

PRESSURE SENSITIVE ADHESIVE SHEET, PRESSURE SENSITIVE ADHESIVE-EQUIPPED POLARIZING PLATE, IMAGE DISPLAY DEVICE AND METHOD FOR MANUFACTURING THEREOF

5 TECHNICAL FIELD

[0001] The present invention relates to a pressure sensitive adhesive sheet and pressure sensitive adhesive-equipped polarizing plate suitably used for manufacturing of an image display device. The present invention also relates to an image display device and method for manufacturing thereof.

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BACKGROUND ART

[0002] Liquid crystal (LC) displays and organic light emitting diode (OLED) displays are widely used as various kinds of image display devices of mobile phones, car navigation devices, personal computer monitors, televisions and so on. In an LC display, a polarizing plate is disposed on a viewing-side surface of an LC cell in accordance with the display principle. In an OLED display, a circularly polarizing plate (a laminate of a polarizing plate and a quarter wave plate) is disposed on a viewing-side surface of an OLED cell for inhibiting external light reflection at a metal electrode (cathode) from being viewed like a mirror surface.

20 [0003] A front transparent plate (also referred to as “cover window”) made of glass, resin, etc. is arranged on a viewing-side surface of an image display device, for the purpose of preventing damage to the image display panel due to impact from the outer surface. The cover window is bonded to a polarizing plate arranged on a surface of an image display panel with a pressure sensitive adhesive sheet interposed therebetween.

25 [0004] Although a polarizing plate generally has a stacking configuration in which a transparent protective film is laminated onto both surfaces of a polarizer, a configuration has been proposed in which lamination of a transparent protective film is omitted on one surface or both surfaces of a polarizer from the viewpoint of thinning an image display device and the viewpoint of the flexibility of the image display device. For example, Patent Document 1 discloses a configuration in which a cover window is bonded via a pressure sensitive adhesive sheet arranged in contact with a polarizer.

35 PRIOR ART DOCUMENT

PATENT DOCUMENT

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

5 [0006] An image display device in which a pressure sensitive adhesive sheet is arranged in contact with the viewing-side surface of a polarizer to bond a cover window has been found to have a problem of durability such that the polarizer is likely to turn yellow in a weather resistance test and fade in a humidification durability test. When the composition of the pressure sensitive adhesive arranged
10 in contact with the polarizer is adjusted in order to enhance the durability, the adhesion reliability tends to deteriorate. In view of such problems, an object of the present invention is to provide a pressure sensitive adhesive sheet that can contribute to thinning of an image display device, the pressure sensitive adhesive sheet with which problems are less likely to occur such as discoloration of a
15 polarizer and separation of the polarizer from a cover window to form an image display device having excellent durability.

MEANS FOR SOLVING THE PROBLEMS

[0007] An embodiment of the present invention is a pressure sensitive adhesive
20 sheet that is to be used for bonding a polarizer including an iodine-containing polyvinyl alcohol-based film and a cover window of an image display device. The pressure sensitive adhesive sheet includes a pressure sensitive adhesive composition containing an acryl-based base polymer and an ultraviolet absorber. The pressure sensitive adhesive sheet is to be arranged in contact with the polarizer.
25 The light transmittance of the pressure sensitive adhesive sheet at a wavelength of 380 nm is preferably 5% or less.

[0008] The acryl-based base polymer of the pressure sensitive adhesive composition preferably contains 5 parts by weight or less of a nitrogen-containing monomer, 0.1 to 8 parts by weight of a hydroxy group-containing monomer, and 1 part by weight
30 or less of a carboxy group-containing monomer based on 100 parts by weight of the total of the monomer components.

[0009] The acryl-based base polymer may contain 20 to 75 parts by weight of a high-Tg monomer based on 100 parts by weight of the total of the monomer components, wherein the high Tg monomer is free of hydroxy group, carboxy group

and nitrogen atom and has a homopolymer glass transition temperature of 10°C or more. The high-T_g monomer may be a (meth)acrylic acid ester having an alicyclic structure.

[0010] The acryl-based base polymer may contain 20 to 79 parts by weight of a (meth)acrylic acid alkyl ester having a homopolymer glass transition temperature of −40°C or less, based on 100 parts by weight of the total of the monomer components.

[0011] The acryl-based base polymer may have a crosslinking structure introduced by a thermal crosslinker.

[0012] The pressure sensitive adhesive composition of the pressure sensitive adhesive sheet may contain a photopolymerizable polyfunctional compound having two or more photopolymerizable functional groups in one molecule and may contain a photopolymerization initiator.

[0013] An embodiment of the present invention is a pressure sensitive adhesive-equipped polarizing plate including a polarizer composed of an iodine-containing polyvinyl alcohol-based film and having a first principal surface and a second principal surface, and the above-mentioned pressure sensitive adhesive sheet arranged in contact with the first principal surface of the polarizer. The pressure sensitive adhesive-equipped polarizing plate may further include a pressure sensitive adhesive sheet arranged on a second principal surface-side of the polarizer.

The pressure sensitive adhesive sheet placed on the second principal surface-side of the polarizer may be in contact with the second principal surface of the polarizer, arranged on the second principal surface of the polarizer with another layer interposed between the polarizer and the second pressure sensitive adhesive layer.

[0014] An embodiment of the present invention is an image display device that includes, on a surface of an image display cell, a second pressure sensitive adhesive sheet, a polarizer composed of an iodine-containing polyvinyl alcohol-based film, a first pressure sensitive adhesive sheet, and a cover window in this order. The first pressure sensitive adhesive sheet is the above-described pressure sensitive adhesive sheet and is arranged in contact with the polarizer.

[0015] In the case where the pressure sensitive adhesive composition of the pressure sensitive adhesive sheet includes a photopolymerizable polyfunctional compound and a photopolymerization initiator, the image display device may be formed through bonding the polarizer to the cover window via the first pressure

sensitive adhesive sheet, and then irradiating the cover window-side with an active ray to photocure the pressure sensitive adhesive composition.

EFFECTS OF THE INVENTION

5 [0016] In the image display device in which the pressure sensitive adhesive sheet of an embodiment of the present invention is arranged in contact with the viewing-side surface of the polarizer, discoloration and fading of the polarizer due to an ultraviolet ray from the outside, heating, humidification, and the like are suppressed, and the durability and the adhesion reliability between layers are
10 excellent.

BRIEF DESCRIPTION OF THE DRAWINGS

[0017] FIG. 1 is a sectional view schematically showing one embodiment of an image display device.

