

DESCRIPTION

TITLE OF THE INVENTION: PRESSURE-SENSITIVE-ADHESIVE
COMPOSITION FOR ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE,
PRESSURE-SENSITIVE-ADHESIVE LAYER FOR ORGANIC
ELECTROLUMINESCENT DISPLAY DEVICE,
PRESSURE-SENSITIVE-ADHESIVE-LAYER ATTACHED POLARIZING FILM
FOR ORGANIC ELECTROLUMINESCENT DISPLAY DEVICE, AND ORGANIC
ELECTROLUMINESCENT DISPLAY DEVICE

TECHNICAL FIELD

[0001]

The present invention relates to a pressure-sensitive-adhesive composition for organic electroluminescent (EL) display device (OLED). The invention also relates to a pressure-sensitive-adhesive layer for organic electroluminescent display device made from the pressure-sensitive-adhesive composition for organic electroluminescent display device; and a pressure-sensitive-adhesive-layer attached polarizing film having this pressure-sensitive-adhesive layer. The invention further relates to an organic electroluminescent display device using the pressure-sensitive-adhesive layer and/or the polarizing film.

BACKGROUND ART

[0002]

In recent years, organic electroluminescent display devices, on each of which an organic electroluminescent panel is mounted, have been coming to be widely used for various articles such as portable telephones, car navigation devices, monitors for personal computers, and televisions. Usually, in any organic electroluminescent display device, a circularly polarizing plate (such as a laminate of a polarizing plate and a quarter wavelength plate) is disposed on a viewing side surface of the organic electroluminescent panel for inhibiting external light reflection at a metal electrode (cathode) from being viewed like a mirror surface. Moreover, a decorative panel or the like may be further stacked onto the circularly polarizing plate stacked on the viewing side surface of the organic electroluminescent panel. Any two of the circularly polarizing plate, the decorative panel, and other constituent members of the organic electroluminescent display device are usually bonded to each other through a bonding material such as a pressure-sensitive-adhesive layer or adhesive layer.

[0003]

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

[0004]

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

[0005]

The 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.

[0006]

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.

[0007]

Thus, an object of the present invention is to provide a pressure-sensitive-adhesive composition, for organic electroluminescent display device, from which a pressure-sensitive-adhesive layer for organic electroluminescent display device can be made, this layer having high transparency and further being capable of being used in an organic electroluminescent display device to suppress deterioration of an organic electroluminescent element therein. Another object thereof is to provide a pressure-sensitive-adhesive layer, for organic electroluminescent display device, made from the pressure-sensitive-adhesive composition; a pressure-sensitive-adhesive layer attached polarizing film having a polarizing film and the pressure-sensitive-adhesive layer for organic electroluminescent display device; and an organic electroluminescent display device including the pressure-sensitive-adhesive layer and/or the pressure-sensitive-adhesive layer attached polarizing film.

MEANS FOR SOLVING THE PROBLEMS

[0008]

In order to solve the above-mentioned problems, the inventors have repeatedly made eager investigations to find out a pressure-sensitive-adhesive composition for organic electroluminescent display device described below, and then

have achieved the present invention.

[0009]

The present invention relates to a pressure-sensitive-adhesive composition for organic electroluminescent display device, comprising a base polymer, an ultraviolet absorbent, and a colorant compound having an absorption spectrum showing a maximum absorption wavelength in a wavelength range from 380 nm to 430 nm.

[0010]

In the pressure-sensitive-adhesive composition for organic electroluminescent display device, the base polymer is preferably a (meth)acryl-based polymer.

[0011]

In the pressure-sensitive-adhesive composition for organic electroluminescent display device, the maximum absorption wavelength of the absorption spectrum of the ultraviolet absorbent is preferably present in a wavelength range from 300 nm to 400 nm.

[0012]

The present invention also relates to a pressure-sensitive-adhesive layer for organic electroluminescent display device, made from the pressure-sensitive-adhesive composition of the invention for organic electroluminescent display device.

[0013]

The pressure-sensitive-adhesive layer for organic electroluminescent display device preferably shows an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance of 70% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

[0014]

Furthermore, the average transmittance may be an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance of 30% or less at a wavelength from 400 nm to 430 nm, an average transmittance of 70% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

[0015]

Furthermore, the average transmittance may be an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance more than 30% and 75% or less at a wavelength from 400 nm to 430 nm, an average transmittance of 80% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

[0016]

The present invention also relates to a pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device, comprising a

polarizing film, and one or more pressure-sensitive-adhesive layers of the invention for organic electroluminescent display device.

[0017]

In the pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device, the polarizing film is preferably a polarizing film in which a transparent protective film is formed over one of two surfaces of a polarizer, and a retardation film is formed over the other surface, and

the pressure-sensitive-adhesive layer(s) for organic electroluminescent display device is preferably formed over a surface of the retardation film that is opposite to a surface of the retardation film that contacts the polarizer, and/or over a surface of the transparent protective film that is opposite to a surface of the transparent protective film that contacts the polarizer.

[0018]

The pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device preferably comprises a first pressure-sensitive-adhesive layer, a transparent protective film, a polarizer, a second pressure-sensitive-adhesive layer, a retardation film and a third pressure-sensitive-adhesive layer in this order, and at least one pressure-sensitive-adhesive layer of the

first pressure-sensitive-adhesive layer, the second pressure-sensitive-adhesive layer, and the third pressure-sensitive-adhesive layer being the above-mentioned pressure-sensitive-adhesive layer for organic electroluminescent display device.

[0019]

In the pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device, the retardation film is preferably a quarter wavelength plate, and the polarizing film is preferably a circularly polarizing film.

[0020]

The present invention also relates to an organic electroluminescent display device, wherein at least one of the following is used: the pressure-sensitive-adhesive layer of the invention for organic electroluminescent display device; or the pressure-sensitive-adhesive layer attached polarizing film of the invention for organic electroluminescent display device.

EFFECT OF THE INVENTION

[0021]

By using the pressure-sensitive-adhesive composition of the present invention for organic electroluminescent display device in an organic electroluminescent display device, it is possible to form a pressure-sensitive-adhesive layer for

organic electroluminescent display device, the pressure-sensitive-adhesive layer having high transparency and being capable of permitting suppressed deterioration of an organic electroluminescent element. Accordingly, an organic electroluminescent display device in which the following is used has an excellent weather-deterioration resistance: the pressure-sensitive-adhesive layer of the invention for organic electroluminescent display device; and/or the pressure-sensitive-adhesive layer attached polarizing film of the invention, which includes the pressure-sensitive-adhesive layer for organic electroluminescent display device. Consequently, the organic electroluminescent display device can be made long in lifespan.

