

RELEASE FILM-EQUIPPED PRESSURE SENSITIVE ADHESIVE SHEET AND METHOD FOR MANUFACTURING THE SAME

TECHNICAL FIELD

5 **[0001]** The present invention relates to a pressure sensitive adhesive sheet with a release film temporarily attached thereon, and a method for manufacturing thereof.

BACKGROUND ART

10 **[0002]** For display devices such as liquid crystal displays and organic light emitting diode (OLED) displays, and display input devices such as touch panels, transparent pressure sensitive adhesive sheets are used for bonding optical members. A transparent pressure sensitive adhesive sheet is generally provided as a release film-equipped pressure sensitive adhesive sheet with a release film disposed on both surfaces. When a pressure sensitive adhesive sheet is used, one
15 release film (light-release film) is peeled off to expose one surface of the pressure sensitive adhesive sheet, and a first adherend is bonded to the surface, followed by peeling off the other release film (heavy-release film), and bonding a second adherend to the other surface of the pressure sensitive adhesive sheet.

20 **[0003]** Optical members to be used for display devices, input devices and the like may be required to have an ultraviolet ray cutting property from the viewpoint of, for example, suppressing degradation of elements by ultraviolet rays. For example, in an OLED display, degradation of organic molecules, which forms a light emitting layer or the like, by ultraviolet rays significantly affects display characteristics, and therefore, an optical member arranged on the front surface of an element is
25 required to have a high ultraviolet ray cutting property. In addition, in a polarizing plate to be used for liquid crystal displays and OLED displays, optical members arranged on the front of a polarizer are required to have an ultraviolet ray cutting property for preventing degradation of the polarizer (*e.g.* color fading of iodine) by ultraviolet rays.

30 **[0004]** As a method for imparting an ultraviolet ray cutting property to a pressure sensitive adhesive sheet, a method is known in which a UV absorber is added to a pressure sensitive adhesive composition. For example, Patent Document 1 suggests that a pressure sensitive adhesive composition obtained by adding a UV absorber to a thermo-polymerized acryl-based pressure sensitive adhesive solution is applied in

the form of a film, and then heated and dried to obtain a pressure sensitive adhesive sheet having an ultraviolet ray cutting property. Patent Document 2 suggests that a photocurable acryl-based pressure sensitive adhesive composition containing a photocurable acryl-based composition, a photopolymerization initiator and a UV absorber is applied on a base film in a layer-form, another release film is superposed thereon to avoid contact with air, and in this state, photocuring is performed to obtain a photocured pressure sensitive adhesive sheet having an ultraviolet ray cutting property.

PRIOR ART DOCUMENTS

[0005] Patent Document 1: Japanese Patent Laid-open Publication No. 2013-75978

Patent Document 2: Japanese Patent Laid-open Publication No. 2016-155981

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0006] As described in Patent Document 2, use of a photocurable pressure sensitive adhesive allows a pressure sensitive adhesive sheet to be formed without the necessity of a solvent, so that it is easy to increase the thickness of the pressure sensitive adhesive sheet. In addition, there is an advantage that the smoothness of the pressure sensitive adhesive sheet can be improved by performing photocuring with a release sheet contacting both surfaces of a sheet-shaped photocurable pressure sensitive adhesive composition.

[0007] However, the present inventors found that when a photocurable pressure sensitive adhesive composition containing a UV absorber is irradiated with an ultraviolet ray through a release film to photocure the composition, it may be difficult to peel a release film during bonding to an adherend because peel strength between the release film on the light irradiation-side and a pressure sensitive adhesive sheet after photocuring considerably increases. In view of such problems, an object of the present invention is to provide a release film-equipped pressure sensitive adhesive sheet having an ultraviolet ray cutting property and good peelability of a release film.

MEANS FOR SOLVING THE PROBLEMS

[0008] A release film-equipped pressure sensitive adhesive sheet of the present invention includes a photocured pressure sensitive adhesive sheet having a first principal surface and a second principal surface, and a first release film temporarily attached on the first principal surface of the pressure sensitive adhesive sheet. The first release film includes a release layer on a base film, the release layer being in contact with the pressure sensitive adhesive sheet. The pressure sensitive adhesive sheet contains a photocured acryl-based polymer and a UV absorber. The release film-equipped pressure sensitive adhesive sheet may include a second release film temporarily attached on the second principal surface of the pressure sensitive adhesive sheet.

[0009] The first principal surface of the pressure sensitive adhesive sheet is a light irradiation surface at the time of photocuring the photocurable pressure sensitive adhesive composition. In other words, a photocured pressure sensitive adhesive sheet is formed by irradiating the photocurable pressure sensitive adhesive composition with light through the first release film. When a release film having a specific silicone-based release layer is used as the first release film disposed on the side through which the photocurable pressure sensitive adhesive composition is irradiated with light, an excessive increase in peel strength can be suppressed even if a pressure sensitive adhesive contains a UV absorber. The silicone-based release layer of the first release film preferably has a Si atom content of 0.02 to 0.07 g / m².

[0010] The light transmittance of the pressure sensitive adhesive sheet at a wavelength of 380 nm is preferably 10% or less. Preferably, the pressure sensitive adhesive sheet contains 0.1 to 10 parts by weight of a UV absorber based on 100 parts by weight of the acryl-based polymer. A triazine-based UV absorber may be used as the UV absorber. The acryl-based polymer of the pressure sensitive adhesive sheet may contain as a monomer component a polyfunctional monomer component having two or more polymerizable functional groups per molecule.

[0011] A release film-equipped pressure sensitive adhesive sheet is obtained by irradiating the photocurable pressure sensitive adhesive composition with light through the first release film disposed on the first principal surface of the photocurable pressure sensitive adhesive composition. The photocurable pressure sensitive adhesive composition contains an acryl-based material, a UV absorber and

a photopolymerization initiator. Examples of the acryl-based material contained in the photocurable pressure sensitive adhesive composition include acryl-based monomers and partially polymerized products thereof. The acryl-based material may include both an acryl-based monomer and a partially polymerized product of the acryl-based monomer.

[0012] In one embodiment, a laminate with a photocurable pressure sensitive adhesive composition layer sandwiched between a first release film and a second release film is irradiated with light from the first release film-side to photocure the photocurable pressure sensitive adhesive composition, whereby a pressure sensitive adhesive sheet with a release film temporarily attached on both surfaces is obtained. In the pressure sensitive adhesive sheet with a release film temporarily attached on both surfaces, peel strength between the first release film and the pressure sensitive adhesive sheet may be higher than peel strength between the second release film and the pressure sensitive adhesive sheet.

EFFECTS OF THE INVENTION

[0013] A pressure sensitive adhesive sheet having a high visible light transmittance and an ultraviolet ray cutting property is suitably used as an optical pressure sensitive adhesive sheet for display devices and display input devices which are required to have an ultraviolet ray cutting property. The release film-equipped pressure sensitive adhesive sheet of the present invention is excellent in workability at the time of peeling off the release film from the pressure sensitive adhesive sheet and bonding the pressure sensitive adhesive sheet to an adherend, because an excessive increase in peel strength between the pressure sensitive adhesive sheet and the first release film is suppressed.

BRIEF DESCRIPTION OF THE DRAWINGS

[0014] FIG. 1 is a sectional view showing a stacking configuration of a release film-equipped pressure sensitive adhesive sheet.