15 FIGS 2 and 3 are sectional views each showing an embodiment of a pressure sensitive adhesive-equipped polarizing plate.

MODE FOR CARRYING OUT THE INVENTION

[0018] An embodiment of the present invention is a pressure sensitive adhesive
20 sheet that is to be arranged in contact with the viewing-side surface of a polarizer in an image display device and is to be used for bonding the polarizer to a cover window.

[0019] FIG. 1 is a sectional view illustrating an embodiment of an image display device including a cover window on the viewing-side surface. An image display
25 device 100 includes a polarizing plate 10 bonded to a surface of an image display cell 60 with a pressure sensitive adhesive sheet 22 interposed therebetween. The An image display device 100 further includes a cover window 70 bonded to the polarizing plate 10 via a pressure sensitive adhesive sheet 21 of an embodiment of the present invention.

30 [0020] The polarizing plate 10 includes a polarizer 11 composed of an iodine-containing polyvinyl alcohol-based film. In an iodine-containing polyvinyl alcohol-based polarizer, the polymer chain of polyvinyl alcohol and polyiodide ions (I_3^- and I_5^-) form a complex, and the polymer chain is oriented in a specific direction to

orient the polyiodide ions. Thus, the polarization property is exhibited.

[0021] An appropriate optical layer 15 may be disposed on the second principal surface (surface on the image display cell 60-side) of the polarizer 11. The pressure sensitive adhesive sheet 21 of an embodiment of the present invention is arranged in contact with the polarizer 11 on the first principal surface (viewing-side surface). The pressure sensitive adhesive sheet 21 is placed on the viewing-side of the polarizer 11 without interposing another optical layer, so that an image display device can be made thinner and flexible.

[0022] [Pressure Sensitive Adhesive Sheet

<Base Polymer >

A based base polymer that constitutes the pressure sensitive adhesive sheet 21 contains an acryl-based base polymer. The acryl based base polymer contains a (meth)acrylic acid alkyl ester as a main constituent monomer component. In this specification, the “(meth)acryl” means acryl and/or methacryl.

[0023] As the (meth)acrylic acid alkyl ester, 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 have a branch or may have a cyclic alkyl group (alicyclic alkyl group).

[0024] Specific examples of the (meth)acrylic acid alkyl ester having a linear or branched alkyl group include methyl (meth)acrylate, ethyl (meth)acrylate, butyl (meth)acrylate, isobutyl (meth)acrylate, s-butyl (meth)acrylate, t-butyl (meth)acrylate, pentyl (meth)acrylate, isopentyl (meth)acrylate, neopentyl (meth)acrylate, hexyl (meth)acrylate, heptyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, octyl (meth)acrylate, isooctyl (meth)acrylate, nonyl (meth)acrylate, isononyl (meth)acrylate, decyl (meth)acrylate, isodecyl (meth)acrylate, undecyl (meth)acrylate, dodecyl (meth)acrylate, isododecyl (meth)acrylate, tetradecyl (meth)acrylate, isotetradecyl (meth)acrylate, pentadecyl (meth)acrylate, cetyl (meth)acrylate, heptadecyl (meth)acrylate, octadecyl (meth)acrylate, isooctadecyl (meth)acrylate, nonadecyl (meth)acrylate and eicosyl (meth)acrylate.

[0025] Specific examples of the (meth)acrylic acid alkyl ester having an alicyclic cycloaliphatic alkyl group include (meth)acrylic acid cycloalkyl esters such as cyclopentyl (meth)acrylate, cyclohexyl (meth)acrylate, cycloheptyl (meth)acrylate and cyclooctyl (meth)acrylate; (meth)acrylic acid esters having a dicyclic aliphatic hydrocarbon ring, such as isobornyl (meth)acrylate; and (meth)acrylic acid esters having a tri-or-more-cyclic aliphatic hydrocarbon ring, such as dicyclopentanyl (meth)acrylate, dicyclopentanyloxyethyl (meth)acrylate, tricyclopentanyl (meth)acrylate, 1-adamantyl

(meth)acrylate, 2-methyl-2-adamantyl (meth)acrylate and 2-ethyl-2-adamantyl (meth)acrylate. The (meth)acrylic acid alkyl ester having an alicyclic alkyl group may be a (meth)acrylic acid alkyl ester having a substituent on the ring, such as 3,3,5-trimethylcyclohexyl (meth)acrylate. The (meth)acrylic acid alkyl ester having an alicyclic alkyl group may be a (meth)acrylic acid ester including a fused ring of an alicyclic structure and a ring structure having an unsaturated bond, such as dicyclopentenyl (meth)acrylate.

[0026] The amount of the (meth)acrylic acid alkyl ester is preferably 60 parts by weight or more, more preferably 70 parts by weight or more, further preferably 80 parts by weight or more, and may be 85 parts by weight or more, 90 parts by weight or more, or 92 parts by weight or more, based on 100 parts by weight of the total of the monomer components of the acryl-based base polymer.

[0027] The acryl-based base polymer preferably contains an acryl-based monomer having a crosslinkable functional group as a copolymer component. When the base polymer contains a crosslinkable functional group, the base polymer can be reacted with the crosslinker to improve adhesion reliability by enhancing cohesive force of the pressure sensitive adhesive.

[0028] Examples of the acryl-based monomer having a crosslinkable functional group include hydroxy group-containing monomers and carboxy group-containing monomers. For example, when an isocyanate-based crosslinker is used, a crosslinked structure is introduced by reaction of a hydroxy group with an isocyanate group. When an epoxy-based crosslinker is used, a crosslinked structure is introduced by reaction of a carboxy group with an epoxy group. For making the pressure sensitive adhesive layer acid-free, as described later, it is preferable that a hydroxy group-containing monomer is used as a copolymerization component for the base polymer, and a crosslinked structure is introduced by an isocyanate-based crosslinker. When the base polymer includes a hydroxy group-containing monomer as a monomer unit, the crosslinkability of the base polymer is improved, and cloudiness of the pressure sensitive adhesive under a high-temperature and high-humidity environment tends to be suppressed, so that a pressure sensitive adhesive having high transparency is obtained.

[0029] Examples of the hydroxyl group-containing monomer include (meth)acrylic acid esters such as 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. Among them, 2-hydroxyethyl acrylate (Tg of homopolymer: -15°C) and 4-hydroxybutyl acrylate (Tg of homopolymer: -32°C) are preferable, because they considerably contribute to enhancement of adhesive strength and tend to suppress cloudiness of the pressure sensitive adhesive sheet in a high-humidity environment so that a pressure sensitive adhesive with an excellent transparency can be obtained.