BRIEF DESCRIPTION OF THE DRAWINGS

[0022]

Figs. 1(a) to 1(c) are each a sectional view which schematically illustrates an embodiment of the pressure-sensitive-adhesive-layer attached polarizing film of the present invention for organic electroluminescent display device.

Fig. 2 is a sectional view which schematically illustrates an embodiment of the organic electroluminescent display device of the invention.

Fig. 3 is a sectional view which schematically

illustrates an embodiment of the organic electroluminescent display device of the invention.

Fig. 4 is a sectional view which schematically illustrates an embodiment of the organic electroluminescent display device of the invention.

MODE FOR CARRYING OUT THE INVENTION

[0023]

1. Pressure-Sensitive-Adhesive Composition for Organic Electroluminescent Display Device

The pressure-sensitive-adhesive composition of the present invention for organic electroluminescent display device includes a base polymer, an ultraviolet absorbent, and a colorant compound having an absorption spectrum showing a maximum absorption wavelength present in a wavelength range from 380 nm to 430 nm. The maximum absorption wavelength denotes the following when plural absorption maximums are present within a wavelength range from 300 nm to 460 nm in a spectral absorption spectrum of a compound: among these absorption maximums, a wavelength of an absorption maximum showing the largest absorbance.

[0024]

The base polymer used in the present invention 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. 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.

[0025]

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); an ultraviolet absorbent; and a colorant compound.

[0026]

(1) 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 components which include an alkyl (meth)acrylate, and/or a (meth)acryl-based polymer yielded from the monomer component(s).

[0027]

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.

[0028]

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 an alkyl group of 4 to 9 carbon atoms, and even 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 an 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.

[0029]

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.

[0030]

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.

[0031]

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.

[0032]

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.

[0033]

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.

[0034]

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.

[0035]

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.

[0036]

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.

[0037]

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.

[0038]

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.

[0039]

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.

[0040]

About the substituted alkyl group of 1 to 3 carbon atoms

as R², 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.

[0041]

Examples of the monomer represented by CH₂=C(R¹)COOR² 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.

[0042]

In the present invention, the proportion of the (meth)acrylate represented by CH₂=C(R¹)COOR² 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.

[0043]

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.

[0044]

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.

[0045]

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.

[0046]

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.

[0047]

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.

[0048]

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.

[0049]

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

[0050]

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.

[0051]

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.

[0052]

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.

[0053]

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).

[0054]

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).

[0055]

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).

[0056]

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.

[0057]

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).

[0058]

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 out of the

radial polymerizations.

[0059]

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. Accordingly, when the ultraviolet polymerization is conducted, it is preferred to form an pressure-sensitive-adhesive layer by polymerizing, through ultraviolet rays, an ultraviolet-ray curing-type acryl-based pressure-sensitive-adhesive composition which includes alkyl-(meth)acrylate-containing monomer component(s) as described above and/or a partially polymerized product of the monomer component(s), an ultraviolet absorbent, a colorant compound, and one or more photopolymerization initiators. The pressure-sensitive-adhesive layer, which is formed by polymerizing, through the ultraviolet rays, the ultraviolet-ray curing-type acryl-based pressure-sensitive-adhesive composition, can be formed also as a thick layer having a thickness of 150 μm or more. Thus, a pressure-sensitive-adhesive layer having a thickness in a wide range can be favorably formed.

[0060]

The photopolymerization initiator(s) is/are not particularly limited, and preferably include(s) a

photopolymerization initiator (A) having an absorbing band in wavelengths of 400 nm or more. In a case where a pressure-sensitive-adhesive composition includes an ultraviolet absorbent or a colorant compound, at the time of polymerizing the composition by effect of ultraviolet rays the ultraviolet absorbent or colorant compound unfavorably absorbs the ultraviolet rays so that the composition is not sufficiently polymerized. However, the photopolymerization initiator (A), which has an absorbing band in wavelengths of 400 nm or more, favorably allows to polymerize the composition of the present invention sufficiently although the composition includes the ultraviolet absorbent or the colorant compound.

[0061]

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).

[0062]

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.

[0063]

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 ultraviolet absorbent or the colorant compound, which will be detailed later. 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.

[0064]

The photopolymerization initiator(s) may include a photopolymerization initiator (B) having an absorbing band in wavelengths less than 400 nm. 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.

[0065]

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.

[0066]

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.

[0067]

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.

[0068]

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

[0069]

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

[0070]

Examples of the benzil-based photopolymerization initiator include benzil.

[0071]

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

[0072]

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

[0073]

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.

[0074]

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

[0075]

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 0.2 part by weight for 100 parts by weight of the monofunctional monomer component (s), from which the (meth)acryl-based polymer is made.

[0076]

When the monomer component(s) is/are polymerized by effect of ultraviolet rays in the present invention, it is preferred to add the photopolymerization initiator (B), which has an absorbing band in wavelengths less than 400 nm, earlier to the monomer component(s); radiate ultraviolet rays to the resultant to polymerize the monomer component(s); add, to the resultant partially polymerized product (prepolymer

composition) of the monomer component(s), a photopolymerization initiator (A) as described above, which has an absorbing band in wavelengths of 400 nm or more, an ultraviolet absorbent, and a colorant compound; and polymerize the resultant by effect of ultraviolet rays. When the photopolymerization initiator (A), which has an absorbing 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 component(s) has/have been partially polymerized by effect of the ultraviolet rays, it is preferred to dissolve the photopolymerization initiator into the monomer(s) and subsequently add the resultant solution thereto. [0077]

(2) Ultraviolet Absorbent

The ultraviolet absorbent is not particularly limited. Examples thereof include any triazine-based ultraviolet absorber, any benzotriazole-based ultraviolet absorber, any benzophenone-based ultraviolet absorber, any oxybenzophenone-based ultraviolet absorber, any salicylate-based ultraviolet absorber, and any cyanoacrylate-based ultraviolet absorber. These may be used singly or in any combination of two or more thereof. Thereamong, any triazine-based ultraviolet absorber and any benzotriazole-based ultraviolet absorber 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, and further the ultraviolet absorbent is high in ultraviolet absorbing ability at wavelengths around 380 nm.