MODE FOR CARRYING OUT THE INVENTION

[0015] The release film-equipped pressure sensitive adhesive sheet of the present invention includes a release film temporarily attached on at least one surface of the pressure sensitive adhesive sheet. The term of “temporarily attached” means a

state of being releasably attached. The release film-equipped pressure sensitive adhesive sheet may have a release film temporarily attached on both surfaces of a pressure sensitive adhesive sheet.

[0016] FIG. 1 is a sectional view of a release film-equipped pressure sensitive adhesive sheet 1 with release films 10 and 20 temporarily attached on both surfaces of a pressure sensitive adhesive sheet 50. The pressure sensitive adhesive sheet 50 is obtained by depositing a pressure sensitive adhesive in a sheet-form. The pressure sensitive adhesive sheet 50 is transparent, and has a small visible light absorption. The total light transmittance of the pressure sensitive adhesive sheet 50 is preferably 85% or more, more preferably 90% or more. The haze of the pressure sensitive adhesive sheet is preferably 2% or less, more preferably 1% or less. The total light transmittance and the haze are measured in accordance with JIS K7136 using a haze meter.

[0017] The pressure sensitive adhesive sheet 50 is an acryl-based pressure sensitive adhesive containing a photocured acryl-based polymer, and contains a UV absorber in addition to the acryl-based polymer. The acryl-based pressure sensitive adhesive sheet includes a photocured pressure sensitive adhesive obtained by applying a photocurable pressure sensitive adhesive composition in a sheet-form, and photocuring the photocurable pressure sensitive adhesive composition. The photocurable pressure sensitive adhesive composition contains a partially polymerized product of an acryl-based monomer (called "prepolymer") and/or an acryl-based polymer, a UV absorber and a photopolymerization initiator. In this specification, the "photocurable" pressure sensitive adhesive refers to a pressure sensitive adhesive which contains a photopolymerizable functional group-containing compound such as a vinyl group or a (meth)acryloyl group, and can be photocured. The "photocured" adhesive refers to an adhesive obtained by photocuring the photocurable pressure sensitive adhesive. When a part of the photopolymerizable compound remains in an unreacted state in the pressure sensitive adhesive after polymerization of the photocurable pressure sensitive adhesive, the pressure sensitive adhesive may be a photocured and photocurable pressure sensitive adhesive.

[0018] <Photocurable Pressure Sensitive Adhesive Composition>

The photocurable pressure sensitive adhesive composition contains a photopolymerizable acryl-based material, a UV absorber and a photopolymerization

initiator.

[0019] <Photopolymerizable Acryl-Based Material>

Examples of the photocurable acrylic material contained in the photocurable pressure sensitive adhesive composition include acryl-based monomers and partially polymerized products (prepolymers) thereof.

[0020] (Monomer Component)

As the acryl-based monomer, a (meth)acrylic acid alkyl ester with the alkyl group having 1 to 20 carbon atoms is preferably used. The alkyl group of the (meth)acrylic acid alkyl ester may be branched. The content of the (meth)acrylic acid alkyl ester is preferably 40% by weight or more, more preferably 50% by weight or more, further preferably 60% by weight or more based on the total amount of the monomer component of the acryl-based material.

[0021] The monomer component may include high-polarity monomer such as a hydroxy group-containing monomer or a nitrogen containing monomer, in addition to the (meth)acrylic acid alkyl ester. When a high-polarity monomer is contained in the acryl-based polymer, the cohesive strength of the pressure sensitive adhesive is increased to improve adhesiveness of the pressure sensitive adhesive sheet to an adherend, and cloudiness of the pressure sensitive adhesive under a high-temperature and high-humidity environment can be suppressed to enhance transparency.

[0022] Examples of the hydroxy group-containing monomer include 2-hydroxyethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, 4-hydroxybutyl (meth)acrylate, 6-hydroxyhexyl (meth)acrylate, 8-hydroxyoctyl (meth)acrylate, 10-hydroxydecyl (meth)acrylate, 12-hydroxylauryl (meth)acrylate and (4-hydroxymethylcyclohexyl)-methyl (meth)acrylate. The content of the hydroxy group-containing monomer is preferably 1 to 40% by weight, more preferably 3 to 30% by weight, further preferably 1 to 40% by weight based on the total amount of the monomer component.

[0023] Examples of the nitrogen containing monomer include vinyl-based monomer such as N-vinylpyrrolidone, methylvinylpyrrolidone, vinylpyridine, vinylpiperidone, vinylpyrimidine, vinylpiperazine, vinylpyrazine, vinylpyrrole, vinylimidazole, vinyloxazole, vinylmorpholine, (meth)acryloylmorpholine, N-vinylcarboxylic acid amides and N-vinylcaprolactam; and cyanoacrylate-based monomer such as acrylonitrile and methacrylonitrile. Among them, lactam-based vinyl monomers such as N-vinylpyrrolidone are preferable. The content of the nitrogen-containing monomer is preferably 0.5 to 50% by weight, more preferably 1 to 40% by weight, further preferably 3

to 30% by weight based on the total amount of the monomer component.

[0024] The monomer components may include monomers other than those described above, such as carboxyl group-containing monomers, cyclic ether group-containing monomers and silane-based monomers.

5 **[0025]** The monomer components may include polyfunctional polymerizable compounds having two or more polymerizable functional groups per molecule. Examples of the polyfunctional polymerizable compound include compounds having two or more C=C bonds per molecule, and compounds having one C=C bond and a polymerizable functional group such as epoxy, aziridine, oxazoline, hydrazine or
10 methylol. Among them, polyfunctional polymerizable compounds having two or more C=C bonds per molecule are preferable. The polyfunctional polymerizable compound may be present as a monomer or oligomer in the pressure sensitive adhesive composition, or may be bonded to a functional group such as a hydroxy group of the prepolymer component.

15 **[0026]** Examples of the polyfunctional polymerizable compound having two or more C=C bonds per molecule include polyfunctional acrylate (ester compound of polyol and (meth) acrylic acid) such as polyethylene glycol di(meth)acrylate, polypropylene glycol di(meth)acrylate, neopentyl glycol di(meth)acrylate, pentaerythritol di(meth)acrylate, pentaerythritol tri(meth)acrylate, dipentaerythritol hexa(meth)acrylate, 1,2-ethyleneglycol
20 di(meth)acrylate, 1,6-hexanediol di(meth)acrylate, 1,12-dodecandiol di(meth)acrylate and tetramethylolmethane tri(meth)acrylate; allyl (meth)acrylate, vinyl (meth)acrylate, divinyl benzene, epoxy acrylate, polyester acrylate, urethane acrylate, butyl di(meth)acrylate and hexyl (meth)acrylate. Among them, polyfunctional acrylates are preferable. As the polyfunctional acrylate, trimethylolpropane tri(meth)acrylate, hexanediol di(meth)acrylate
25 and dipentaerythritol hexa(meth)acrylate are preferably used.

[0027] Although suitable amount of the polyfunctional monomer varies depending on the molecular weight thereof, the number of functional groups, or the like, it is preferably 5% by weight or less, more preferably 3% by weight or less, further preferably 2% by weight or less based on the total amount of the monomer component. The amount of the
30 polyfunctional monomer may be 0.001 parts by weight or more, 0.01 parts by weight or more, or 0.05 parts by weight or more based on the total amount of the monomer component.