[0030] The amount of the hydroxy group-containing monomer is preferably 0.1 parts by weight or more, more preferably 0.5 parts by weight or more, further preferably 0.8 parts by weight or more, and may be 1 part by weight or more, 1.5 parts by weight or more, or 2 parts by weight or more, based on 100 parts by weight of the total of the monomer components of the acryl-based base polymer. If the amount of the hydroxy group-containing monomer is increased, functional groups remaining unreacted are reduced in the crosslinker, so that the degree of crosslinking can be enhanced with a small amount of the crosslinker, and the adhesion reliability can be improved.

[0031] If the amount of the hydroxy group-containing monomer used in the base polymer is excessively large, increase in the polarity of the polymer leads to increase in the hydrophilicity and the moisture permeability of the pressure sensitive adhesive sheet, and as a result, the polarizer 11 arranged in contact with the pressure sensitive adhesive sheet 21 is likely to fade at high temperature and high humidity. One reason of the fading of the polarizer is considered to be that in the pressure sensitive adhesive sheet having high hydrophilicity and high moisture permeability, moisture from the external environment easily reaches the polarizer, and the moisture causes disturbance of the orientation of the polymer chains included in the polarizer and release of a polyiodide ions from the polymer chain. The amount of the hydroxy group-containing monomer is preferably 8 parts by weight or less, more preferably 7 parts by weight or less, and may be 6 parts by weight or less or 5 parts by weight or less, based on 100 parts by weight of the total of the monomer components of the acryl-based base polymer.

[0032] The acryl-based base polymer may contain a monomer component other than the above-described components. The acryl-based base polymer may contain a monomer component such as a vinyl ester monomer, an aromatic vinyl monomer, an epoxy group-containing monomer, or a vinyl ether monomer.

[0033] The acryl-based base polymer may contain a nitrogen-containing monomer as the monomer component. Examples of the nitrogen-containing monomer include N-vinylpyrrolidone, methylvinylpyrrolidone, vinylpyridine, vinylpiperidone, vinylpyrimidine, vinylpiperazine, vinylpyrazine, vinylpyrrole, vinylimidazole, vinylloxazole, vinylmorpholine, (meth)acryloylmorpholine, N-vinylcarboxylic acid amides N-vinylcaprolactam acrylonitrile and methacrylonitrile.

[0034] If the acryl-based base polymer contains the nitrogen-containing monomer as the monomer component, the cohesive force tends to be improved, and the adhesion reliability tends to be enhanced. If the amount of the nitrogen-containing monomer used in the base polymer contained in the pressure sensitive adhesive is increased, the polarizer 11 arranged in contact with the pressure sensitive adhesive sheet 21 is likely to fade. One reason of the fading of the polarizer is considered to be that, for example, because a nitrogen atom is likely to be coordinated to iodine, increase in the amount of nitrogen atoms contained in the base polymer of the pressure sensitive adhesive sheet leads to coordination of the iodine fixed to the polymer chain in the polarizer with the nitrogen atom in the pressure sensitive adhesive, resulting in release of the iodine from the polymer chain. The amount of the nitrogen-containing monomer is preferably 5 parts by weight or less, more preferably 3 parts by weight or less, and may be 1 part by weight or less, 0.5 parts by weight or less, 0.1 parts by weight or less, or 0.05 parts by weight or less, based on 100 parts by weight of the total of the monomer components of the acryl-based base polymer. The acryl-based base polymer may contain no nitrogen-containing monomer as the monomer component.

[0035] When the acid component contained in the pressure sensitive adhesive sheet is transferred to the polarizer, the acid component may promote hydrolysis of polyvinyl alcohol to cause deterioration of the polarizer. Therefore, the pressure sensitive adhesive sheet 21 preferably has a low content of an organic acid monomer (free organic acid) such as (meth)acrylic acid. In thermosetting or photocurable polymers, the presence of unreacted residual monomers is inevitable. Therefore, in order to reduce the content of the acid monomer in the pressure sensitive adhesive sheet, it is preferable to reduce the amount of the organic acid monomer component such as (meth)acrylic acid in the monomer component of the base polymer. The content of the carboxy group-containing monomer is preferably 1 part by weight or less, more preferably 0.5 parts by weight or less, further preferably 0.1 parts by

weight or less, based on 100 parts by weight of the total of the constituent monomer components of the acryl-based base polymer. The acryl-based base polymer preferably contains no carboxy group-containing monomer as the monomer component.

5 **[0036]** From the viewpoint of suppressing fading of the polarizer 11 in a high-temperature and high-humidity environment, the base polymer of the pressure sensitive adhesive sheet 21 arranged in contact with the polarizer 11 preferably has low polarity. In order to lower the polarity of the base polymer, the base polymer preferably has a low content of a polar monomer such as a nitrogen-containing
10 monomer, a hydroxy group-containing monomer, or a carboxy group-containing monomer as a constituent monomer component. The content of the polar monomer is preferably 12 parts by weight or less, more preferably 10 parts by weight or less, further preferably 8 parts by weight or less, and may be 6 parts by weight or less or 5 parts by weight or less, based on 100 parts by weight of the total of the
15 constituent monomer components of the acryl-based base polymer.

[0037] The acryl-based base polymer may contain no polar monomer as the constituent monomer component. However, the acryl-based base polymer preferably contains 0.1 parts by weight or more of a polar monomer such as a hydroxy group-containing monomer, from the viewpoint of introducing a
20 crosslinking structure by a thermal crosslinker such as an isocyanate-based crosslinker into the base polymer. The content of the polar monomer is more preferably 0.5 parts by weight or more, further preferably 0.8 parts by weight or more, and may be 1 part by weight or more, 1.5 parts by weight or more, or 2 parts by weight or more, based on 100 parts by weight of the total of the constituent
25 monomer components of the acryl-based base polymer.

[0038] From the viewpoint of enhancing the cohesive force of the acryl-based base polymer having a small content of the polar monomer component and enhancing the adhesion reliability, the acryl-based base polymer preferably contains a high-T_g monomer, which is free of hydroxy group, carboxy group and nitrogen atom and has
30 a homopolymer glass transition temperature of 10°C or more, as the constituent monomer component.