[0078]

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).

[0079]

Examples of the benzotriazole-based ultraviolet absorber 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), and 2-[2-hydroxy-3-(3,4,5,6-tetrahydrophthalimide-methyl)-5-methylphenyl]benzotriazole (SUMISORB 250, manufactured by Sumitomo Chemical Co., Ltd.).

[0080]

Examples of the benzophenone-based ultraviolet absorber (benzophenone-based compound), or the oxybenzophenone-based

ultraviolet absorber (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, and 2,2'-dihydroxy-4,4-dimethoxybenzophenone.

[0081]

Examples of the salicylate-based ultraviolet absorber (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).

[0082]

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

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

[0083]

The maximum absorption wavelength of the absorption spectrum of the ultraviolet absorber is present preferably in a wavelength range of 300 nm to 400 nm, more preferably in a wavelength range of 320 nm to 380 nm. The method for measuring the maximum absorption wavelength is equivalent to a measuring method for the colorant compound, which will be described below.

[0084]

The above-mentioned ultraviolet absorbers 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 5 parts by weight, more preferably about 0.5 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. When the addition amount of the ultraviolet absorber(s) is set in any one of these ranges, favorably, the pressure-sensitive adhesive layer can sufficiently exhibit an ultraviolet absorbing function and additionally when the monomer component(s) is/are polymerized by effect of ultraviolet rays, the polymerization is not hindered.

[0085]

(3) Colorant compound

It is sufficient for the colorant compound used in the

present invention to be a compound about which the maximum absorption wavelength of its absorption spectrum is present in a wavelength range of 380 nm to 430 nm. The compound is not particularly limited. About the absorption spectrum of the colorant compound, the maximum absorption wavelength is more preferably present in a wavelength range of 380 nm to 420 nm. In the present invention, the use of a combination of the colorant compound with the ultraviolet absorbent makes the following possible: the resultant pressure-sensitive adhesive layer sufficiently absorbs light in the range that does not affect the light emission of the organic electroluminescent device (wavelength: 380 nm to 430 nm); and this layer sufficiently transmits light in an emission range of the organic electroluminescent element (wavelengths: wavelengths longer than 430 nm). As a result, it is possible to suppress deterioration of the organic electroluminescent element 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 not to hinder display characteristics of the organic electroluminescent element.

[0086]

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, the pressure-sensitive adhesive layer 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 maximum absorption 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.

[0087]

The colorant compound may be any compound as far as the compound is a compound about which the maximum absorption wavelength of its absorption spectrum is present in a wavelength range of 380 nm to 430 nm. The structure thereof and other factors thereof are not particularly limited. Examples of the colorant compound include organic colorant compounds and inorganic colorant compounds. Thereamong, organic colorant compounds are preferred from the viewpoint of the dispersibility thereof in the base polymer or other resin components, and the maintenance of the transparency of the resultant layer.

[0088]

Examples of the organic colorant compounds include azomethine-based compounds, indole-based compounds, cinnamic acid-based compounds, pyrimidine-based compounds and porphyrin-based compounds.

[0089]

The organic colorant compounds are preferably commercially available products. Specific examples of the indole-based compounds include BONASORB UA 3911 ((trade name) manufactured by Orient Chemical Industries Co., Ltd.; maximum absorption wavelength of absorption spectrum: 398 nm, half value width: 48 nm), BONASORB UA 3912 ((trade name), Orient

Chemical Industries Co., Ltd.; maximum absorption wavelength of the absorption spectrum: 386 nm, half value width: 53 nm). Examples of the cinnamic acid-based compound include SOM-5-0106 ((trade name) manufactured by Orient Chemical Industries Co., Ltd.; maximum absorption wavelength of absorption spectrum: 416 nm, half value width: 50 nm). Examples of the porphyrin-based compounds include FDB-001 ((trade name) manufactured by Yamada Chemical Industry Co., Ltd.; maximum absorption wavelength of the absorption spectrum: 420 nm, half value width: 14 nm).
[0090]

These 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 colorant compound(s) 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 monofunctional monomer(s), from which the (meth)acryl-based polymer is made. When the addition amount of the colorant compound(s) is set into any one of these ranges, the colorant compound(s) 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.

[0091]

(4) 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 monofunctional monomer component(s), from which the (meth)acryl-based polymer is made.

[0092]

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.

[0093]

(5) 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.

[0094]

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.

[0095]

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.

[0096]

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.

[0097]

(6) 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; light stabilizers (HALSes); and antioxidants.

[0098]

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.

[0099]

2. Pressure-Sensitive-Adhesive layer for Organic Electroluminescent Display Device

The pressure-sensitive-adhesive layer for organic

electroluminescent display device is formed from the above-defined pressure-sensitive-adhesive composition of the present invention for organic electroluminescent display device.

[0100]

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.

[0101]

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.

[0102]

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.

[0103]

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.

[0104]

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.

[0105]

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.

[0106]

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

[0107]

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.

[0108]

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.

[0109]

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.

[0110]

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.

[0111]

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.

[0112]

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 to 500 nm, more preferably from 300 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.

[0113]

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.

[0114]

When the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition used in the present

invention contains a photopolymerization initiator (B), 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), an ultraviolet absorbent, a colorant compound 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.

[0115]

When a pressure-sensitive-adhesive layer is formed as described above, using the ultraviolet-ray-curing-type pressure-sensitive-adhesive composition containing the photopolymerization initiator (B), 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.

[0116]

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 in order that the layer can ensure a function of absorbing light rays having a wavelength less than 430 nm. 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.

[0117]

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 is poor in cohesive strength and may undergo problems against the workability and handleability.

[0118]

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% 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.

[0119]

About the pressure-sensitive-adhesive layer, the average transmittance at wavelengths of 300 nm to 400 nm is preferably 5% or less, more preferably 2% or less. When the transmittance of the pressure-sensitive-adhesive layer is in any one of the ranges, the layer can sufficiently absorb light in the range that does not affect the light emission of the organic electroluminescent element so that deterioration of the organic electroluminescent element can be suppressed.

