin (trade name: "UNIDIC (registered trade name) RS29-120") were added 0.07 parts by weight of plural particles having a diameter of 3 μm (trade name: "SSX 105", manufactured by Sekisui Jushi Corp.), and then the resultant was diluted with ethyl acetate to give a solid concentration of 30% by weight to prepare an anti-blocking layer forming composition. This composition was applied onto one surface of the cycloolefin polymer film (Z1), and then dried at 80°C for one minute. Ultraviolet rays (from a high-pressure mercury lamp) were radiated thereto at an integrated light quantity of 300 mJ/cm^2 to form an anti-blocking layer (AB layer) of 1.5 μm film thickness on the one surface of the COP film.

[0395]

(Formation of Hard Coat Layer (Y))

A composition solution (Y) was prepared by mixing 100 parts by weight of an ultraviolet-ray-curing-type acrylic resin ("ELS 888", manufactured by DIC Corp.), 2 parts by weight of a photopolymerization initiator ("Irgacure 184", manufactured by the company BASF), and 160 parts by weight of ethyl acetate with each other. Next, the composition solution (Y) was applied onto a surface of the cycloolefin polymer film (Z1) that was opposed to the anti-blocking-layer-formed surface of this film, and then dried at 80°C for one minute. Ultraviolet rays (from a high-pressure mercury lamp) were radiated thereto at an integrated light quantity of 300 mJ/cm². In this way, a hard coat layer of 1.0 μm thickness was formed onto the upper surface of the cycloolefin polymer film (Z1).

[0396]

(Formation of Refractive Index Adjusting Layer (X))

A composition solution (X) was prepared by blending 700 parts by weight of propylene glycol monomethyl ether into 100 parts by weight of an inorganic-particle-containing resin solution ("KZ 7414", manufactured by JSR Corp.). Next, the composition solution (X) was applied onto the upper surface of the hard coat layer (Y1), and then dried at 60°C for one minute. Ultraviolet rays (from

a high-pressure mercury lamp) were radiated thereto at an integrated light quantity of 300 mJ/cm². In this way, a refractive index adjusting layer (X) of 100 nm thickness was formed onto the upper surface of the hard coat layer.

[0397]

(Formation of ITO Layer)

Next, the laminate yielded by the above-mentioned operations, which had a structure of refractive index adjusting layer (X)/hard coat layer (Y)/cycloolefin polymer film (Z1)/anti-blocking layer, was put into a winding-type sputtering machine to form an (amorphous) ITO layer of 30 nm thickness onto the upper surface of the refractive index adjusting layer (X1). Specifically, in a vacuum atmosphere having an atmospheric pressure of 0.4 Pa, into which 98% argon gas and 2% oxygen gas were introduced, an ITO target made of a sintered body composed of 97% by mass of indium oxide and 3% by mass of tin oxide was used, and sputtered onto the refractive index adjusting layer (X1).

As described above, a transparent conductive film was produced which had a structure of ITO layer/refractive index adjusting layer (X)/hard coat layer (Y)/cycloolefin polymer film (Z1)/anti-blocking layer.

[0398]

Example 13

In the same way as in Comparative Example 5 except

that in Comparative Example 5, instead of the hard coat layer (Y), a hard coat layer (Y-1) was formed, a transparent conductive film was produced which had a structure of ITO layer/refractive index adjusting layer (X1)/hard coat layer (Y-1)/cycloolefin polymer film (Z1)/anti-blocking layer.

[0399]

About the formation of the hard coat layer (Y-1), the same operations as in the formation of the hard coat layer (Y) were made except that in the formation of the hard coat layer (Y), a composition solution (Y-1) was used, this solution being prepared by adding 2 parts by weight of the colorant compound (C2) produced in Production Example 2 further to 100 parts by weight of the ultraviolet-ray-curing-type acrylic resin ("ELS888", manufactured by DIC Corp.). The addition amount of the colorant compound (C2) was 2.0% by weight of the base polymer (100% by weight) in the hard coat layer (Y-1).

[0400]

Example 14

In the same way as in Comparative Example 5 except that in Comparative Example 5, instead of the refractive index adjusting layer (X), a refractive index adjusting layer (X-1) was formed, a transparent conductive film was produced which had a structure of ITO layer/refractive

index adjusting layer (X-1)/hard coat layer (Y)/cycloolefin polymer film (Z1)/anti-blocking layer.