[0028] In the photocurable pressure sensitive adhesive composition, the above-described monomer component may be present as a partially polymerized product

(prepolymer). The prepolymer is one obtained by partially polymerizing a monomer component. When the monomer component is present as a prepolymer, the viscosity of the photocurable pressure sensitive adhesive composition can be adjusted to fall within a range of viscosities appropriate to application to a supporting substrate.

5 **[0029]** The prepolymer can be prepared by, for example, partially polymerizing a prepolymer-forming composition obtained by mixing a monomer component and a polymerization initiator. The prepolymer-forming composition may contain all the monomer components which form the acryl-based polymer, or may contain only some of the monomers which form the acryl-based polymer. When the monomer
10 components which form the acryl-based polymer include a monofunctional monomer and a polyfunctional monomer, a pressure sensitive adhesive composition may be prepared by adding the polyfunctional monomer to a prepolymer composition obtained by partially polymerizing only a monofunctional monomer and performing post-polymerization,
15 a crosslinking point from the polyfunctional monomer can be uniformly introduced into the polymer. A part of the polyfunctional monomer component which forms the acryl-based polymer may be added to the prepolymer-forming composition, followed by performing polymerization to obtain a prepolymer, then adding the remaining
20 part of the polyfunctional monomer component, and performing post-polymerization.

[0030] The prepolymer may be prepared through polymerization in two or more stages or three or more stages. For example, only a monofunctional monomer may be pre-polymerized, followed by adding a polyfunctional monomer, performing partial polymerization to prepare a prepolymer composition, further adding a
25 monomer component etc. if necessary, and performing post-polymerization.

[0031] The method for producing a prepolymer is not particularly limited. From the viewpoint of adjusting the reaction time to ensure that the molecular weight (polymerization ratio) of the prepolymer is in a desired range, photopolymerization by irradiation with an actinic ray such as an ultraviolet ray is preferable. When
30 photopolymerization is performed, it is preferable that the prepolymer composition contains a photopolymerization initiator. Specific examples of the photopolymerization initiator will be described later.

[0032] In addition to the monomer component and the polymerization initiator, the prepolymer-forming composition may contain a chain-transfer agent etc. as

necessary. The chain-transfer agent has an action such that a radical is received from a growing polymer chain to stop extension of a polymer chain, and the chain-transfer agent which has received the radical attacks a monomer to start polymerization again. By using the chain-transfer agent, an excessive increase in molecular weight can be suppressed without decreasing the concentration of radicals in the reaction system. Examples of the chain-transfer agent that are suitably used include thiols such as α -thioglycerol, lauryl mercaptan, glycidyl mercaptan, mercaptoacetic acid, 2-mercaptoethanol, thioglycolic acid, 2-ethylhexyl thioglycolate and 2,3-dimercapto-1-propanol.

[0033] Although the polymerization ratio of the prepolymer is not particularly limited, the polymerization ratio is preferably 3 to 50%, more preferably 5 to 40% from the viewpoint of obtaining a viscosity suitable for application of the prepolymer onto a substrate. The polymerization ratio of the prepolymer can be adjusted to fall within a desired range by adjusting the type and amount of the photopolymerization initiator, the irradiation intensity and irradiation time of an active ray such as an ultraviolet ray, and so on. The polymerization ratio is calculated in accordance with the following expression from weights before and after the prepolymer composition is heated at 130°C for 3 hours. When partial polymerization is performed by solution polymerization, the polymerization ratio is calculated in accordance with the following expression where the weight before heating is a weight obtained by subtracting the amount of the solvent from the total weight of the prepolymer composition.

Polymerization ratio (%) of polymer = 100 x (weight after heating/weight before heating)

[0034] <Preparation of Photocurable Pressure Sensitive Adhesive Composition>

[0035] The above-described photopolymerizable acrylic material (monomer and/or partially polymerized product thereof) is mixed with a remaining monomer component, a UV absorber, a photopolymerization initiator, and other additives to obtain a photocurable pressure sensitive adhesive composition.

[0036] <UV Absorber>

Examples of the UV absorber include benzotriazole-based UV absorbers, benzophenone-based UV absorbers, triazine UV absorbers, salicylate-based UV absorbers and cyanoacrylate-based UV absorbers. Triazine-based UV absorbers are

preferable because they have high ultraviolet absorbability and excellent compatibility with acryl-based polymers, and ensure that an acryl-based pressure sensitive adhesive sheet with high transparency is easily obtained. Among them, triazine-based UV absorbers are preferable, with hydroxyphenyltriazine-based UV absorbers being particularly preferable. The number of hydroxyl groups in the triazine-based UV absorber is preferably 2 or less.

[0037] A commercially available product may be used as the UV absorber. Examples of the commercially available triazine-based UV absorber include reaction products of 2-(4,6-bis (2,4-dimethylphenyl)-1,3,5-triazin-2-yl)-5-hydroxyphenyl with [(alkyloxy)methyl]oxirane ("TINUVIN 400" manufactured by BASF SE), reaction products of 2-(2,4-dihydroxyphenyl)-4,6-bis(2,4-dimethylphenyl)-1,3,5-triazine with (2-ethylhexyl)-glycidic acid ester ("TINUVIN 405" manufactured by BASF SE), (2,4-bis[2-hydroxy-4-butoxyphenyl]-6-(2,4-dibutoxyphenyl)-1,3,5-triazine ("TINUVIN 460" manufactured by BASF SE), 2-(4,6-diphenyl-1,3,5-triazin-2-yl)-5-[(hexyl)oxy]-phenol ("TINUVIN 577" manufactured by BASF SE), and 2-(2-hydroxy-4-[1-octyloxycarbonylethoxy]phenyl)-4,6-bis(4-phenylphenyl)-1,3,5-triazine ("TINUVIN 479" manufactured by BASF SE).

[0038] The content of the UV absorber in the photocurable pressure sensitive adhesive composition is preferably 0.1 to 10 parts by weight, more preferably 0.3 to 7 parts by weight, further preferably 0.5 to 5 parts by weight, based on 100 parts by weight of the monomer component. By setting the content of the UV absorber within the above-described range, the ultraviolet ray cutting property of the pressure sensitive adhesive sheet can be improved while deterioration of transparency due to bleed-out etc. of the UV absorber is suppressed. When the content of the UV absorber is within the above-described range, a decrease in polymerization rate of the pressure sensitive adhesive composition can be suppressed.

[0039] <Photopolymerization Initiator>

The photocurable pressure sensitive adhesive composition contains a photopolymerization initiator. The photopolymerization initiator is a photoradical generator which generates radicals with the aid of visible light or ultraviolet rays having a wavelength shorter than 450 nm.

[0040] When the photocurable pressure sensitive adhesive composition contains a UV absorber, a part of irradiation light for photocuring is absorbed by the UV

absorber. From the viewpoint of promoting the generation of radicals by cleavage of the photopolymerization initiator to improve the polymerization rate, it is preferable to use a photopolymerization initiator having a sensitivity in a range of wavelengths at which absorption by the UV absorber is small. Specifically, the photopolymerization initiator is preferably one having a sensitivity at a wavelength of longer than 380 nm, more preferably one having a sensitivity at a wavelength of longer than 400 nm. It is preferable to use a photopolymerization initiator having an absorption coefficient of 1×10^2 [mLg⁻¹ cm⁻¹] or more at a wavelength of 405 nm. The photopolymerization initiator having a photosensitivity at a long wavelength may have a sensitivity to light having a wavelength of 400 nm or shorter.