[0120]

About the pressure-sensitive-adhesive layer, the average transmittance at wavelengths of 450 nm to 500 nm is preferably 70% or more, more preferably 75% or more. The average transmittance at wavelengths of 500 nm to 780 nm is preferably 80% or more, more preferably 85% or more. When the transmittance of the pressure-sensitive-adhesive layer is in any one of the ranges, the layer can sufficiently transmit light in the light emission range (wavelengths longer 430 nm) of the

organic electroluminescent element, so that an organic electroluminescent display device using this pressure-sensitive-adhesive layer can sufficiently emit light.

[0121]

The average transmittance at wavelengths of 400 nm to 430 nm may be set correspondingly to properties required for the electroluminescent display device. For example, in order that the pressure-sensitive-adhesive layer can sufficiently absorb light in the range that does not affect the light emission of the organic electroluminescent element to suppress deterioration of, and protect, the organic electroluminescent element, the average transmittance at wavelengths of 400 nm to 430 nm is preferably 30% or less, more preferably 20% or less. In order that the organic electroluminescent element can be protected from ultraviolet rays and simultaneously the organic electroluminescent element can be restrained from being colored, the average transmittance at wavelengths of 400 nm to 430 nm is preferably more than 30% and 75% or less, more preferably more than 30% and 65% or less.

[0122]

The above-mentioned wording "average transmittance at wavelengths of 300 nm to 400 nm" denotes a value obtained by measuring individual values of the transmittance of light at a pitch of 1 nm in the range of 300 nm to 400 nm, and calculating

the average of the measured values. The average transmittance in each of the other wavelength ranges is also equivalent thereto.

[0123]

When the pressure-sensitive-adhesive layer of the present invention has the above-mentioned transmittances, the layer can sufficiently absorb light in the range that does not affect the light emission of the organic electroluminescent element, and can further sufficiently transmit light in the light emission range (longer than 430 nm) of the organic electroluminescent element. Thus, it is possible to suppress deterioration of the organic electroluminescent element by external light.

[0124]

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.

[0125]

3. Pressure-Sensitive-Adhesive Layer Attached Polarizing Film for Organic Electroluminescent Display Device

The pressure-sensitive-adhesive layer attached polarizing film of the present invention for organic electroluminescent display device has a polarizing film and the above-defined pressure-sensitive-adhesive layer for organic electroluminescent display device.

[0126]

The pressure-sensitive-adhesive layer for organic electroluminescent display device is preferably the pressure-sensitive-adhesive layer detailed above. When the pressure-sensitive-adhesive layer is formed onto a substrate other than the polarizing film, the pressure-sensitive-adhesive layer may be bonded and transferred onto the polarizing film. The above-mentioned release film is usable, at it is, as a separator for the pressure-sensitive-adhesive-layer attached polarizing film. This case allows to simplify the process.

[0127]

The polarizing film is not particularly limited, and is, for example, a polarizing film having a polarizer, and a transparent protective film on at least one surface of the polarizer.

[0128]

(1) Polarizer

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 .

[0129]

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 film 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.

[0130]

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.

[0131]

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 this 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.

[0132]

The thin polarizing membranes are preferably polarizing membranes each yielded by the following producing method, out of 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.

[0133]

(2) Transparent Protective Film

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 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 curable resin of, for example, acryl-based, urethane-based, acrylic urethane-based, epoxy-based or silicone-based resin.

[0134]

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.

[0135]

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.

[0136]

A hard coat layer or a treatment may be applied onto the surface of the transparent protective film onto which no polarizer is bonded, examples of the treatment including an

anti-reflection treatment, or a treatment for sticking-prevention, diffusion or anti-glaring.

[0137]

The transparent protective film may be any transparent protective film that has a retardation and can function as an optical compensation layer. When a transparent protective film having a retardation is used, retardation properties thereof are appropriately adjustable to values necessary for optical compensation. This retardation film is preferably a stretched film. 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.

[0138]

When the polarizing film used in the present invention

is used as a circularly polarizing plate for reflection-prevention of an organic electroluminescent display device, the retardation film is preferably a quarter wavelength plate in which its $1/4$ wavelength is set to the front-surface retardation of a transparent protective film (about 100 nm to 170 nm).

[0139]

When a retardation film is used as the transparent protective film, a polarizer is favorably usable about which the transparent protective film is laid on one of the two surfaces of this polarizer, and a retardation film is laid on the other surface. In this case, a location where the pressure-sensitive-adhesive layer is set is not particularly limited. Thus, the pressure-sensitive-adhesive layer may be laid on the surface of the transparent protective film that is opposite to the surface of this film that contacts the polarizer, or on the surface of the retardation film that is opposite to the surface of this film that contacts the polarizer. In order to suppress deterioration of the organic electroluminescent element, it is preferred to lay the pressure-sensitive-adhesive layer on at least one surface of the transparent protective film and the retardation film, or both surfaces of the transparent protective film and the retardation film.

[0140]

A specific example of the

pressure-sensitive-adhesive-layer attached polarizing film of the present invention for organic electroluminescent display device is shown in each of Figs. 1(a) to 1(c). A pressure-sensitive-adhesive-layer attached polarizing film 1 for organic electroluminescent display device can be demonstrated in which individual layers are laminated onto each in the order of the following: as illustrated in Fig. 1(a), pressure-sensitive-adhesive layer 2/transparent protective film 3/polarizer 4/retardation film 5; in which as illustrated in Fig. 1(b), transparent protective film 3/polarizer 4/retardation film 5/pressure-sensitive-adhesive layer 2; or in which as illustrated in Fig. 1(c), pressure-sensitive-adhesive layer 2/transparent protective film 3/polarizer 4/retardation film 5/pressure-sensitive-adhesive layer 2. In each of Figs. 1(a) and 1(b), the pressure-sensitive-adhesive layer 2 is a pressure-sensitive-adhesive layer of the present invention for organic electroluminescent display device. In Fig. 1(c), at least one of the two pressure-sensitive-adhesive layers 2 is sufficient to be a pressure-sensitive-adhesive layer of the present invention for organic electroluminescent display device. The two may be each a pressure-sensitive-adhesive layer of the invention for organic electroluminescent display device. In each of Figs. 1(a) to 1(c), the polarizing film 6 is a single-side protected polarizing film composed of the

polarizer 4 and the transparent protective film 3. However, the polarizing film 6 is not limited to this example. Thus, the polarizing film 6 may be a double side protected polarizing film further having a transparent protective film between the polarizer 4 and the retardation film 5. As described above, for example, various function layers such as a hard coat layer may be formed on the surface of the transparent protective film 3 that does not contact the polarizer 4.