[0401]

About the formation of the refractive index adjusting layer (X-1), the same operations as in the formation of the refractive index adjusting layer (X) were made except that: in the formation of the refractive index adjusting layer (X), instead of the composition solution (X), a composition solution (X-1) was used, this solution being prepared by mixing 700 parts by weight of propylene glycol monomethyl ether with 100 parts by weight of an inorganic-particle-containing resin solution ("KZ 7412", manufactured by JSR Corp.), and further mixing the colorant compound (C2) produced in Production Example 2 with the resin solution to set the amount of this colorant compound to 5 parts by weight for resin solid components in the resin solution. The addition amount of the colorant compound (C2) was 5.0% by weight of the base polymer (100% by weight) in the refractive index adjusting layer (X-1).

[0402]

Example 15

In the same way as in Comparative Example 5 except that in Comparative Example 5, instead of the refractive index adjusting layer (X), a refractive index adjusting layer (X-2) was formed, a transparent conductive film was

produced which had a structure of ITO layer/refractive index adjusting layer (X-2)/hard coat layer (Y)/cycloolefin polymer film (Z1)/anti-blocking layer.

[0403]

About the formation of the refractive index adjusting layer (X-2), the same operations as in the formation of the refractive index adjusting layer (X1) were made except that: in the formation of the refractive index adjusting layer (X), instead of the composition solution (X), a composition solution (X-2) was used, this solution being prepared by mixing 700 parts by weight of propylene glycol monomethyl ether with 100 parts by weight of an inorganic-particle-containing resin solution ("TYZ 68-A12", manufactured by Toyo Ink Co., Ltd.), and further mixing 2 parts by weight of the colorant compound (C2) produced in Production Example 2 with the resin solution to set the amount of this colorant compound to 5 parts by weight for resin solid components in this resin solution. The addition amount of the colorant compound (C2) was 5.0% by weight of the base polymer (100% by weight) in the refractive index adjusting layer (X-2).

[0404]

Comparative Example 6

(Preparation of Polyester Film (Z2))

From dimethyl terephthalate and ethylene glycol, a

melt-polymerized polyethylene terephthalate was yielded by an ordinary method using antimony trioxide as a catalyst. The resultant polyethylene terephthalate was vacuum-dried at 160°C for 2 hours, and then charged into a film melt extrusion molding machine to be melted at 290°C and extruded out onto a casting drum. The resultant was stretched to give a polyester film (Z2) of 50 µm thickness.

[0405]

(Formation of Anti-Blocking Layer)

In the same way as in Comparative Example 5, an anti-blocking layer (AB layer) of 1.5 µm film-thickness was formed onto one surface of the polyester film (Z2).

[0406]

(Formation of Crack Preventing Layer(Q))

The following were mixed with each other: 10 parts by weight of ADEKA FILTERA BUR-12A (manufactured by Adeka Corp.) containing a rubber-modified epoxy resin (weight-average molecular weight of its epoxy resin skeleton moiety: 2000) as a main component; and 0.001 parts of an antimony-based curing promoter ADEKA FILTERA BUR-12B (manufactured by Adeka Corp). To this mixture were added 90 parts by weight of methyl isobutyl ketone to set the weight of the whole to 100 parts by weight. In this way, a composition solution (Q) was prepared. The composition solution (Q) was heated at 170°C. At this time, a period

for gelatinizing this solution was 10 seconds. Next, the composition solution (Q) was applied onto a surface of the polyester film (Z2) that was opposed to the anti-blocking-layer-formed surface of this film, and the resultant was dried at 195°C for one minute to form a crack preventing layer (Q) of 30 nm thickness onto the upper surface of the polyester film (Z2).

[0407]

(Formation of ITO Layer)

Next, the laminate yielded by the above-mentioned operations, which had a structure of crack preventing layer (Q)/polyester film (Z2)/anti-blocking layer, was put into a winding-type sputtering machine to form an (amorphous) ITO layer of 30 nm thickness onto the upper surface of the crack preventing layer (Y2). Specifically, in a vacuum atmosphere having an atmospheric pressure of 0.4 Pa, into which 98% argon gas and 2% oxygen gas were introduced, an ITO target made of a sintered body composed of 97% by mass of indium oxide and 3% by mass of tin oxide was used, and sputtered onto the crack preventing layer (Q).