[0039] Examples of the high-T_g monomer containing no polar group include styrene (T_g: 80°C), methyl methacrylate (T_g: 105°C), cyclohexyl acrylate (T_g: 15°C),

cyclohexyl methacrylate (Tg: 66°C), 3,3,5-trimethylcyclohexyl acrylate (Tg: 52°C), dicyclopentanyl methacrylate (Tg: 175°C), dicyclopentanyl acrylate (Tg: 120°C), dicyclopentenyl acrylate (Tg: 120°C), isobornyl methacrylate (Tg: 173°C), isobornyl acrylate (Tg: 97°C), 1-adamantyl methacrylate (Tg: 250°C), and 1-adamantyl acrylate (Tg: 153°C). Among these high-Tg monomers, acrylic acid esters are preferable because they are excellent in copolymerizability with the low-Tg monomer (acrylic acid lower alkyl ester) described below. Furthermore, the high-Tg monomer is preferably a (meth)acrylic acid ester having an alicyclic structure because both the acrylic acid ester and the methacrylic acid ester can exhibit a high Tg, and an acrylic acid ester having an alicyclic structure is particularly preferable such as cyclohexyl acrylate, dicyclopentanyl acrylate, dicyclopentenyl acrylate, isobornyl acrylate, or 1-adamantyl acrylate. The high-Tg monomer may have a homopolymer glass transition temperature of 13°C or more, or 15°C or more.

[0040] From the viewpoint of enhancing the adhesion reliability of the pressure sensitive adhesive sheet, the content of the high-Tg monomer containing no polar group is preferably 20 parts by weight or more, more preferably 25 parts by weight or more, further preferably 30 parts by weight or more, based on 100 parts by weight of the total of the constituent monomer components of the acryl-based base polymer. If the content of the high-Tg monomer is excessively large, the base polymer has a high glass transition temperature, resulting in deterioration of the adhesiveness and the impact resistance at low temperature in some cases. Therefore, the content of the high-Tg monomer containing no polar group is preferably 75 parts by weight or less, more preferably 70 parts by weight or less, and may be 65 parts by weight or less, 60 parts by weight or less, 55 parts by weight or less, or 50 parts by weight or less, based on 100 parts by weight of the total of the constituent monomer components of the acryl-based base polymer.

[0041] The acryl-based base polymer preferably has a glass transition temperature of -50 to 10°C, more preferably -45 to 5°C, further preferably -40 to 0°C, from the viewpoint of achieving both the adhesion reliability of the pressure sensitive adhesive sheet and the adhesiveness and the impact resistance at low temperature. The glass transition temperature of the acryl-based base polymer can be derived from a theoretical Tg. The theoretical Tg can be calculated from the glass transition temperature Tg_i of a homopolymer of a constituent monomer component of the acryl-based

base polymer and the weight fraction W_i of each monomer component in accordance with the following Fox equation:

$$1/T_g = \Sigma(W_i/T_{gi}).$$

[0042] T_g represents a glass transition temperature (unit: K) of the polymer chain, W_i represents a weight fraction (copolymerization degree on a weight basis) of a monomer component i forming the segment, and T_{gi} represents a glass transition temperature (unit: K) of a homopolymer of the monomer component i . As the glass transition temperature of the homopolymer, the value described in Polymer Handbook, 3rd edition (John Wiley & Sons, Inc., 1989) can be referred. As the T_g of a homopolymer of a monomer which is not described in the document, a $\tan \delta$ peak-top temperature obtained by dynamic viscoelasticity measurement may be employed.

[0043] In order to set the glass transition temperature of the acryl-based base polymer containing 20 parts by weight or more of the high- T_g monomer as the monomer component within the above-described range, the acryl-based base polymer preferably contains a low- T_g monomer having a homopolymer glass transition temperature of -40°C or less as the monomer component. Examples of the low T_g monomer include 2-ethylhexyl acrylate (T_g : -70°C), n -hexyl acrylate (T_g : -65°C), n -octyl acrylate (T_g : -65°C), isononyl acrylate (T_g : -60°C), n -nonyl acrylate (T_g : -58°C), isooctyl acrylate (T_g : -58°C) and butyl acrylate (T_g : -55°C). Of these, butyl acrylate and 2-ethylhexyl acrylate are preferable.

[0044] The content of the (meth)acrylic acid alkyl ester having a homopolymer glass transition temperature of -40°C or less is preferably 20 to 79 parts by weight, more preferably 25 to 70 parts by weight, and may be 30 to 65 parts by weight, based on 100 parts by weight of the total of the constituent monomer components of the acryl-based base polymer.

[0045] The acryl-based base polymer is obtained by polymerizing the monomer components using various kinds of known methods such as solution polymerization, emulsification polymerization and mass polymerization. The solution polymerization method is suitable from the viewpoint of a balance of properties such as adhesive strength and retentive strength of the pressure sensitive adhesive, costs and so on. As a solvent for solution polymerization, ethyl acetate, toluene or the like is generally used. The solution concentration is normally about 20 to 80% by weight. As the polymerization initiator, an azo-based initiator, a peroxide-based initiator, a redox-based initiator obtained by

combining a peroxide and a reducing agent (*e.g.*, combination of a persulfate and sodium hydrogen sulfite, combination of a peroxide and sodium ascorbate, or the like), or the like is preferably used. The usage amount of the polymerization initiator is not particularly limited, and is for example about 0.005 to 5 parts by weight, preferably about 0.02 to 3 part by weight, based on 100 parts by weight of the total amount of monomer components that form the base polymer.

[0046] For adjusting the molecular weight of the base polymer, a chain-transfer agent may be used. The chain-transfer agent can receive radicals from a growing polymer chain to stop extension of the polymer, and the chain-transfer agent having received the radicals can attack the monomer to start polymerization again. Accordingly, when a chain-transfer agent is used, an increase in molecular weight of the base polymer is inhibited without reducing the concentration of radicals in the reaction system. As the chain-transfer agent, for example, a thiol such as α -thioglycerol, lauryl mercaptan, glycidyl mercaptan, mercaptoacetic acid, 2-mercaptoethanol, thioglycolic acid, 2-ethylhexyl thioglycollate or 2,3-dimercapto-1-propanol is suitably used.

[0047] Although the amount of the chain-transfer agent is not particularly limited, using an excessively large amount of the chain-transfer agent may cause reduction of molecular weight of the base polymer, leading to deterioration of the processability and processing dimensional stability of the pressure sensitive adhesive sheet before photocuring. Thus, the amount of the chain-transfer agent is preferably 1 part by weight or less, more preferably 0.3 parts by weight or less, further preferably 0.15 parts by weight or less, especially preferably 0.1 parts by weight or less, based on 100 parts by weight of the total of monomer components that form the base polymer.