[0041] Specific examples of the photopolymerization initiator having a photosensitivity at a wavelength of 400 nm or longer include acylphosphine oxides such as 2,4,6-trimethylbenzoyldiphenylphosphine oxide ("Lucirin TPO" manufactured by BASF SE) and 2,4,6-trimethylbenzoylphenylethoxyphosphosphine ("Lucirin TPO-L" manufactured by BASF SE); aminoketones such as 2-benzyl-2-dimethylamino-1-(4-morpholinophenyl)butanone-1 ("IRGACURE 369" manufactured by BASF SE); and bisacylphosphine oxides such as bis(2,4,6-trimethylbenzoyl)-phenylphosphine oxide ("IRGACURE 819" manufactured by BASF SE), 2,2-dimethoxy-1,2-diphenylethan-1-one ("IRGACURE 651" manufactured by BASF SE) and bis(2,6-dimethoxybenzoyl)-2,4,4-trimethylpentylphosphine oxide ("CGI403" manufactured by BASF SE).

[0042] As the photopolymerization initiator, one having a photosensitivity at a long wavelength may be used in combination with one having no photosensitivity at a long wavelength (*e.g.* one having an absorption coefficient of less than 1×10^2 [mLg⁻¹cm⁻¹] at a wavelength of 405 nm).

[0043] Examples of the photopolymerization initiator having no photosensitivity at a long wavelength include benzoin ether-based photopolymerization initiators, acetophenone-based photopolymerization initiators, α -ketol-based photopolymerization initiators, photoactive oxime-based photopolymerization initiators, benzoin-based photopolymerization initiators, benzyl-based photopolymerization initiators, benzophenone-based photopolymerization initiators, ketal-based photopolymerization initiators, thioxanthone-based photopolymerization initiators, acylphosphine oxide-based photopolymerization

initiators and titanocene-based photopolymerization initiators.

[0044] The content of the photopolymerization initiator in the photocurable pressure sensitive adhesive composition is preferably from 0.02 to 10 parts by weight, more preferably from 0.05 to 5 parts by weight, based on 100 parts by weight of the total of monomer components and prepolymer components which form the acryl-based polymer. When the amount of the photopolymerization initiator is excessively small, the polymerization ratio may be insufficient, and when the amount of the photopolymerization initiator is excessively large, the polymer may have a low molecular weight, leading to insufficient adhesive strength of the pressure sensitive adhesive.

[0045] As described above, a photopolymerization initiator can also be used in preparation (partial polymerization) of the prepolymer. The photopolymerization initiator to be used for partial polymerization may be identical to or different from the photopolymerization initiator to be added to the photocurable pressure sensitive adhesive composition. When the prepolymer-forming composition does not contain a UV absorber, and the UV absorber is added after partial polymerization, the photopolymerization initiator to be used for partial polymerization may have no photosensitivity at a long wavelength. The unreacted product of the photopolymerization initiator used for partial polymerization may be used directly as the photopolymerization initiator in the photopolymerizable pressure sensitive adhesive composition.

[0046] From the viewpoint of the utilization efficiency of irradiation light and the like, it is preferable that a UV absorber is added to the prepolymer composition after partial polymerization while the prepolymer-forming composition does not contain a UV absorber. It is preferable that for example, partial polymerization is performed with the aid of a photopolymerization initiator, which has no photosensitivity at a long wavelength, as a pre-addition polymerization initiator, a UV absorber and a photopolymerization initiator which has a photosensitivity at a long wavelength, as a post-addition polymerization initiator, are added to the composition after partial polymerization to prepare a photocured pressure sensitive adhesive composition, and the photocured pressure sensitive adhesive composition is applied in a layer-form onto a substrate, followed by performing post-polymerization.

[0047] <Other Components>

The photocurable pressure sensitive adhesive composition may contain a chain-transfer agent. The chain-transfer agent contained in the photocurable pressure sensitive adhesive composition is not particularly limited, and for example, the above-described chain-transfer agents can be used. The pressure sensitive adhesive composition may contain a silane coupling agent, a crosslinker, a tackifier, a plasticizer, a softener, and the like for the purpose of, for example, adjusting adhesive strength. In addition, the pressure sensitive adhesive composition may contain additives such as a degradation preventing agent, a filler, a colorant, an antioxidant, a surfactant and an antistatic agent within the bounds of not impairing the properties of the pressure sensitive adhesive.

[0048] Preferably, the photocurable pressure sensitive adhesive composition has a viscosity (*e.g.* about 5 to 100 poises) suitable for application of the composition to a substrate. The viscosity of the pressure sensitive adhesive composition can be adjusted by, for example, addition of various polymers such as a thickening additive, addition of a polyfunctional monomer and the like, and adjusting the polymerization ratio of a prepolymer. The content of acryl-based monomer components (acryl-based monomers and partially polymerized products of acryl-based monomers) in the photocurable pressure sensitive adhesive composition is preferably 50% by weight or more, more preferably 70% by weight or more, further preferably 80% by weight or more.

[0049] [Formation of Pressure Sensitive Adhesive Sheet]

The photocurable pressure sensitive adhesive composition is applied to a supporting substrate, and photocuring is performed to obtain a pressure sensitive adhesive sheet. The method for applying the pressure sensitive adhesive composition to the substrate includes 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 and die coating. Since photoradical polymerization is hindered by oxygen in the air, it is preferable to dispose a cover sheet on the coating layer of the photocurable pressure sensitive adhesive composition to block oxygen. The photocurable pressure sensitive adhesive composition may be applied with the pressure sensitive adhesive composition sandwiched between two sheets (supporting substrate and cover sheet).

[0050] The coating thickness of the photocurable pressure sensitive adhesive composition (thickness of the pressure sensitive adhesive sheet 50) is not

particularly limited, and is, for example, about 10 to 500 μm . From the viewpoint of enhancing ultraviolet absorbability of the pressure sensitive adhesive sheet, the thickness of the pressure sensitive adhesive sheet is preferably 50 μm or more, more preferably 100 μm or more, further preferably 150 μm or more. The light transmittance of the pressure sensitive adhesive sheet 50 at a wavelength of 380 nm is preferably 10% or less, more preferably 5% or less, further preferably 3% or less.

[0051] A laminate including a photocurable acryl-based pressure sensitive adhesive composition layer on a supporting substrate is irradiated with an ultraviolet ray and/or short-wavelength visible light to perform photocuring, whereby a pressure sensitive adhesive sheet is obtained. When a laminate with a photocurable pressure sensitive adhesive composition layer sandwiched between a supporting substrate and a cover sheet is irradiated with light to perform photocuring, the light irradiation may be performed from any of the supporting substrate-side and the cover sheet-side or from both sides. As described in detail later, in the present invention, a release film 10 having a specific release layer 15 is used as a supporting substrate or a cover sheet arranged on the light irradiation-side of the pressure sensitive adhesive sheet.

[0052] From the viewpoint of improving the curing rate, the light irradiation intensity is preferably 5 mW/cm^2 or more. The light irradiation intensity is preferably 20 mW/cm^2 or less from the viewpoint of sufficiently increasing the molecular weight of the acryl-based polymer after photocuring to secure the retaining force at a high temperature.