As described above, a transparent conductive film was produced which had a structure of ITO layer/crack preventing layer (Q)/polyester film (Z2)/anti-blocking layer.

[0408]

Example 16

In the same way as in Comparative Example 6 except that in Comparative Example 6, instead of the polyester film (Z2), a polyester film (Z2-1) was used, a transparent conductive film was produced which had a structure of ITO layer/crack preventing layer (Q)/polyester film (Z2-1)/anti-blocking layer.

[0409]

About the polyester film (Z2-1), the same operations as in the preparation of the polyester film (Z2) were made except that in the preparation of the polyester film (Z2), one part by weight of the colorant compound (C2) yielded in Production Example 2 was further added to 100 parts by weight of the resultant polyethylene terephthalate to yield a composition, and this composition was used. The addition amount of the colorant compound (C2) was 1% by weight of the base polymer (100% by weight) in the polyester film (Z2-1).

[0410]

Example 17

In the same way as in Comparative Example 6 except that in Comparative Example 6, an adhesion facilitating layer (R-1) was further laid, a transparent conductive film was produced which had a structure of ITO layer/crack preventing layer (Q)/adhesion facilitating layer (R-

1)/polyester film (Z2)/anti-blocking layer.

[0411]

The adhesion facilitating layer (R-1) was laid by the following method: An adhesion-facilitating-layer-forming composition (R-1) was prepared by adding 5 parts by weight of the colorant compound (C2) yielded in Production Example 2 into 100 parts by weight of a resin made from a phthalic acid ester (reaction product made from phthalic acid, and ethylene glycol and propylene glycol), methacrylic acid, oxazoline, ethylene glycol, propylene glycol, and melamine. Next, the adhesion-facilitating composition (R-1) was applied onto a surface of the polyester film (Z2) that was opposed to the anti-blocking-layer-formed surface of this film, and the resultant was dried at 195°C for one minute to form an adhesion facilitating layer (R-1) of 0.1 μm thickness. Next, the crack preventing layer (Y2) was laid onto the adhesion facilitating layer (R-1). The addition amount of the colorant compound (C2) was 5% by weight of the base polymer (100% by weight) in the adhesion facilitating layer (R-1).

[0412]

Example 18

In the same way as in Comparative Example 6 except that in Comparative Example 6, instead of the crack preventing layer (Y2), a crack preventing layer (Q-1) was

formed, a transparent conductive film was produced which had a structure of ITO layer/crack preventing layer (Q-1)/polyester film (Z2)/anti-blocking layer.

[0413]

About the formation of the crack preventing layer (Q-1), the same operations as in the formation of the crack preventing layer (Q) were made except that: in the formation of the crack preventing layer (Q), instead of the composition solution (Q-1), 5 parts by weight of the colorant compound (C2) yielded in Production Example 2 were further added to 100 parts by weight of the rubber-modified epoxy resin to prepare a composition solution (Q-1), and this composition solution was used; and further the thickness of the layer was changed to 70 nm.

[0414]

(Evaluations)

About any one of the transparent conductive films yielded in each of Examples 13 to 18 and Comparative Examples 5 and 6, evaluations described below were made. The evaluations were made by methods described below. The results are shown in Tables 4 and 5.

[0415]

<Measurement of Transmittance and Hue of Each Transparent Conductive Film: Initial Values Thereof>

Any one of the transparent conductive films yielded

in each of the working examples and the comparative examples was cut out into a test piece. The test piece was fitted to a measuring tool to cause measuring light to be radiated into the test piece from the transparent conductive layer (ITO layer) side thereof, and then the test piece was measured by a reflective-type spectrophotometer (product name: U4100, manufactured by Hitachi High-Technologies Corp.). The transmittance thereof in a range from 380 to 780 nm was measured (Table 5 shows the measured value at each of 380 nm, 400 nm, and 420 nm), and the following were also measured: the single-body Y value, and the single-body hue (L^* , a^* , b^*).

[0416]

<Surface Resistivity of ITO Layer of Each Transparent Conductive Film>

After the ITO layer was formed, the resultant was subjected to heating treatment at 140°C for 90 minutes to crystallize the ITO layer. In this way, a crystalline transparent conductive film was produced. In accordance with JIS K7194 (1994) the surface resistivity ($\Omega/\square$) of the crystalline transparent conductive layer was measured by a four-terminal method.