[0048] The weight average molecular weight of the acryl-based base polymer is preferably 100,000 to 3,000,000, more preferably 250,000 to 2,000,000, further preferably 500,000 to 1,500,000. The molecular weight of the base polymer refers to the molecular weight before introduction of a crosslinked structure.

[0049] <Crosslinked Structure of Base Polymer>

The acryl-based base polymer preferably contains a crosslinked structure. In general, examples of the method for introducing a crosslinked structure into a base polymer include: (1) a method in which a base polymer having a functional group capable of reacting with a crosslinker is prepared, and the crosslinker is then added to react the base polymer with the crosslinker; and (2) a method in which a photopolymerizable polyfunctional compound is incorporated in polymerization components of a base polymer

to introduce a branched structure (crosslinked structure) into the polymer chain.

[0050] In the pressure sensitive adhesive composition of the pressure sensitive adhesive sheet 21 arranged in contact with the polarizer 11, the acryl-based base polymer preferably has a crosslinking structure introduced with the above-mentioned method (1). The pressure sensitive adhesive composition of the pressure sensitive adhesive sheet 21 may contain a photopolymerizable polyfunctional compound and a photopolymerization initiator so that the crosslinking structure described in the above-mentioned method (2) is introduced through bonding the pressure sensitive adhesive sheet 21 to the cover window 70 followed by photocuring. In other words, in the pressure sensitive adhesive composition of the pressure sensitive adhesive sheet 21, the base polymer preferably has a crosslinking structure by a (thermal) crosslinker such as an isocyanate-based crosslinker, and an optional crosslinking structure may be further introduced by a photopolymerizable polyfunctional compound (photocrosslinker) through photocuring.

[0051] <Pressure Sensitive Adhesive Composition>

A pressure sensitive adhesive composition is prepared by mixing a crosslinker, a photopolymerizable polyfunctional compound, a photopolymerization initiator, and optionally an oligomer, various additives and the like with the base polymer. Preferably, the pressure sensitive adhesive composition has a viscosity (*e.g.*, about 0.5 to 20 Pa·s) suitable for application of the composition onto a substrate. The viscosity of the pressure sensitive adhesive composition can be set within an appropriate range by adjusting the molecular weight of the base polymer, the amount of the photopolymerizable polyfunctional compound, and composition, molecular weight and amount of other components (*e.g.*, oligomer), and so on. Additives such as thickener may be used for the purpose of, for example, adjusting the viscosity.

[0052] (Ultraviolet Absorber)

The pressure sensitive adhesive sheet 21 preferably has ultraviolet absorbency. In a polarizing plate in which a transparent protective film is provided on the viewing-side surface of a polarizer, the transparent protective film generally has ultraviolet absorbency to suppress deterioration of the polarizer due to an ultraviolet ray incident from the outside of the display device. Meanwhile, in the configuration in which the pressure sensitive adhesive sheet 21 is arranged in contact with the viewing-side surface of the polarizer 11, no transparent protective

film is provided on the viewing-side of the polarizer. Therefore, the pressure sensitive adhesive sheet 21 preferably has ultraviolet absorbency to prevent photodegradation of the polarizer 11 (such as a change in color of the polarizer due to a structural change of the polyiodide ions (change from I_5^- to I_3^-) or the like) caused by an ultraviolet ray.

[0053] It is preferable the pressure sensitive adhesive composition contains an ultraviolet absorber for imparting ultraviolet absorbency to the pressure sensitive adhesive layer 21. Examples of the ultraviolet absorber include benzotriazole-based ultraviolet absorbers, benzophenone-based ultraviolet absorbers, triazine ultraviolet absorbers, salicylate-based ultraviolet absorbers and cyanoacrylate-based ultraviolet absorbers. Triazine-based ultraviolet absorbers and benzotriazole-based ultraviolet absorbers are preferable because they have high ultraviolet absorbency and excellent compatibility with acryl-based polymers, and ensures that an acryl-based pressure sensitive adhesive with high transparency is easily obtained. Among them, triazine-based ultraviolet absorbers containing a hydroxyl group, and benzotriazole-based ultraviolet absorbers containing one benzotriazole backbone per molecule are preferable.

[0054] As the ultraviolet absorber, a commercially available product may be used. Examples of the commercially available triazine-based ultraviolet 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), 2-(2-hydroxy-4-[1-octyloxycarbonylethoxy]phenyl)-4,6-bis(4-phenylphenyl)-1,3,5-triazine ("TINUVIN 479" manufactured by BASF SE), bis(ethylhexyl) oxyphenolmethoxyphenyl triazine ("Tinosorb S" manufactured by BASF SE), and 2-(4,6-diphenyl-1,3,5-triazine-2-yl)-5-[2-(2-ethylhexanoyloxy)ethoxy]-phenol ("ADK STAB LA-46" manufactured by ADEKA Corporation).

[0055] Examples of the commercially available benzotriazole ultraviolet absorber include 2-(2H-benzotriazol-2-yl)-6-(1-methyl-1-phenylethyl)-4-(1,1,3,3-tetramethylbutyl)phenol ("TINUVIN 928" manufactured by BASF SE), 2-(2-hydroxy-5-tert-butylphenyl)-2H-

benzotriazole ("TINUVIN PS" manufactured by BASF SE), 2-(2H-benzotriazol-2-yl)-6-dodecyl-4-methylphenol ("TINUVIN 571" manufactured by BASF SE), 2-(2H-benzotriazol-2-yl)-p-cresol ("TINUVIN P" manufactured by BASF SE), 2-(2H-benzotriazol-2-yl)-4-bis(1-methyl-1-phenylethyl)phenol ("TINUVIN 234" manufactured by BASF SE), 2-(5-chloro (2H)-benzotriazol-2-yl)-4-methyl-6-(tert-butyl)phenol ("TINUVIN 326" manufactured by BASF SE), 2-(2H-benzotriazol-2-yl)-4,6-di-tert-pentylphenol ("TINUVIN 328" manufactured by BASF SE), 2-(2H-benzotriazol-2-yl)-4-(1,1,3,3-tetramethylbutyl)phenol ("TINUVIN 329" manufactured by BASF SE), ester compounds of benzenepropanoic acid with 3-(2H-benzotriazol-2-yl)-5-(1,1-dimethylethyl)-4-hydroxy (C₇₋₉ side chain and linear alkyl) ("TINUVIN 384-2" manufactured by BASF SE), reaction products of methyl-3-(3-(2H-benzotriazol-2-yl)-5-tert-butyl-4-hydroxyphenyl)propionate with polyethylene glycol ("TINUVIN1 130" manufactured by BASF SE), reaction products of methyl 3-(3-(2H-benzotriazol-2-yl)-5-tert-butyl-4-hydroxyphenyl) propionate with polyethylene glycol 300 ("TINUVIN 213" manufactured by BASF SE), and 2-[2-hydroxy-3-(3,4,5,6-tetrahydrophthalimido-methyl)-5-methylphenyl]benzotriazole ("Sumisorb 250" manufactured by Sumitomo Chemical Company, Limited).