[0141]

When the retardation layer is laminated over a polarizer to interpose a pressure-sensitive-adhesive layer therebetween, this pressure-sensitive-adhesive layer may be a pressure-sensitive-adhesive layer of the present invention for organic electroluminescent display device. In other words, in a pressure-sensitive-adhesive-layer attached polarizing film for organic electroluminescent display device that has a first pressure-sensitive-adhesive layer, a transparent protective film, a polarizer, a second pressure-sensitive-adhesive layer, a retardation film, and a third pressure-sensitive-adhesive layer in this order,

it is sufficient that at least one of the first, the second and the third pressure-sensitive-adhesive layers is the above-defined pressure-sensitive-adhesive layer for organic electroluminescent display device.

[0142]

4. Organic electroluminescent Display Device

The organic electroluminescent display device of the present invention is a display device in which at least one of the following is used: a pressure-sensitive-adhesive layer of the present invention for organic electroluminescent display device; and/or a pressure-sensitive-adhesive-layer attached polarizing film of the invention for organic electroluminescent display device.

[0143]

As illustrated in, for example, each of Figs. 2 to 4, an example of a specific structure of the organic electroluminescent display device is an organic electroluminescent display device in which individual layers are laminated onto each other in the following order: cover glass or cover plastic 7/pressure-sensitive-adhesive layer 2/transparent protective film 3/polarizer 4/retardation film 5/pressure-sensitive-adhesive layer 2/organic electroluminescent display panel (OLED element panel) 8 (Fig. 2); cover glass or cover plastic 7/adhesive layer 9/transparent protective film 3/polarizer 4/retardation film 5/pressure-sensitive-adhesive layer 2/organic electroluminescent display panel 8 (Fig. 3); or cover glass or cover plastic 7/pressure-sensitive-adhesive layer 2/sensor layer 10/pressure-sensitive-adhesive layer 2/transparent protective film 3/polarizer 4/retardation layer

5/pressure-sensitive-adhesive layer 2/organic electroluminescent display panel 8 (Fig. 4). In each of these structures, it is sufficient for at least one of the pressure-sensitive-adhesive layers 2 to be a pressure-sensitive-adhesive layer of the present invention. All the pressure-sensitive-adhesive layers 2 may be pressure-sensitive-adhesive layers of the present invention. The organic electroluminescent display device of the present invention may include, besides the above-mentioned constituents, a protective film, a hard coat layer, and other various functional layers. In the lamination of any two of these layers onto each other, a pressure-sensitive-adhesive layer and/or an adhesive layer may be appropriately used. As any pressure-sensitive-adhesive layer other than the pressure-sensitive-adhesive layer of the present invention, an ordinary pressure-sensitive-adhesive layer used in the art is appropriately usable.

EXAMPLES

[0144]

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

[0145]

Production Example 1 (Production of Acryl-based
Pressure-Sensitive-Adhesive Composition (a))

As photopolymerization initiators, the following were blended into a monomer mixture of 78 parts by weight of 2-ethylhexyl acrylate (2EHA), 18 parts by weight of N-vinyl-2-pyrrolidone (NVP), and 15 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: 8%). Next, to the prepolymer composition were added 0.15 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).

[0146]

Production Example 2 (Production of Acryl-based
Pressure-Sensitive-Adhesive Composition (b))

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 (b) solution.

[0147]

Production Example 3 (Production of
Pressure-Sensitive-Adhesive Layer (B1-1))

The pressure-sensitive-adhesive composition (b) solution yielded in Production Example 2 was applied onto a separator (polyethylene terephthalate film having a surface subjected to release treatment) having a thickness of 38 μm to give a thickness of 12 μm after the resultant would be dried. The resultant was dried at 100°C for 3 minutes to remove the solvent to yield pressure-sensitive-adhesive layer. Thereafter, the workpiece was heated at 50°C for 48 hours to be subjected to crosslinking treatment. Hereinafter, the pressure-sensitive-adhesive layer will be referred to as the "organic electroluminescent display panel side pressure-sensitive-adhesive layer (B1-1)".

[0148]

Production Example 4 (Production of
Pressure-Sensitive-Adhesive Layer (B1-2))

The pressure-sensitive-adhesive composition (b) solution yielded in Production Example 2 was applied onto a separator (polyethylene film having a surface subjected to release treatment) having a thickness of 38 μm to give a thickness of 23 μm after the resultant would be dried. The resultant was dried at 100°C for 3 minutes to remove the solvent to yield pressure-sensitive-adhesive layer. Thereafter, the workpiece was heated at 50°C for 48 hours to be subjected to

crosslinking treatment. Hereinafter, the pressure-sensitive-adhesive layer will be referred to as the "organic electroluminescent display panel side pressure-sensitive-adhesive layer (B1-2)".

[0149]

Example 1

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

The following were added to the acryl-based pressure-sensitive-adhesive composition (a) (the amount of the monomer components from which an acryl-based polymer was made was regarded as 100 parts by weight) yielded in Production Example 1: 0.7 part by weight (solid weight) of 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.: an "ultraviolet absorbent (b1)" in each of Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 346 nm) dissolved in butyl acrylate to give a solid content of 15%; 0.3 part by weight of bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide (trade name: IRGACURE 819, manufactured by BASF Japan Ltd., and having an absorption band in wavelengths of 200 nm to 450 nm); and 0.5 part by weight (solid weight) of a product BONASORB UA3911 ((trade name) manufactured by Orient Chemical Industries Co., Ltd.: an indole-based compound, which is a "colorant compound (c1)" in each of Tables 1 and 2; maximum absorption wavelength

of absorption spectrum: 398 nm; half value width: 48 nm)
dissolved in N-vinyl-2-pyrrolidone (NVP) to give a solid
content of 5%. These components were then stirred to yield a
pressure-sensitive-adhesive composition (A).