[0417]

[Table 7]

	Layer to which colorant compound was added in transparent conductive film					Evaluation results							
	Added position		Thickness (μm)	Colorant compound		380 nm transmittance (%)	400 nm transmittance (%)	420 nm transmittance (%)	Initial hue			Surface resistivity value (Ω/□)	
				Species	Added amount (parts)				Y	L*	a*		b*
	Symbol	Member											
Example 13	Y-1	Hard coat layer	1	C2	2	77.0	56.8	50.5	83.9	93.4	-1.1	1.8	50.8
Example 14	X-1	Refactive index adjusting layer	0.1	C2	5	79.5	74.5	70.0	84.7	93.7	-1	1.9	50.2
Example 15	X-2	Refactive index adjusting layer	0.1	C2	5	78.8	73.2	68.9	84.0	92.8	-1.2	2	50.4
Comparative Example 5	-		-	-	-	80.7	79.4	76.7	82.8	92.9	-0.3	0.7	50.1
Example 16	Z2-1	Optical substrate film	50	C2	1	0.0	2.3	60.5	88.1	95.3	-1.4	6.9	50.1
Example 17	R-1	Adhesion facilitating layer	0.1	C2	5	69.9	72.3	76.9	88.2	95.3	-1.1	5.3	50.3
Example 18	Q-1	Crack preventing layer	0.07	C2	5	71.0	74.4	79.8	88.2	95.4	-1	4.9	50.5
Comparative Example 6	-		-	-	-	74.2	77.7	80.4	88.3	95.3	-0.4	3.6	52.1

DESCRIPTION OF REFERENCE SIGNS

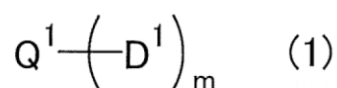
[0418]

- 1 Optical Laminate
- 2 Pressure-sensitive adhesive/Adhesive Layer
- 3 Transparent Protective Film
- 4 Polarizer
- 5 Retardation Film
- 6 Pressure-sensitive adhesive Layer
- 7 Covering member
- 8 Organic EL panel
- 10 Organic EL Display Device
- 20 Transparent conductive film
- 21 Transparent substrate film
- 22 Transparent conductive layer
- 23 Intermediate layer
- 24 Anti-blocking layer

CLAIMS

1. A composition for optical members, comprising a base polymer, and a compound represented by general formula (1):

[Formula 1]

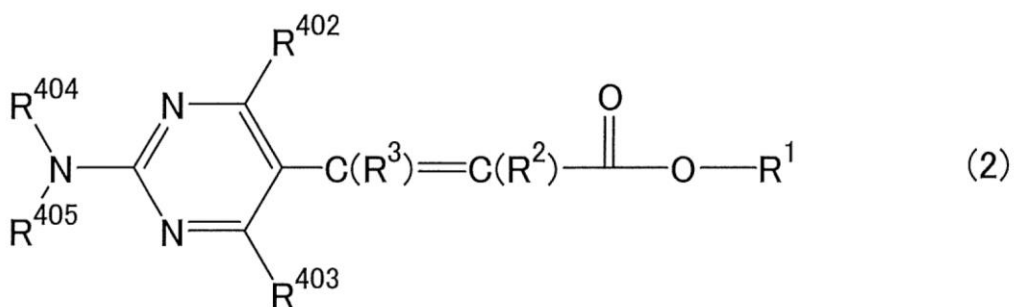


wherein m represents an integer of 1 to 6;

Q^1 represents a hydrogen atom when m is 1, and represents a bivalent to hexavalent linking group when m is from 2 to 6; and

D^1 represents a group in which one hydrogen atom has left a compound represented by general formula (2), and when m is from 2 to 6, a plurality of D^1 s may be wholly the same, or different from each other:

[Formula 2]



wherein R^1 represents a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent, R^2 represents a hydrogen

atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-C(O)-R^7$ or $-SO_2-R^8$ wherein R^7 represents a hydroxyl group or $-OR^{71}$, and R^8 represents a halogen atom, a hydroxyl group, $-OR^{81}$, $-NR^{82}R^{83}$, or $-R^{84}$ wherein R^{71} and R^{81} to R^{84} may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent;

R^3 represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent;