[0053] The accumulated amount of irradiation light is preferably about 100 to 5000 mJ/cm^2 . The light source for photoirradiation is not particularly limited as long as it can emit light in a wavelength range over which the photopolymerization initiator contained in the pressure sensitive adhesive composition is sensitive to light, and an LED light source, a high-pressure mercury lamp, an ultra-high mercury lamp, a metal halide lamp, a xenon lamp or the like is preferably used.

[0054] Most of ultraviolet light applied to the photocurable pressure sensitive adhesive composition containing a UV absorber is absorbed by the UV absorber. From the viewpoint of suppressing reduction of the molecular weight due to an increase in temperature and enhancing the curing rate, it is preferable to apply

light having a wavelength at which absorption by the UV absorber is small. It is preferable to use an LED light source because heat dissipation from the light source is small and light having a small wavelength width can be applied. When an LED light source is used, the emission peak wavelength is preferably 350 nm or longer, more preferably 380 nm or longer, further preferably 400 nm or longer.

[0055] The final polymerization ratio of the monomer component in the pressure sensitive adhesive sheet after photocuring is preferably 90% or more, more preferably 95% or more, further preferably 98% or more. The gel fraction of the pressure sensitive adhesive sheet is preferably 50% or more, more preferably 75% or more, further preferably 85% or more.

[0056] [Release Film]

As a supporting substrate for applying the pressure sensitive adhesive composition, and a cover sheet disposed on the surface of the coating layer of the pressure sensitive adhesive sheet, release films having a release layer on a contact surface with the coating layer (pressure sensitive adhesive sheet) are preferably used. In the present invention, photocuring is performed in a state in which a release film (first release film) 11 having a specific silicone-based release layer 15 is disposed on the light irradiation-side of the photocurable pressure sensitive adhesive composition layer 55.

[0057] <Base Film>

As the base films 11 and 21 of the release films 10 and 20, various resin films having transparency are used. Examples of the resin material include polyester-based resins such as polyethylene terephthalate and polyethylene naphthalate, acetate-based resins, polyether sulfone-based resins, polycarbonate-based resins, polyamide-based resins, polyimide-based resins, polyolefin-based resins, (meth)acryl-based resins, polyvinyl chloride-based resins, polyvinylidene chloride-based resins, polystyrene-based resins, polyvinyl alcohol-based resins, polyacrylate-based resins and polyphenylene sulfide-based resins. Among them, polyester-based resins such as polyethylene terephthalate are especially preferable. The thicknesses of the base films 11 and 12 are preferably 10 to 200 μm , more preferably 25 to 150 μm .

[0058] <Release Layer>

Examples of the material of the release layer include silicone-based release agents, fluorine-based release agents, long-chain alkyl-based release agents,

aliphatic amide-based release agents and silica powder. As the release film 20, a film having on a surface of the base film 21 a silicone-based release layer 25 formed of a silicone-based release agent is preferably used because it is possible to attain adhesion and peelability with respect to the acryl-based pressure sensitive adhesive sheet.

[0059] The release film 10 disposed on the light irradiation-side of the photocurable pressure sensitive adhesive composition layer 55 includes a silicone-based release layer 15. The silicone-based release layer 15 has a Si atom content of 0.02 to 0.07 g/m² per unit area. The Si atom content of the silicone-based release layer 15 is preferably 0.025 to 0.06 g/m², more preferably 0.03 to 0.055 g/m².

[0060] The silicone-based release layer 15 of the release film 10 contains a cured silicone resin. The silicone-based resin may be one containing silicone as a main component, or may be a silicone-modified resin obtained by introducing reactive silicone into an organic resin such as a urethane resin, an epoxy resin or an alkyd resin by graft polymerization or the like. As the silicone resin, resins of various curing reaction types such as an addition-type, a condensation-type, an ultraviolet curing-type, an electron beam curing-type and a solventless-type can be used. In particular, a silicone resin which is curable by addition reaction under heat to form a peelable film is preferable because excellent adhesion with a base film is exhibited, and moderate adhesion and peelability with respect to the acryl-based pressure sensitive adhesive sheet can be attained.

[0061] Examples of the silicone-based material curable by addition reaction include polyorganosiloxanes having a vinyl group or an alkenyl group in the molecule. Examples of alkenyl group include a 3-butenyl group, a 4-pentenyl group, a 5-hexenyl group, a 6-heptenyl group, a 7-octenyl group, a 8-nonenyl group, a 9-decenyl group, a 10-undecenyl group, and a 11-dodecenyl group. Examples of the polyorganosiloxane include polyalkylalkylsiloxanes such as polydimethylsiloxane, polydiethylsiloxane and polymethylethylsiloxane; polyalkylarylsiloxanes; and copolymers having a plurality of Si atom-containing monomer components, such as poly(dimethylsiloxane-diethylsiloxane). Among them, polydimethylsiloxane is preferable.

[0062] A commercially available composition containing a curable silicone resin may be used as the silicone resin. Examples of the commercially available curable silicone release agent include KS-774, KS-775, KS-778, KS-779H, KS-847H, KS-856,

X-62-2422 and X-62-2461 manufactured by Shin-Etsu Chemical Co., Ltd; YSR-3022, TPR-6700, TPR-6720 and TPR-6721 manufactured by Toshiba Silicone Co., Ltd; LTC300B, LTC303E, LTC310, LTC314, SRX357, BY24-749, SD7333, BY24 -179, BY24-840, BY24-842, BY24-850, SP7015, SP7259, SD7220, SD7226 and SD7229
5 manufactured by Dow Corning Toray Co., Ltd.; and DKQ3-202, DKQ3-203, DKQ3-204, DKQ3-205 and DKQ3 -210 manufactured by Dow Corning Asia Ltd.

[0063] The curable silicone-based release agent composition may contain an additive (release control agent) intended for adjustment of the peelability of the release layer, etc. The addition-type silicone-based release agent composition may
10 contain a curing catalyst. As the curing catalyst, a platinum-based catalyst is preferable. Examples of the platinum-based catalyst include platonic chloride, olefin complexes of platinum and olefin complexes of platonic chloride. The amount of the platinum-based catalyst used is about 10 to 1000 ppm in terms of platinum, based on the total solid content of the silicone-based release agent composition.

[0064] The silicone-based release agent composition may contain an organic solvent. Examples of the organic solvent include hydrocarbon-based solvents such as cyclohexane, n-hexane and n-heptane; aromatic solvents such as toluene and xylene; ester-based solvents such as ethyl acetate and methyl acetate; ketone-based solvents such as acetone and methyl ethyl ketone; and alcohol-based solvents such
20 as methanol, ethanol and butanol. The organic solvent may be a mixed solvent. The amount of the organic solvent used is preferably about 80 to 99.9% by mass in the silicone-based release agent composition.

[0065] The silicone-based release agent composition may contain various additives such as a filler, an antistatic agent, an antioxidant, a plasticizer and a
25 colorant if necessary.

[0066] The silicone-based release agent composition is applied to the substrate 11, and heated and dried to form a silicone-based release layer. The application method includes roll coating, kiss roll coating, gravure coating, reverse coating, roll brushing, spray coating, dip roll coating, bar coating, knife coating, air knife coating,
30 curtain coating., lip coating and die coating. Examples of the heating and drying method include hot-air drying. The conditions for hot-air drying vary depending on the heat resistance of the substrate. The hot-air drying is performed typically at about 80 to 150°C for about 10 seconds to 10 minutes. If necessary, heat treatment

may be performed in combination with active energy ray irradiation such as ultraviolet ray irradiation for the purpose of accelerating addition reaction of silicone.