[0056] When the pressure sensitive adhesive composition contains an ultraviolet absorber, the content of the ultraviolet absorber is about 0.05 to 10 parts by weight, preferably 0.1 to 5 parts by weight, more preferably 0.3 to 3 parts by weight, based on 100 parts by weight of the acryl-based base polymer. If the content of the ultraviolet absorber is within the above-described range, the pressure sensitive adhesive sheet 21 has an ultraviolet shielding property while deterioration of the transparency due to bleed-out of the ultraviolet absorber or the like is suppressed to inhibit photodegradation of the polarizer caused by an ultraviolet ray from the outside.

[0057] <Crosslinker>

As mentioned above, the acryl-based base polymer preferably contains a crosslinked structure. The crosslinked structure can be introduced into the base polymer by adding a crosslinker into the pressure sensitive adhesive composition, followed by optional heating. Although crosslinking with an isocyanate crosslinker or the like may be described as "thermal crosslinking" for discriminating the crosslinking from a crosslinking structure introduced by a photopolymerizable polyfunctional compound, the crosslinked structure by a crosslinker may be introduced without heating. By introducing a thermal-crosslinked structure into the acryl-based base polymer, cohesive force of the pressure

sensitive adhesive is enhanced and adhesiveness tends to be improved.

[0058] Examples of the crosslinker include compounds that react with functional groups such as a hydroxy group and a carboxy group contained in the base polymer. Specific examples of the crosslinker include isocyanate-based crosslinkers, epoxy-based crosslinkers, oxazoline-based crosslinkers, aziridine-based crosslinkers, carbodiimide-based crosslinkers and metal chelate-based crosslinkers. In particular, isocyanate-based crosslinkers are preferable because they have high reactivity with the hydroxy group of the base polymer, so that introduction of a crosslinked structure is facilitated.

[0059] As an isocyanate-based crosslinker, a polyisocyanate having two or more isocyanate groups per molecule is used.

Examples of the polyisocyanate-based crosslinker include lower aliphatic polyisocyanates such as butylene diisocyanate and hexamethylene diisocyanate; cycloaliphatic isocyanates such as cyclopentylene diisocyanate, cyclohexylene diisocyanate and isophorone diisocyanate; aromatic isocyanates such as 2,4-tolylene diisocyanate, 4,4'-diphenylmethane diisocyanate and xylylene diisocyanate; isocyanate adducts such as trimethylolpropane/tolylene diisocyanate trimer adducts (*e.g.* "CORONATE L" manufactured by Tosoh Corporation), trimethylolpropane/hexamethylene diisocyanate trimer adducts (*e.g.* "CORONATE HL" manufactured by Tosoh Corporation), trimethylolpropane adducts of xylylene diisocyanate (*e.g.* "TAKENATE D110N" manufactured by Mitsui Chemicals, Incorporated) and isocyanurate forms of hexamethylene diisocyanate (*e.g.* "CORONATE HX" manufactured by Tosoh Corporation).

[0060] It is possible to optimize the cohesive force and the adhesive force of the pressure sensitive adhesive by adjusting the addition amount of the crosslinker. The addition amount of the crosslinker is preferably 0.01 to 1 part by weight, more preferably 0.05 to 0.7 parts by weight, further preferably 0.1 to 0.5 parts by weight, based on 100 parts by weight of the base polymer.

[0061] (Photopolymerizable Polyfunctional Compound)

It is preferable the pressure sensitive adhesive composition contains a photocurable polyfunctional compound for imparting photocurable property into the pressure sensitive adhesive sheet. The photopolymerizable polyfunctional compound has two or more photopolymerizable functional groups per molecule. The photopolymerizable functional group may be any of radically polymerizable, cationically polymerizable and anionically polymerizable photopolymerizable functional groups, but a radical-polymerizable functional group having an unsaturated double bond (ethylenically

unsaturated group) is preferable because it is excellent in reactivity. The photopolymerizable polyfunctional compound is preferably a polyfunctional (meth)acrylate because it has high compatibility with the acryl-based base polymer, and is especially preferably a polyfunctional acrylate because it has high photoradical reactivity.

5 **[0062]** Examples of the polyfunctional (meth)acrylate include difunctional (meth)acrylic acid esters such as hexanediol di(meth)acrylate, nonanediol di(meth)acrylate, polyethylene glycol di(meth)acrylate, polypropylene glycol di(meth)acrylate, polytetramethylene glycol di(meth)acrylate, bisphenol A ethylene oxide-modified di(meth)acrylate, bisphenol A propylene oxide-modified di(meth)acrylate, alkanediol di(meth)acrylate, tricyclodecane
10 dimethanol di(meth)acrylate, pentaerythritol di(meth)acrylate, neopentyl glycol di(meth)acrylate and glycerin di(meth)acrylate; trifunctional (meth)acrylic acid esters such as pentaerythritol tri(meth)acrylate, trimethylolpropane tri(meth)acrylate and ethoxylated isocyanuric acid tri(meth)acrylate; tetrafunctional (meth)acrylic acid esters such as ditrimethylolpropane tetra(meth)acrylate, ethoxylated pentaerythritol
15 tetra(meth)acrylate and pentaerythritol tetra(meth)acrylate; and penta-or-more-functional (meth)acrylic acid esters such as dipentaerythritol penta(meth)acrylate etc. and dipentaerythritol hexa(meth)acrylate etc.