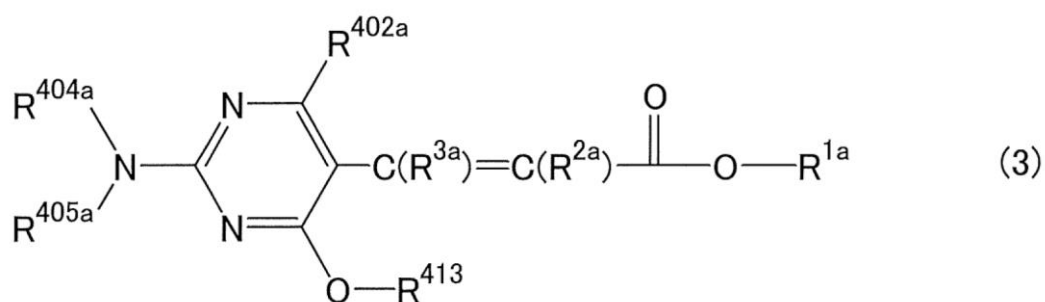
R^{402} and R^{403} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group optionally having a substituent, an aryl group optionally having a substituent, $-NR^{406}R^{407}$, $-OR^{408}$, a cyano group, $-C(O)R^{409}$, $-O-C(O)R^{410}$, or $-C(O)OR^{411}$, and

R^{404} to R^{411} may be the same or different, and each represent a hydrogen atom, an alkyl group optionally having a substituent, or an aryl group optionally having a substituent, and R^{404} , R^{405} , and a nitrogen atom to which R^{404} and R^{405} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

2. The composition for optical members according to claim 1, wherein m in the general formula (1) is 1 or 2.

3. The composition for optical members according to claim 1 or 2, wherein the compound represented by the general formula (1) is a compound represented by general formula (3):

[Formula 3]



wherein R^{1a} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{2a} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, -C(O)-R^{7a} or -SO₂-R^{8a} wherein R^{7a} represents a hydroxyl group or -OR^{71a}, and R^{8a} represents a halogen atom, a hydroxyl group, -OR^{81a}, -NR^{82a}R^{83a} or -R^{84a} wherein R^{71a} and R^{81a} to R^{84a} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6

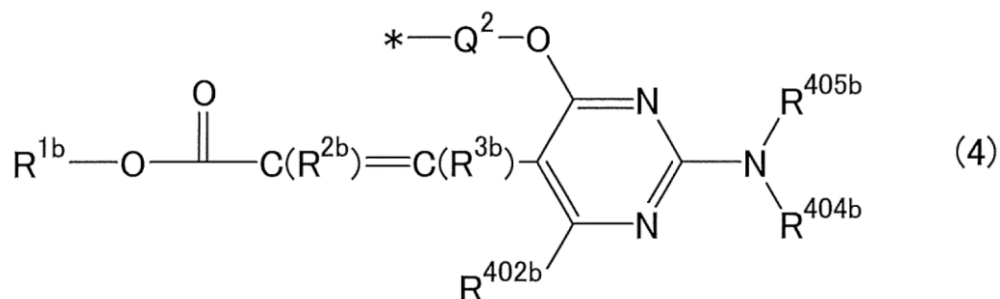
to 20 carbon atoms and optionally having a substituent,

R^{3a} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{402a} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406a}R^{407a}$, $-OR^{408a}$, a cyano group, $-C(O)R^{409a}$, $-O-C(O)R^{410a}$, or $-C(O)OR^{411a}$, and R^{404a} to R^{411a} may be the same or different, and each represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404a} , R^{405a} , and a nitrogen atom to which R^{404a} and R^{405a} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent, and

R^{413} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by general formula (4):

[Formula 4]



wherein Q^2 represents a bivalent hydrocarbon group having 1 to 20 carbon atoms and optionally having a substituent, * represents a moiety which is to be bonded to the general formula (3),

R^{1b} represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, R^{2b} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-\text{C}(\text{O})-\text{R}^{7b}$, or $-\text{SO}_2-\text{R}^{8b}$ wherein R^{7b} represents a hydroxyl group or $-\text{OR}^{71b}$, R^{8b} represents a halogen atom, a hydroxyl group, $-\text{OR}^{81b}$, $-\text{NR}^{82b}\text{R}^{83b}$, or $-\text{R}^{84b}$ wherein R^{71b} and R^{81b} to R^{84b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3b} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6