[0067] The amount of the silicone release agent composition applied may be adjusted so that the amount of the silicone resin is about 0.03 to 1 g/m². The thickness of the silicone-based release layer 15 is, for example, 10 to 500 nm. The amount of the silicone-based release agent composition applied and the thickness of the silicone-based release layer 15 may be adjusted so that the Si atom content of the silicone-based release layer 15 is in the above-described range.

[0068] [Peelability of Release Film and Pressure Sensitive Adhesive Sheet]

In a release film-equipped pressure sensitive adhesive sheet in which a release film is temporarily attached on each surfaces of a pressure sensitive adhesive sheet, in general, peel strength between the pressure sensitive adhesive sheet and one release film is relatively smaller than peel strength between the pressure sensitive adhesive sheet and the other release film. In a practical use of the pressure sensitive adhesive sheet, a release film having low peel strength (light-release film) is peeled off from the pressure sensitive adhesive sheet, the pressure sensitive adhesive sheet is bonded to a first adherend, a release film having relatively high peel strength (heavy-release film) is then peeled off, and the pressure sensitive adhesive sheet is bonded to a second adherend. By providing a difference in peel strength between the release films temporarily bonded on the first and second surfaces of the pressure sensitive adhesive sheet, the light-release film can be selectively peeled off at the time of bonding the pressure sensitive adhesive sheet to the first adherend, so that bonding workability can be improved.

[0069] In the photocured pressure sensitive adhesive sheet, the adhesive strengths of the pressure sensitive adhesive before and after photocuring are different, and therefore the adhesiveness (peelability) of each of the light-release film and the heavy-release film with respect to the pressure sensitive adhesive sheet is adjusted in light of the adhesive property of the pressure sensitive adhesive sheet after photocuring. When the pressure sensitive adhesive composition does not contain a UV absorber, the magnitude relationship between the peel strength of one release film and the peel strength of the other release film does not change before and after photocuring. On the other hand, when the photocurable pressure sensitive adhesive composition contains a UV absorber, an increase in peel strength

of the first release film on the light irradiation-side tends to be significantly larger and increases in the second release film disposed on a surface on a side opposite to the light irradiation.

[0070] Thus, in the release film-equipped pressure sensitive adhesive sheet of the present invention, it is preferable that the first release film 10 on the light irradiation-side is a heavy-release film and the second release film 20 on a surface on a side opposite to the light irradiation-side is a light-release film. In other words, it is preferable that the peel strength between the first release film 10 and the pressure sensitive adhesive sheet 50 is larger than the peel strength between the second release film 20 and the pressure sensitive adhesive sheet 50.

[0071] When the peel strength between the first release film 10 (heavy-release film) and the pressure sensitive adhesive sheet 50 is excessively large, failure such as deformation of the pressure sensitive adhesive sheet or peeling of the pressure sensitive adhesive sheet from the adherend may occur at the time of peeling the first release film 10 from a surface of the pressure sensitive adhesive sheet 50 in a state that the other surface of the pressure sensitive adhesive sheet 50 is bonded onto the first adherend. The peel strength between the first release film 10 and the pressure sensitive adhesive sheet 50 after photocuring is preferably 0.1 to 1.1 N/50 mm, more preferably 0.2 to 0.8 N/50 mm, further preferably 0.3 to 0.7 N/50 mm. The peel strength between the release film and the pressure sensitive adhesive sheet is a measured value obtained by a 180° peel test at a tensile speed of 0.3 m/min. In the present invention, an excessive increase in peel strength between the first release film and the pressure sensitive adhesive sheet after photocuring can be suppressed by setting the Si atom content of the release layer 15 of the first release film 10 within the above-described range.

[0072] Although the reason why the peel strength of the first release film increases when the photocurable pressure sensitive adhesive composition contains a UV absorber, and the reason why adjustment of the Si content of the release layer enables suppression of an excessive increase in peel strength after the pressure sensitive adhesive composition is photocured are uncertain, these may be related to reaction of unreacted heat-reactive functional groups in the release layer with a compound in the pressure sensitive adhesive composition.

[0073] As described above, most of ultraviolet light applied to the photocurable

pressure sensitive adhesive composition containing a UV absorber is absorbed by the UV absorber. Even when the sensitivity wavelength of the photopolymerization initiator and the wavelength of irradiation light are shifted to a longer wavelength (e.g. 400 nm or longer), it is difficult to completely suppress absorption of light by the UV absorber. When the UV absorber absorbs light, light energy is converted into heat energy to increase the temperature. In particular, in the vicinity of the interface between the release layer 15 and the pressure sensitive adhesive composition layer 55 on the light irradiation-side, the temperature easily increases because a large amount of light is absorbed by the UV absorber. When the temperature increases under light irradiation, thermal curing reaction easily proceeds in addition to photocuring reaction. Thus, unreacted heat-reactive functional groups in the release layer 15 (vinyl group, alkenyl group, alkoxysilyl group, silanol group, hydrosilyl group and the like) may react with a compound in the pressure sensitive adhesive composition, leading to enhancement of adhesive strength (peel strength).

[0074] By decreasing the content of Si atoms per unit area of the silicone-based release layer 15, the amount of unreacted heat-reactive functional groups in the release layer 15 is reduced. Thus, it is considered that in the present invention, the amount of the remaining reactive functional groups in the release layer 15, which are capable of reacting with a compound in the pressure sensitive adhesive composition layer 15, is small, so that an excessive increase in peel strength between the release film 10 and the pressure sensitive adhesive sheet 50 after photocuring can be suppressed.

[0075] As described above, the pressure sensitive adhesive composition may be irradiated with light from any of the supporting substrate-side and the cover sheet-side, or from both sides. When light irradiation is performed from the supporting substrate-side, the release film 10 including the silicone-based release layer 15 may be used as the supporting substrate to be coated with the pressure sensitive adhesive composition. When light irradiation is performed from the cover sheet-side, the release film 10 having the silicone-based release layer 15 may be used as the cover sheet to be disposed on the pressure sensitive adhesive composition layer 55.

[0076] When light irradiation is performed from both sides, the above-described release film may be used for one of the supporting substrate and the cover sheet.

The release film may be used for both the supporting substrate and the cover sheet. It is preferable that the release film is used for a surface that is first irradiated with light when both surfaces are irradiated with light while a folded path line for reversing the conveyance direction is conveyed as described in Japanese Patent

5 Laid-open Publication No. 2014-65754.

[0077] [Use of Pressure Sensitive Adhesive Sheet]

The photocured pressure sensitive adhesive sheet has a high visible light transmittance and an ultraviolet ray cutting property, and is therefore suitably used as an optical pressure sensitive adhesive for display devices and display input
10 devices which are required to have an ultraviolet ray cutting property. Examples of the display device include liquid crystal display devices, organic light emitting diode (OLED) display devices, PDPs (plasma display panels) and electronic papers. Examples of the input device include touch panels. In addition, the photocured pressure sensitive adhesive sheet can be used for bonding a display device to an
15 input device, performing bonding to a transparent plate disposed on a surface of a display device or an input device, or the like.