[0063] From the viewpoint of enhancing the adhesion reliability of the pressure sensitive adhesive sheet after the photocuring, molecular weight of the photopolymerizable
20 polyfunctional compound is preferably 1500 or less, more preferably 1000 or less. The functional group equivalent weight (g/eq) of the photopolymerizable polyfunctional compound is preferably 50 to 500, more preferably 70 to 300, further preferably 80 to 200. The photopolymerizable polyfunctional compound is preferably liquid at normal temperature because it has moderate compatibility with the base polymer.

25 **[0064]** The content of the photopolymerizable polyfunctional compound in the pressure sensitive adhesive composition is preferably 0.3 to 15 parts by weight, more preferably 0.5 to 10 parts by weight, further preferably 1 to 5 parts by weight based on 100 parts by weight of the acryl-based base polymer. If the content of the photopolymerizable polyfunctional compound is small, the pressure sensitive
30 adhesive sheet tends to have insufficient adhesion reliability after photocuring. If the content of the photocurable polyfunctional compound is excessively large, the ratio of the base polymer in the pressure sensitive adhesive sheet (pressure sensitive adhesive composition) before photocuring is so small that the processability and the dimensional stability in processing of the pressure sensitive

adhesive sheet sometimes deteriorate. Furthermore, if the content of the photocurable polyfunctional compound is excessively large, the pressure sensitive adhesive sheet after photocuring is so hard that the pressure sensitive adhesive sheet 21 may have insufficient adhesive force and insufficient impact resistance at low temperature.

[0065] (Photopolymerization Initiator)

It is preferable a photopolymerization initiator is contained in the photocurable pressure sensitive adhesive composition having a photocurable polyfunctional compound. Examples of the photopolymerization initiator include benzoin ether-based photopolymerization initiators, acetophenone-based photopolymerization initiators, α -ketol-based photopolymerization initiators, aromatic sulfonyl chloride-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 and acylphosphine oxide-based photopolymerization initiators. The content of the photopolymerization initiator in the pressure sensitive adhesive composition is preferably 0.01 to 5 parts by weight, more preferably from 0.05 to 3 parts by weight based on 100 parts by weight of the base polymer.

[0066] (Oligomer)

The pressure sensitive adhesive composition may contain oligomers for the purpose of, for example, adjusting the adhesive strength and the viscosity of the pressure sensitive adhesive sheet. As the oligomer, one having a weight average molecular weight of, for example, about 1000 to 30000 is used. The oligomer is preferably an acryl-based oligomer because it is excellent in compatibility with the acryl-based base polymer.

[0067] The acryl-based oligomer contains a (meth)acrylic acid alkyl ester as a main constituent monomer component. In particular, the acryl-based oligomer is preferably one containing as a constituent monomer component a (meth)acrylic acid alkyl ester having a linear or branched alkyl group (linear or branched alkyl (meth)acrylate) and a (meth)acrylic acid alkyl ester having a cycloaliphatic alkyl group (cycloaliphatic alkyl (meth)acrylate). Specific examples of the linear or branched alkyl (meth)acrylate and the cycloaliphatic alkyl (meth)acrylate are as shown above as constituent monomers of the acryl-based base polymer.

[0068] The glass transition temperature of the acryl-based oligomer is preferably 20°C or

higher, more preferably 50°C or higher, further preferably 80°C or higher, especially preferably 100°C or higher. When a base polymer which has a low glass transition temperature (T_g) and in which a crosslinked structure is introduced by a urethane-based segment, and an acryl-based oligomer having a high glass transition temperature (T_g) are used in combination, the adhesion retaining force of the pressure sensitive adhesive sheet tends to be improved. The upper limit of the glass transition temperature of the acryl-based oligomer is not particularly limited, but is generally 200°C or lower, preferably 180°C or lower, more preferably 160°C or lower. The glass transition temperature of the acryl-based oligomer is calculated in accordance with the Fox equation.

[0069] Among the shown (meth)acrylic acid alkyl esters, the linear or branched alkyl (meth)acrylate is preferably methyl methacrylate because it has a high glass transition temperature, and is excellent in compatibility with the base polymer. As the cycloaliphatic alkyl (meth)acrylate, dicyclopentanyl acrylate, dicyclopentanyl methacrylate, cyclohexyl acrylate and cyclohexyl methacrylate are preferable. That is, the acryl-based oligomer is preferably one containing as constituent monomer components at least one selected from the group consisting of dicyclopentanyl acrylate, dicyclopentanyl methacrylate, cyclohexyl acrylate and cyclohexyl methacrylate, and methyl methacrylate.

[0070] The amount of the cycloaliphatic alkyl (meth)acrylate based on the total amount of monomer components for forming the acryl-based oligomer is preferably 10 to 90% by weight, more preferably 20 to 80% by weight, further preferably 30 to 70% by weight. The amount of the linear or branched alkyl (meth)acrylate based on the total amount of monomer components for forming the acryl-based oligomer is preferably 10 to 90% by weight, more preferably 20 to 80% by weight, further preferably 30 to 70% by weight.

[0071] The weight average molecular weight of the acryl-based oligomer is preferably 1000 to 30000, more preferably 1500 to 10000, further preferably 2000 to 8000. When an acryl-based oligomer having a molecular weight falling within the above-mentioned range is used, the adhesive strength and the adhesion retaining force of the pressure sensitive adhesive sheet tend to be improved.

[0072] The acryl-based oligomer is obtained by polymerizing the above-mentioned monomer components by various polymerization methods. In polymerization of the acryl-based oligomer, various polymerization initiators may be used. In addition, a chain-transfer agent may be used for the purpose of adjusting the molecular weight.

[0073] When the pressure sensitive adhesive composition contains an oligomer

component such as an acryl-based oligomer, the content of the oligomer component is preferably 0.1 to 10 parts by weight, more preferably 0.2 to 5 parts by weight based on 100 part by weight of the above base polymer. Improvement of adhesion can be expected when the content of the oligomer in the pressure sensitive adhesive composition is within the above-described range.

[0074] (Silane Coupling Agent)

A silane coupling agent can also be added in the pressure sensitive adhesive composition for the purpose of adjusting the adhesive strength. When the pressure sensitive adhesive composition includes a silane coupling agent, the content thereof is normally about 0.01 to 5.0 parts by weight, preferably 0.03 to 2.0 parts by weight based on 100 parts by weight of the base polymer.