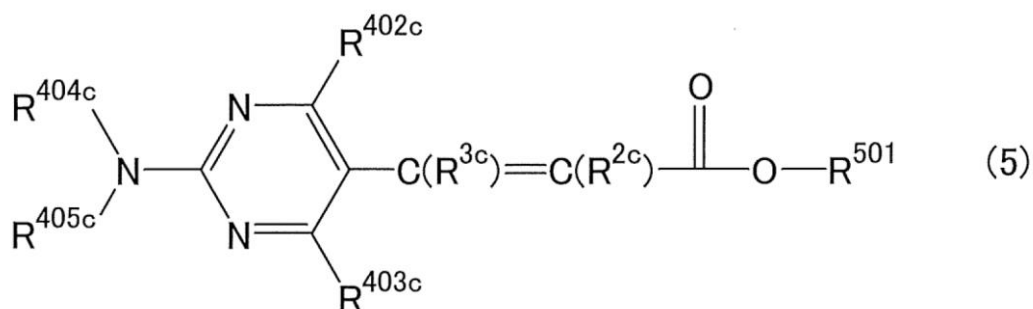
to 20 carbon atoms and optionally having a substituent,

R^{402b} represents a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406b}R^{407b}$, $-OR^{408b}$, a cyano group, $-C(O)R^{409b}$, $-O-C(O)R^{410b}$, or $-C(O)OR^{411b}$, and R^{404b} to R^{411b} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404b} , R^{405b} , and a nitrogen atom to which R^{404b} and R^{405b} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent.

4. The composition for optical members according to claim 3, wherein R^{413} is a group represented by the general formula (4).

5. The composition for optical members according to claim 1 or 2, wherein the compound represented by the general formula (1) is a compound represented by general formula (5):

[Formula 5]



wherein $\text{R}^{2\text{c}}$ represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-containing group, $-\text{C}(\text{O})-\text{R}^{7\text{c}}$ or $-\text{SO}_2-\text{R}^{8\text{c}}$ wherein $\text{R}^{7\text{c}}$ represents a hydroxyl group or $-\text{OR}^{71\text{c}}$, and $\text{R}^{8\text{c}}$ represents a halogen atom, a hydroxyl group, $-\text{OR}^{81\text{c}}$, $-\text{NR}^{82\text{c}}\text{R}^{83\text{c}}$, or $-\text{R}^{84\text{c}}$ wherein $\text{R}^{71\text{c}}$ and $\text{R}^{81\text{c}}$ to $\text{R}^{84\text{c}}$ may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

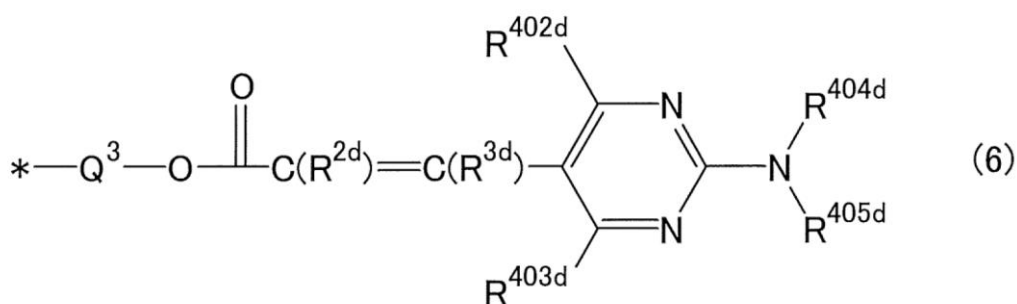
$\text{R}^{3\text{c}}$ represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

$\text{R}^{402\text{c}}$ and $\text{R}^{403\text{c}}$ may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-\text{NR}^{406\text{c}}\text{R}^{407\text{c}}$, $-\text{OR}^{408\text{c}}$, a cyano group, $-\text{C}(\text{O})\text{R}^{409\text{c}}$, $-\text{O}-\text{C}(\text{O})\text{R}^{410\text{c}}$, or $-\text{C}(\text{O})\text{OR}^{411\text{c}}$, and $\text{R}^{404\text{c}}$

to R^{411c} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404c}, R^{405c}, and a nitrogen atom to which R^{404c} and R^{405c} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having a substituent, and

R⁵⁰¹ represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, or a group represented by general formula (6):

[Formula 6]



wherein Q³ represents a bivalent hydrocarbon group having 1 to 20 carbon atoms, and optionally having a substituent, * represents a moiety which is to be bonded to the general formula (5),