[0078] At the time of using a release film-equipped pressure sensitive adhesive sheet in which a release film is temporarily attached on each surfaces, first the light-release film (second release film 20) is peeled off to expose the second principal
20 surface of the pressure sensitive adhesive sheet 50, and the pressure sensitive adhesive sheet is bonded to the first adherend. Thereafter, the heavy-release film (first release film 10) is peeled off to expose the first principal surface of the pressure sensitive adhesive sheet 50, and the pressure sensitive adhesive sheet 50 is bonded to the second adherend. The adherends may be bonded to the pressure
25 sensitive adhesive sheet after the release films on both surfaces are peeled off. When the pressure sensitive adhesive sheet has photocurability, the pressure sensitive adhesive sheet bonded to the adherends may be further irradiated with light. When the pressure sensitive adhesive sheet is further irradiated with light after bonded to the adherends, it may be possible to improve bonding reliability
30 with the adherends.

EXAMPLES

[0079] The present invention will be described more specifically below by showing examples and comparative examples, but the present invention is not limited to these

examples.

[0080] [Preparation of Photocurable Pressure Sensitive Adhesive Composition]

<Pressure Sensitive Adhesive Composition A>

0.035 parts by weight of 1-hydroxycyclohexylphenylketone ("IRGACURE
5 184" manufactured by BASF SE) as a photopolymerization initiator (pre-addition
photopolymerization initiator) and 0.035 parts by weight of 2,2-dimethoxy-1,2-
diphenylethan-1-one ("IRGACURE 651" manufactured by BASF SE) were added to
a monomer mixture including 78 parts by weight of 2-ethylhexyl acrylate (2EHA),
18 parts by weight of N-vinyl-2-pyrrolidone (NVP) and 4 parts by weight of 2-
10 hydroxyethyl acrylate (HEA). This composition was irradiated with an ultraviolet
ray to perform pre-polymerization until the viscosity at room temperature was
about 20 Pa·s, thereby obtaining a prepolymer having a polymerization ratio of
about 8%.

[0081] 0.15 parts by weight of hexanediol diacrylate (HDDA), 0.3 parts by weight
15 of a silane coupling agent ("KBM-403" manufactured by Shin-Etsu Chemical Co.,
Ltd.) and a UV absorber (a 15 wt% butyl acrylate (BA) solution of "Tinosorb S"
manufactured by BASF SE (2,4-bis-[(4-(4-ethylhexyloxy)-4-hydroxy}-phenyl]-6-(4-
methoxyphenyl)-1,3,5-triazine) 4.7 parts by weight (0.7 parts by weight of UV
absorber); and 0.15 parts by weight of bis(2,4,6-trimethylbenzoyl)-phenylphosphine
20 oxide ("IRGACURE 819" manufactured by BASF SE) as a post-addition
polymerization initiator was added to 100 parts by weight of the prepolymer to
obtain an ultraviolet ray-curable acryl-based pressure sensitive adhesive
composition A.

[0082] <Pressure Sensitive Adhesive Composition B>

25 Except that the amount of the post-addition polymerization initiator added
was changed from 0.15 parts by weight to 0.1 parts by weight, the same procedure
as in preparation of the pressure sensitive adhesive composition 1 was carried out
to obtain a pressure sensitive adhesive composition B.

[0083] <Pressure Sensitive Adhesive Composition C>

30 In preparation of a prepolymer composition, the components of the
monomer mixture were changed to 30.5 parts by weight of 2EHA, 30.5 parts by
weight of isostearyl acrylate (ISTA), 19 parts by weight of isobornyl acrylate (IBXA)
and 20 parts by weight of 4-hydroxybutyl acrylate (4HBA), and the amount of the
photopolymerization initiator added was 0.05 parts by weight for 1

hydroxycyclohexylphenylketone and 0.05 parts by weight for 2,2-dimethoxy-1,2-diphenylethane-1-one. Except that the above-mentioned changes were made, the same procedure as in preparation of the pressure sensitive adhesive composition 1 was carried out to obtain a pressure sensitive adhesive composition C.

5 **[0084]** [Preparation of Silicone-Based Release Agent Solution]

<Release Agent Solution A>

30 parts by weight of a 30% toluene solution of hexenyl group-containing addition-type silicone (addition-type silicone-based release agent containing polyorganosiloxane having a hexenyl group in the molecule and a
10 polyorganosiloxane crosslinker having a hydrosilyl group in the molecule: "LTC761" manufactured by Dow Corning Toray Co., Ltd.); 0.9 parts by weight of a silicone dispersion ("BY 24-850" manufactured by Dow Corning Toray Co., Ltd.); and 2 parts by weight of a silicone curing platinum catalyst ("SRX 212" manufactured by Dow Corning Toray Co., Ltd.) were diluted with a mixed solvent of toluene and hexane at
15 a volume ratio of 1 : 1 to the concentration shown in Table 1, thereby preparing a release agent solution A.

[0085] <Release Agent Solution B>

100 parts by weight of a 30% toluene solution of vinyl group-containing addition-type silicone ("KS-847T" manufactured by Shin-Etsu Chemical Co., Ltd.)
20 and 1 part by weight of a silicone curing platinum catalyst ("CAT-PL-50T" manufactured by Shin-Etsu Chemical Co., Ltd.) were added at a volume ratio of 1 : 1 to the concentration shown in Table 1, thereby preparing a release agent solution B.

[0086] [Example 1]

25 <Preparation of Substrate Release Film>

The release agent solution B prepared so as to have a silicone solid content of 1.25 wt% was applied to one surface of a 75 μm -thick biaxially-stretched polyester film ("RUMIRROR XD500P" manufactured by Toray Advanced Materials Korea Inc.) with a wire bar (#15), and heated with a hot-air dryer at 130°C for 1 minute to
30 form a release layer.

[0087] <Preparation of Substrate Release Film>

The release agent solution A prepared so as to have a silicone solid content of 0.7 wt% was applied to one surface of a 75 μm -thick biaxially-stretched polyester

film ("RUMIRROR XD500P" manufactured by Toray Advanced Materials Korea Inc.) with a wire bar (#9), and heated with a hot-air dryer at 130°C for 1 minute to form a release layer.

[0088] <Preparation of Release Film-Equipped Pressure Sensitive Adhesive Sheet>

On a release layer-formed surface of the substrate release film, the pressure sensitive adhesive composition A was applied in a thickness of 150 μm to form a coating layer, and a cover release film was bonded to the surface of the coating layer to obtain a laminate. The laminate was irradiated with an ultraviolet ray from the cover release film-side under the conditions of an illuminance of 6.5 mW/cm² and an accumulated light amount of 1500 mJ/cm², and the coating layer was photocured to obtain a pressure sensitive adhesive sheet having a release film on both surfaces of a photocured pressure sensitive adhesive layer.

[0089] [Examples 2 to 6 and Comparative Examples 1 to 3]

The type and concentration of the release agent solution, the wire diameter (size) of the wire bar, and the type of the pressure sensitive adhesive composition at the time of preparing the cover release film were changed as shown in Table 1. Except that these changes were made, the same procedure as in Example 1 was carried out to prepare a photocured pressure sensitive adhesive sheet having a release film on both surfaces.

[0090] [Evaluation]

<Si Atom Content of Release Layer>

The amount of Si atoms per unit area (mg/m²) was calculated by X-ray fluorescence analysis (XRF) of the surface of the release layer of the cover release film. For XRF analysis, a scanning X-ray fluorescence spectrometer equipped with a vertical rhodium tube as an X-ray source ("ZSX100e" manufactured by Rigaku Corporation) was used to perform measurement under the conditions of analysis area: 30 mmφ, analysis element: Si, spectral crystal: RX4, and output: 50 kV, 70 mA.