[0150]

The pressure-sensitive-adhesive composition (A) was
applied onto a release film, which was a film subjected to
release treatment, to give a thickness of 150 μm after a
pressure-sensitive-adhesive layer would be formed. Next, a
release film was bonded onto an outer surface of the
pressure-sensitive-adhesive composition layer. Thereafter,
the resultant was irradiated with ultraviolet rays under the
following conditions: illuminance: 6.5 mW/cm², light quantity:
1500 mJ/cm²; and peak wavelength: 350 nm. In this way, the
pressure-sensitive-adhesive composition layer was optically
cured to form pressure-sensitive-adhesive layer (A-1).

[0151]

Example 2

A pressure-sensitive-adhesive layer (A-2) was formed in
the same way as in Example 1 except that the colorant compound
(c) was applied as the following in an amount of 2.5 parts by
weight (solid weight) to give a thickness of 100 μm after the
pressure-sensitive-adhesive layer formation: a product
BONASORB UA3912 ((trade name) an indole-based compound,
manufactured by Orient Chemical Industries, Ltd.: a "colorant

compound (c2) in each of Tables 1 and 2"; maximum absorption wavelength of absorption spectrum: 386 nm; half value width: 53 nm) dissolved in N-vinyl-2-pyrrolidone (NVP) to give a solid content of 10%.

[0152]

Example 3

A pressure-sensitive-adhesive layer (A-3) was formed in the same way as in Example 1 except that the species of the ultraviolet absorbent in Example 1 was changed to 2-(2H-benzotriazol-2-yl)-6-(1-methyl-1-phenylethyl)-4-(1,1,3,3-tetramethylbutyl)phenol (trade name: Tinuvin 928, manufactured by BASF Japan Ltd.: an "ultraviolet absorbent (b2)" in each of Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 349 nm) dissolved into butyl acrylate to give a solid content of 15%; the addition amount thereof was changed to 1.5 parts by weight (solid weight); the species of the colorant compound was changed to a cinnamic acid compound (sample name: SOM-5-0103, manufactured by Orient Chemical Industries Co., Ltd. and being a "colorant compound (c3)" in each of Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 416 nm; half value width: 50 nm); and 0.2 part by weight (solid weight) thereof was directly added to the pressure-sensitive-adhesive composition, and the composition was applied to give a thickness of 100 μm after the pressure-sensitive-adhesive layer formation.

[0153]

Example 4

A pressure-sensitive-adhesive layer (A-4) was formed in the same way as in Example 1 except that the addition amount of the ultraviolet absorbent (b1) in Example 1 was changed to 3.0 parts by weight (solid weight); the species of the colorant compound was changed to 0.1 part by weight (solid weight) of a porphyrin-based compound (sample name: FDB-001 manufactured by Yamada Chemical Co., Ltd.: a "colorant compound (c4)" in each of Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 420 nm; half value width: 14 nm) dissolved into N-vinyl-2-pyrrolidone (NVP) to give a solid content of 1%; and the composition was applied to give a thickness of 100 μm after the pressure-sensitive-adhesive layer formation.

[0154]

Example 5

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

The following were directly added to the acryl-based pressure-sensitive-adhesive composition (b) (the amount of the monomer components from which an acryl-based polymer was made was regarded as 100 parts by weight) yielded in Production Example 2: 3 parts by weight (solid weight) of 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.: an "ultraviolet absorbent (b1)" in each of

Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 346 nm); and 0.8 part by weight (solid weight) of a product BONASORB UA3912 ((trade name) manufactured by Orient Chemical Industries Co., Ltd.: an indole-based compound, which is a "colorant compound (c2)" in each of Tables 1 and 2; maximum absorption wavelength of absorption spectrum: 386 nm; half value width: 53 nm). These components were then stirred to yield a pressure-sensitive-adhesive composition (B) solution. [0155]

The resultant pressure-sensitive-adhesive composition (B) solution was applied onto a separator (polyethylene terephthalate-based film having a surface subjected to release treatment) having a thickness of 38 μm to give a thickness of 25 μm after the resultant would be dried. The resultant was then dried at 120°C for 3 minutes to remove the solvent to yield a pressure-sensitive-adhesive layer. Thereafter, the resultant was heated at 50°C for 48 hours to be subjected to crosslinking treatment. In this way, pressure-sensitive-adhesive layer (B) was formed. [0156]

Comparative Example 1

A pressure-sensitive-adhesive layer (A1-1) was formed in the same way as in Example 1 except the use of an acryl-based pressure-sensitive-adhesive composition (a) including neither the ultraviolet absorbent (b1) nor the colorant compound (c1)

in Example 1.

[0157]

Comparative Example 2

The organic electroluminescent display panel side pressure-sensitive-adhesive layer (B1-2) in Production Example 3 were used.

[0158]

Comparative Example 3

A pressure-sensitive-adhesive layer (A1-2) was formed in the same way as in Example 1 except that the colorant compound (c1) in Example 1 was not incorporated, and the composition was applied to give a thickness of 100 μm after the pressure-sensitive-adhesive layer formation.

[0159]

Comparative Example 4

A pressure-sensitive-adhesive layer (A1-3) was formed in the same way as in Example 3 except that the colorant compound (c3) was not incorporated, and the composition was applied to give a thickness of 150 μm after the pressure-sensitive-adhesive layer formation.

[0160]

Comparative Example 5

A pressure-sensitive-adhesive layer (A1-4) was formed in the same way as in Example 1 except that the ultraviolet absorbent (b1) in Example 1 was not incorporated, the addition

amount of the colorant compound (c1) was changed to 0.3 part by weight (solid weight), and further the composition was applied to give a thickness of 100 μm after the pressure-sensitive-adhesive layer formation.

[0161]

Comparative Example 6

A pressure-sensitive-adhesive layer (A1-5) was formed in the same way as in Example 2 except that the ultraviolet absorbent (b1) in Example 2 was not incorporated, and the addition amount of the colorant compound (c2) was changed to 0.5 part by weight (solid weight).

[0162]

Comparative Example 7

A pressure-sensitive-adhesive layer (A1-6) was formed in the same way as in Example 3 except that the ultraviolet absorbent (b2) in Example 3 was not incorporated.

[0163]

Comparative Example 8

A pressure-sensitive-adhesive layer (A1-7) was formed in the same way as in Example 4 except that the ultraviolet absorbent (b1) in Example 4 was not incorporated.