R^{2d} represents a hydrogen atom, a cyano group, a nitro group, a trifluoromethyl group, a heterocycle-

containing group, $-C(O)-R^{7d}$, or $-SO_2-R^{8d}$, wherein R^{7d} represents a hydroxyl group or $-OR^{71d}$, and R^{8d} represents a halogen atom, a hydroxyl group, $-OR^{81d}$, $-NR^{82d}R^{83d}$, or $-R^{84d}$ wherein R^{71d} , and R^{81d} to R^{84d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{3d} represents a hydrogen atom, a halogen atom, a cyano group, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent,

R^{402d} and R^{403d} may be the same or different, and each represent a hydrogen atom, a halogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, an aryl group having 6 to 20 carbon atoms and optionally having a substituent, $-NR^{406d}R^{407d}$, $-OR^{408d}$, a cyano group, $-C(O)R^{409d}$, $-O-C(O)R^{410d}$, or $-C(O)OR^{411d}$, and R^{404d} to R^{411d} may be the same or different, and each represent a hydrogen atom, an alkyl group having 1 to 20 carbon atoms and optionally having a substituent, or an aryl group having 6 to 20 carbon atoms and optionally having a substituent, and R^{404d} , R^{405d} , and a nitrogen atom to which R^{404d} and R^{405d} are bonded may form a four-membered to eight-membered nitrogen-containing heterocycle optionally having

a substituent.

6. The composition for optical members according to claim 5, wherein R^{501} is a group represented by the general formula (6).

7. The composition for optical members according to any one of claims 1 to 6, wherein the compound represented by the general formula (1) is a colorant compound having an absorption spectrum showing an absorption maximum wavelength in a wavelength range from 380 to 430 nm.

8. The composition for optical members according to any one of claims 1 to 7, further comprising an ultraviolet absorbent.

9. The composition for optical members according to claim 8, wherein the absorption maximum wavelength of the absorption spectrum of the ultraviolet absorbent is present in a wavelength range from 300 nm to 400 nm.

10. An optical member, formed using the composition recited in any one of claims 1 to 9 for optical members.

11. The optical member according to any one of

claims 1 to 10, which is used as an optical film.

12. The optical member according to any one of claims 1 to 10, which is used as a pressure-sensitive adhesive layer or adhesive layer for optical films.

13. The optical member according to claim 12, wherein the base polymer that the composition, which forms the pressure-sensitive adhesive layer for optical films comprises, is a (meth)acryl-based polymer.

14. The optical member according to any one of claims 1 to 10, which is used as a surface treatment layer laid on an optical film.

15. The optical member according to any one of claims 11 to 14, wherein the optical film is a polarizing film, a polarizer, a transparent protective film for polarizers, or a retardation film.

16. An optical laminate, comprising a polarizer, and a retardation film,

the optical laminate being an optical laminate (1) comprising the optical member recited in any one of claim 10 to 15.

17. An image display device, comprising an image display section, and the optical member recited in any one of claims 10 to 15 or the optical laminate (1) recited in claim 16.

18. The image display device according to claim 17, wherein the optical member or the optical laminate (1) is present nearer to a viewing side of the display device than the image display section.

19. The image display device according to claim 17 or 18,

which is an organic EL display device comprising an optical laminate comprising at least a polarizer and a retardation film in this order from a viewing side, and an organic EL panel as the image display section,

wherein the optical laminate comprises the optical member recited in any one of claims 10 to 15, or the optical laminate (1) recited in claim 16.

20. The optical member according to any one of claims 1 to 10, in a transparent conductive film having a transparent substrate film and a transparent conductive layer, which is used as the transparent substrate film, or

as an intermediate layer located between the transparent substrate film and the transparent conductive layer.

21. The optical member according to claim 20, wherein the intermediate layer is at least one selected from a refractive index adjusting layer, an adhesion facilitating layer, a hard coat layer, and a crack preventing layer.

22. A transparent conductive film, comprising a transparent substrate film and a transparent conductive layer, and comprising the optical member recited in claim 20 or 21 as the transparent substrate film, or as an intermediate layer laid between the transparent substrate film and the transparent conductive layer.

23. An image display device, comprising an image display section, and the transparent conductive film recited in claim 22.

24. The image display device according to claim 23, wherein the transparent conductive film is located nearer to a viewing side of the display device than the image display section.

25. The image display device according to claim 23 or 24, which is an organic EL display device comprising an organic EL panel as the image display section.