[0091] <Release Strength of Release Film>

The release film-equipped pressure sensitive adhesive sheet was cut to a width of 50 mm, and a 180° peel test was conducted at a tension speed of 0.3 m/min with a tensile tester in an environment at 23°C to measure peel strengths in peeling of the substrate release film and the cover release film, respectively, from the

pressure sensitive adhesive sheet.

[0092] [Evaluation Results]

Table 1 shows the configurations of release layers (type of release agent solution, silicone concentration, thickness, and Si amount) in the cover release film, the types of pressure sensitive adhesives, and the results of evaluation of peel strengths in Examples and Comparative Examples.

[0093] [Table 1]

	Cover release film release layer				Pressure sensitive adhesive composition	Peel strength (N/50mm)	
	Release agent solution		Wire bar size	Amount of Si (mg/m ²)		Cover release film	Substrate release film
	Type	Silicone concentration (wt%)					
Example 1	A	0.7%	#9	45.8	A	0.56	0.21
Example 2	A	0.7%	#9	45.8	B	0.47	0.15
Example 3	A	0.7%	#9	45.8	C	0.35	0.24
Example 4	A	0.8%	#9	50.0	A	0.63	0.20
Example 5	A	1.0%	#9	62.6	A	0.99	0.20
Example 6	A	1.0%	#9	62.6	B	0.49	0.17
Comparative Example 1	A	1.2%	#9	76.7	A	1.56	0.19
Comparative Example 2	A	1.5%	#9	114.0	A	2.46	0.19
Comparative Example 3	B	0.7%	#15	78.0	B	1.23	0.16

[0094] In each of Examples 1 to 6 and Comparative Examples 1 to 3, the release strength of the substrate release film was about 0.2 N/50 mm, and there was no particular difference. In Comparative Example 3 using the same release agent for the substrate release film and the cover release film, the release strength of the cover release film after photocuring of the pressure sensitive adhesive sheet was larger than 10 times the release strength of the substrate release film, and the cover release film was difficult to peel. In Comparative Example 1 where the type of the silicone release agent of the cover release film and the components of the pressure sensitive adhesive were changed, the peel strength of the cover release film was significantly increased as in Comparative Example 3. These results show that when a laminate in which a photocured pressure sensitive adhesive sheet containing a UV absorber is sandwiched between two release films is irradiated with light to perform photocuring, the peel strength of a release sheet on a light

irradiation-side increases.

[0095] In Comparative Example 2 where the concentration of the release agent solution and the coating thickness during preparation of the cover release film were larger as compared to Comparative Example 1, the amount of Si per unit area of the release layer increased, and the peel strength of the cover release film after photocuring of the pressure sensitive adhesive sheet was larger as compared to Comparative Example 1.

[0096] In Examples 1, 4 and 5 where the amount of Si per unit area was reduced by adjusting the concentration of the release agent solution and the coating thickness during preparation of the cover release film, the peel strength of the cover release film after photocuring of the pressure sensitive adhesive sheet decreased to less than 1 N/50 mm, and failure such as deformation of the pressure sensitive adhesive sheet during peeling was unlikely to occur. The results of Examples 1, 4 and 5 and Comparative Examples 1 and 2 show that peel strength of the cover release film after photocuring of the pressure sensitive adhesive sheet is decreased by reducing the amount of Si per unit area of the release layer.

[0097] In Examples 2 and 3 where a cover release film identical to that in Example 1 was used, and the components of the pressure sensitive adhesive were changed, the peel strength of the cover release film was equivalent to that in Example 1. In Example 6 where a pressure sensitive adhesive sheet identical to that in Example 2 was used, the cover release film had good peelability after photocuring of the pressure sensitive adhesive sheet.

[0098] The above results show that an excessive increase in peel strength of the release film after photocuring of the pressure sensitive adhesive sheet can be suppressed by disposing a release film having a release layer in which the amount of Si atoms per unit area is in a specific range on a photocured pressure sensitive adhesive sheet containing a UV absorber.

DESCRIPTION OF REFERENCE SIGNS

[0099]

1	release film-equipped pressure sensitive adhesive sheet
50	pressure sensitive adhesive sheet
10, 20	release film
11, 21	substrate

15, 25	release layer
5	laminate
55	photocurable pressure sensitive adhesive composition layer

CLAIMS

1. A release film-equipped pressure sensitive adhesive sheet comprising:
 - a photocured pressure sensitive adhesive sheet having a first principal surface
 - 5 and a second principal surface; and
 - a first release film temporarily attached on the first principal surface of the pressure sensitive adhesive sheet,
 - wherein
 - the first release film has a release layer on a base film,
 - 10 the release layer is in contact with the pressure sensitive adhesive sheet,
 - the pressure sensitive adhesive sheet contains a photocured acryl-based polymer and a UV absorber,
 - the release layer is a silicone-based release layer having a Si atom content of 0.02 to 0.07 g/m².
- 15 2. The release film-equipped pressure sensitive adhesive sheet according to claim 1, further comprising a second release film temporarily attached on the second principal surface of the pressure sensitive adhesive sheet.
- 20 3. The release film-equipped pressure sensitive adhesive sheet according to claim 2, wherein a peel strength between the first release film and the pressure sensitive adhesive sheet is higher than a peel strength between the second release film and the pressure sensitive adhesive sheet.
- 25 4. The release film-equipped pressure sensitive adhesive sheet according to any one of claims 1 to 3, wherein the pressure sensitive adhesive sheet has a light transmittance of 10% or less at a wavelength of 380 nm.
5. The release film-equipped pressure sensitive adhesive sheet according to any one
- 30 of claims 1 to 4, wherein monomer component of the acryl-based polymer includes a polyfunctional monomer component having two or more polymerizable functional groups per molecule.
6. The release film-equipped pressure sensitive adhesive sheet according to any one

of claims 1 to 5, wherein the UV absorber is a triazine-based UV absorber.

7. The release film-equipped pressure sensitive adhesive sheet according to any one of claims 1 to 6, wherein the pressure sensitive adhesive sheet contains 0.1 to 10 parts
5 by weight of the UV absorber based on 100 parts by weight of the acryl-based polymer.

8. A method for manufacturing a release film-equipped pressure sensitive adhesive sheet including: a photocured pressure sensitive adhesive sheet having a first principal surface and a second principal surface; a first release film temporarily
10 attached on the first principal surface of the pressure sensitive adhesive sheet; and a second release film temporarily attached on the second principal surface of the pressure sensitive adhesive sheet,
wherein the method comprising the steps of:

preparing a laminate in which a photocurable pressure sensitive adhesive
15 composition layer is sandwiched between the first release film and the second release film; and

irradiating the laminate with light from a first release film-side to photocure the photocurable pressure sensitive adhesive composition,
wherein

20 the photocurable pressure sensitive adhesive composition layer contains an acryl-based monomer and/or a partially polymerized product of the acryl-based monomer, a UV absorber and a photopolymerization initiator,

the first release film has a release layer on a base film at a surface contacting the photocurable pressure sensitive adhesive composition, and

25 the release layer is a silicone-based release layer having a Si atom content of 0.02 to 0.07 g/m².

9. The method for manufacturing a release film-equipped pressure sensitive adhesive sheet according to claim 8, wherein the photopolymerization initiator has
30 a photosensitivity at a wavelength of 400 nm or longer.