[0164]

Example 6

(Production of Pressure-Sensitive-Adhesive Layer (A-5))

A pressure-sensitive-adhesive layer (A-5) was formed in

the same way as in Example 1 except that the addition amount of the colorant compound (c1) in Example 1 was changed to 0.7 part by weight (solid weight) and the pressure-sensitive-adhesive composition was applied to give a thickness of 100 μm after the pressure-sensitive-adhesive layer formation.

[0165]

(Production of Polarizing Film (P))

By using a polyvinyl alcohol-based adhesive, a cycloolefin polymer (COP) film having a thickness of 25 μm was bonded onto the viewing side of a polarizer made of a stretched polyvinyl alcohol film impregnated with iodine and having a thickness of 5 μm . By using a polyvinyl alcohol-based adhesive, an acrylic film having a thickness of 20 μm was laminated onto an organic electroluminescent display panel side surface of the polarizer to produce a polarizing film (P). The polarization degree of the polarizing film was 99.995.

[0166]

(Production of Pressure-Sensitive-Adhesive-Layer Attached Polarizing Film)

The pressure-sensitive-adhesive layer (A-5) produced as described above was laminated onto the viewing side (that is, the outer surface of the cycloolefin polymer (COP), the thickness of which was 25 μm) of the polarizing film (P). The image display section side pressure-sensitive-adhesive layer

(B1-1) was laminated onto an organic electroluminescent display panel side surface (that is, the outer surface of the acrylic film, the thickness of which was 20 μm) of the polarizing film (P). Furthermore, the following were laminated thereonto to form a pressure-sensitive-adhesive-layer attached polarizing film: a retardation film (thickness: 56 μm ; material: polycarbonate); and the image display section side pressure-sensitive-adhesive layers (B1-2). The resultant pressure-sensitive-adhesive-layer attached polarizing film had a structure of pressure-sensitive-adhesive layer (A-5)/polarizing film (P)/organic electroluminescent display panel side pressure-sensitive-adhesive layer (B1-1)/retardation film/organic electroluminescent display panel side pressure-sensitive-adhesive layer (B1-2).

[0167]

Example 7

A pressure-sensitive-adhesive layer (A-6) was formed in the same way as in Example 2 except that the addition amount of the colorant compound (c2) in Example 2 was changed to 0.5 part by weight (solid weight). Moreover, a pressure-sensitive-adhesive-layer attached polarizing film was formed in the same way as Example 6 except that the pressure-sensitive-adhesive layers (A-6) was used.

[0168]

Comparative Example 9

A pressure-sensitive-adhesive layer (A1-8) was formed in the same way as in Example 6 except that the pressure-sensitive-adhesive layer (A-5) in Example 6 did not contain the colorant compound (c1). Moreover, a pressure-sensitive-adhesive-layer attached polarizing film was formed in the same way as in Example 6 except that the pressure-sensitive-adhesive layers (A1-8) was used.

[0169]

About the resultant pressure-sensitive adhesive layers and pressure-sensitive-adhesive-layer attached polarizing films, the following evaluations were made:

[0170]

<Transmittance Measurement of Pressure-Sensitive-Adhesive Layers>

The release films of any one of the pressure-sensitive-adhesive layers yielded in each of the working examples and the comparative examples were peeled off, and then the pressure-sensitive-adhesive layer was fitted to a measuring tool. The transmittance thereof was measured, using a spectrophotometer (production name: U4100, manufactured by Hitachi High-Technologies Corp.). The measured transmittance was the transmittance in the range of wavelengths of 300 nm to 780 nm.

[0171]

<Transmittance Measurement of Pressure-Sensitive-Adhesive

Layer Attached Polarizing Films>

The release films of any one of the pressure-sensitive-adhesive layers yielded in each of the working examples and the comparative examples were peeled off, and then the transmittance thereof was measured, using the spectrophotometer (production name: U4100, manufactured by Hitachi High-Technologies Corp.). The measured transmittance was the transmittance in the range of wavelengths of 350 nm to 780 nm.

[0172]

<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 out. Next, one of the release films of the pressure-sensitive-adhesive layer was peeled off. Onto the remaining layer was then bonded (lined) a PET film (trade name: LUMILAR S-10, manufactured by Toray Industries, Inc.; thickness: 25 μm). Next, the other release film was peeled off, and the remaining layer was bonded onto a glass plate (trade name: SODA LIME GLASS #0050, manufactured by Matsunami Glass Ind., Ltd.) as a test plate under pressure conditions that a 2-kg roller was reciprocated thereon one time. In this way, a sample was produced which was composed of the test plate/pressure-sensitive-adhesive layer (A)/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 cooling, a tensile tester (machine name: AUTOGRAPH AG-IS, manufactured by Shimadzu Corp.) was used to peel away the pressure-sensitive adhesive sheet (pressure-sensitive-adhesive layer/PET film) from the test plate in accordance with JIS Z0237 in an atmosphere of 23°C and 50% R.H. under conditions that the tensile speed was 300 mm/minute and the peeling angle was 180°. In this way, the 180°-peel adhering strength (N/20-mm) thereof was measured. [0173]

<Total Light 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. The remaining layer was bonded onto 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 transmittance: 92%; haze: 0.2%). Furthermore, the other release film was peeled off therefrom to produce a test piece having a layer structure of the pressure-sensitive-adhesive layer and the slide glass piece. A haze meter (instrument name: HM-150, manufactured by Murakami Color Research Laboratory Co., Ltd.) was used to measure the total light transmittance and the haze value of the test piece

in a visible light range.

[0174]

[Table 1]

	Pressure-sensitive-adhesive-layer	Pressure-sensitive-adhesive-composition-species	Ultraviolet absorbent (b)		Colorant compound (c)		Sheet thickness (μm)	Evaluation results						Haze value	Adhering strength [N/20 mm]
			Species	Addition amount (part (s))	Species	Addition amount (part (s))		300-400 nm Average transmittance (%)	400-430 nm Average transmittance (%)	430-450 nm Average transmittance (%)	450-500 nm Average transmittance (%)	500-780 nm Average transmittance (%)	Total light transmittance (%)		
Example 1	A-1	(a)	b1	0.7	c1	0.5	150	0.1	12.5	76.9	91.5	92.4	92.3	0.4	12
Example 2	A-2	(a)	b1	0.7	c2	2.5	100	0.0	4.5	60.0	89.5	91.4	92.3	0.4	9
Example 3	A-3	(a)	b2	1.5	c3	0.2	100	0.7	0.9	7.0	74.8	91.9	92.3	0.4	13
Example 4	A-4	(a)	b1	3.0	c4	0.1	100	1.1	5.4	51.3	82.7	84.9	77.6	0.6	10
Example 5	B	(b)	b1	3.0	c2	0.8	25	0.0	46.4	88.5	91.4	92.3	92.6	0.3	8
Comparative example 1	Al-1	(a)	-	-	-	-	150	92.0	92.3	92.5	92.5	92.9	92.4	0.3	14
Comparative example 2	Bl-2	(b)	-	-	-	-	23	91.0	92.3	92.5	92.5	92.9	92.6	0.3	7
Comparative example 3	Al-2	(a)	b1	0.7	-	-	100	8.7	86.4	91.9	92.4	92.7	92.4	0.3	14
Comparative example 4	Al-3	(a)	b2	1.5	-	-	150	6.7	86.5	92.0	92.4	92.7	92.3	0.3	14
Comparative example 5	Al-4	(a)	-	-	c1	0.3	100	21.1	26.3	84.3	92.0	92.5	92.3	0.4	12
Comparative example 6	Al-5	(a)	-	-	c2	0.5	100	11.3	34.2	89.3	92.9	93.0	92.3	0.4	10
Comparative example 7	Al-6	(a)	-	-	c3	0.2	100	53.0	0.8	7.0	74.8	91.9	92.3	0.4	11
Comparative example 8	Al-7	(a)	-	-	c4	0.1	100	82.9	17.5	51.3	82.7	84.9	92.3	0.4	11

[0175]

[Table 2]

	Viewing side pressure-sensitive-adhesive layer										Image display cell side pressure-sensitive-adhesive layer				Evaluation results			
	Pressure-sensitive-adhesive layer	Ultraviolet absorbent (b)		Colorant compound (c)		Sheet thickness (μm)	B1-1 Thickness (μm)	B1-2 Thickness (μm)	350-400 nm Average transmittance (%)	400-430 nm Average transmittance (%)	430-450 nm Average transmittance (%)	450-500 nm Average transmittance (%)	500-780 nm Average transmittance (%)					
		Species	Addition amount (part)	Species	Addition amount (part)													
Example 6	A-5	b1	0.7	0.7	C1	0.7	100	12	23	0.0	5.2	33.5	41.8	46.5				
Example 7	A-6	b1	0.7	0.7	C2	0.5	100	12	23	0.0	14.2	35.9	42.2	46.5				
Comparative example 9	A1-8	b1	0.7	0.7	-	-	100	12	23	4.0	34.8	40.3	42.3	46.7				

DESCRIPTION OF REFERENCE SIGNS

[0176]

- 1: Pressure-sensitive-adhesive-layer attached
polarizing film for organic electroluminescent display device
- 2: Pressure-sensitive-adhesive layer
- 3: Transparent protective film
- 4: Polarizer
- 5: Retardation film
- 6: Polarizing film
- 7: Cover glass or cover plastic
- 8: Organic electroluminescent panel
- 9: Adhesive layer
- 10: Sensor layer

CLAIMS

1. A pressure-sensitive-adhesive composition for organic electroluminescent display device, comprising a base polymer, an ultraviolet absorbent, and a colorant compound having an absorption spectrum showing a maximum absorption wavelength in a wavelength range from 380 nm to 430 nm.

2. The pressure-sensitive-adhesive composition for organic electroluminescent display device according to claim 1, wherein the base polymer is a (meth)acryl-based polymer.

3. The pressure-sensitive-adhesive composition for organic electroluminescent display device according to claim 1 or 2, wherein the maximum absorption wavelength of the absorption spectrum of the ultraviolet absorbent is present in a wavelength range from 300 nm to 400 nm.

4. A pressure-sensitive-adhesive layer for organic electroluminescent display device, made from the pressure-sensitive-adhesive composition according to any one of claims 1 to 3 for organic electroluminescent display device.

5. The pressure-sensitive-adhesive layer for organic electroluminescent display device according to claim 4, which

shows an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance of 70% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

6. The pressure-sensitive-adhesive layer for organic electroluminescent display device according to claim 5, which shows an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance of 30% or less at a wavelength from 400 nm to 430 nm, an average transmittance of 70% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

7. The pressure-sensitive-adhesive layer for organic electroluminescent display device according to claim 5, which shows an average transmittance of 5% or less at a wavelength from 300 nm to 400 nm, an average transmittance more than 30% and 75% or less at a wavelength from 400 nm to 430 nm, an average transmittance of 80% or more at a wavelength from 450 nm to 500 nm, and an average transmittance of 80% or more at a wavelength from 500 nm to 780 nm.

8. A pressure-sensitive-adhesive layer attached

polarizing film for organic electroluminescent display device, comprising a polarizing film, and one or more pressure-sensitive-adhesive layers according to any one of claims 4 to 7 for organic electroluminescent display device.

9. The pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device according to claim 8,

the polarizing film being a polarizing film in which a transparent protective film is formed over one of two surfaces of a polarizer, and a retardation film is formed over the other surface, and the pressure-sensitive-adhesive layer(s) for organic electroluminescent display device being formed over a surface of the retardation film that is opposite to a surface of the retardation film that contacts the polarizer, and/or over a surface of the transparent protective film that is opposite to a surface of the transparent protective film that contacts the polarizer.

10. The pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device according to claim 8,

comprising a first pressure-sensitive-adhesive layer, a transparent protective film, a polarizer, a second pressure-sensitive-adhesive layer, a retardation film and a

third pressure-sensitive-adhesive layer in this order, and at least one pressure-sensitive-adhesive layer of the first pressure-sensitive-adhesive layer, the second pressure-sensitive-adhesive layer, and the third pressure-sensitive-adhesive layer being the above-mentioned pressure-sensitive-adhesive layer for organic electroluminescent display device.

11. The pressure-sensitive-adhesive layer attached polarizing film for organic electroluminescent display device according to claim 9 or 10, wherein the retardation film is a quarter wavelength plate, and the polarizing film is a circularly polarizing film.

12. An organic electroluminescent display device, wherein at least one of the following is used: the pressure-sensitive-adhesive layer according to any one of claims 4 to 7 for organic electroluminescent display device; or the pressure-sensitive-adhesive layer attached polarizing film according to any one of claims 8 to 11 for organic electroluminescent display device.