[0075] (Antioxidant)

The pressure sensitive adhesive composition may contain an antioxidant. If the pressure sensitive adhesive composition contains an antioxidant, the reaction and the deterioration of the curable component caused by heat or light can be suppressed in the environment in which the pressure sensitive adhesive composition or the pressure sensitive adhesive sheet is stored or used. Examples of the antioxidant include amine-based antioxidants, sulfur-based antioxidants, phosphorus-based antioxidants, and phenol-based antioxidants. Among the antioxidants, antioxidants that act as a radical chain inhibitor, such as amine-based antioxidants and phenol-based antioxidants, are preferable, and phenol-based antioxidants having a hindered phenol structure are particularly preferable.

[0076] The antioxidant having a hindered phenol structure has a large steric hindrance group, such as a tert-butyl group, bonded to at least one of the carbon atoms adjacent to the carbon atom of the aromatic ring to which an OH group of phenol is bonded. Examples of the antioxidant having a hindered phenol structure include dibutylhydroxytoluene (BHT), pentaerythritol tetrakis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate] ("Irganox 1010" manufactured by BASF SE), octadecyl-3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate ("Irganox 1076" manufactured by BASF SE), 3,3',3",5,5',5"-hexa-tert-butyl-a,a',a"- (mesitylene-2,4,6-triyl)tri-p-cresol ("Irganox 1330" manufactured by BASF SE), 1,3,5-tris(3,5-di-tert-butyl-4-hydroxybenzyl)-1,3,5-triazine-2,4,6 (1H,3H,5H)-trione ("Irganox 3114" manufactured by BASF SE), tris[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionyloxyethyl] isocyanurate ("Irganox 3125" manufactured by

BASF SE), pentaerythritol tetrakis[3-(3,5-di-*t*-butyl-4-hydroxyphenyl)propionate] (“ADK STAB AO-60” manufactured by ADEKA Corporation), 3,9-bis{2-[3-(3-*t*-butyl-4-hydroxy-5-methylphenyl)propionyloxy]-1,1-dimethylethyl}-2,4,8,10-tetraoxaspiro[5.5]undecane (“ADK STAB AO -80” manufactured by ADEKA Corporation), 2-[1-(2-hydroxy-3,5-di-*tert*-pentylphenyl)ethyl]-4,6-di-*tert*-pentylphenyl acrylate (“SUMILIZER GS” manufactured by SUMITOMO CHEMICAL COMPANY, LIMITED), 2-*tert*-butyl-4-methyl-6-(2-hydroxy-3-*tert*-butyl-5-methylbenzyl)phenyl acrylate (“SUMILIZER GM” manufactured by SUMITOMO CHEMICAL COMPANY, LIMITED), 2,2'-dimethyl-2,2'-(2,4,8,10-tetraoxaspiro[5.5]undecane-3,9-diyl)dipropyl-1,1'-diyl=bis[3-(3-*tert*-butyl-4-hydroxy-5-methylphenyl) propanoate] (“SUMILIZER GA-80” manufactured by SUMITOMO CHEMICAL COMPANY, LIMITED), and 1,3,5-tris(3-hydroxy-4-*tert*-butyl-2,6-dimethylbenzyl)-1,3,5-triazine-2,4,6 (1*H*,3*H*,5*H*)-trione (“CYANOX 1790” manufactured by Cytec Industries Inc.).

[0077] In the case where the pressure sensitive adhesive composition contains an antioxidant, the content of the antioxidant is preferably 0.01 parts by weight or more, more preferably 0.05 parts by weight or more, further preferably 0.1 parts by weight or more, and may be 0.3 parts by weight or more or 0.5 parts by weight or more, based on 100 parts by weight of the acryl-based base polymer, from the viewpoint of suppressing an undesired curing reaction and deterioration. Meanwhile, if the content of the antioxidant is excessively large, the antioxidant may cause curing inhibition during photocuring of the pressure sensitive adhesive sheet. Therefore, the content of the antioxidant is preferably 10 parts by weight or less, more preferably 5 parts by weight or less, further preferably 3 parts by weight or less, based on 100 parts by weight of the acryl-based base polymer.

[0078] (Other Additives)

In addition to the components exemplified above, additives such as a tackifier, a plasticizer, a softener, a degradation inhibitor, a filler, a colorant, a surfactant and an antistatic agent may be contained in the pressure sensitive adhesive composition.

[0079] [Pressure Sensitive Adhesive Sheet]

A pressure sensitive adhesive composition is applied onto a substrate, and a solvent is optionally removed by drying to form a pressure sensitive adhesive sheet on the substrate. Any suitable material may be used for formation of the pressure sensitive adhesive sheet. The substrate may be a release film having a release layer on a surface of

a resin film.

[0080] Examples of the resin material of the release film 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 thickness of the release film is preferably 10 to 200 μm , more preferably 25 to 150 μm . Examples of the material of the release layer include silicone-based release agents, fluorine-based release agents, long-chain alkyl-based release agents and aliphatic amide-based release agents. The thickness of the release layer is generally about 10 to 2000 nm.

[0081] For applying the pressure sensitive adhesive composition on the substrate, various kinds of coating methods 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, and extrusion coating may be employed.

[0082] When the pressure sensitive adhesive composition includes a solvent, the solvent is preferably dried after application of the pressure sensitive adhesive composition on the substrate. As a method for drying, a suitable method can be appropriately employed according to a purpose. The heating/drying temperature is preferably 40°C to 200°C, more preferably 50°C to 180°C, further preferably 70°C to 170°C. Drying time can be appropriately set. The drying time is preferably 5 seconds to 20 minutes, more preferably 5 seconds to 15 minutes, further preferably 10 seconds to 10 minutes.

[0083] After the solvent is removed by drying, it is preferable to dispose a cover sheet for protecting the surface of the pressure sensitive adhesive sheet. Preferably, a release film having a release layer on the contact surface with the pressure sensitive adhesive sheet, like the base film, is used as the cover sheet.

[0084] After the pressure sensitive adhesive composition is applied onto the substrate, heating is optionally performed to introduce a crosslinked structure into the base polymer. The heating temperature and the heating time may be appropriately set according to the type of crosslinker to be used, and normally, the heating is performed at 20°C to 160°C for about 1 minute to 7 days. The heating for removing the solvent by drying may also serve

as heating for crosslinking. As described above, the introduction of the crosslinked structure does not necessarily require heating.

[0085] A crosslinking catalyst may be used for accelerating formation of a crosslinked structure. Examples of the crosslinking catalyst of the isocyanate-based crosslinker include metal-based crosslinking catalysts (particularly tin-based crosslinking catalysts) such as tetra-n-butyl titanate, tetraisopropyl titanate, NACEM ferric, butyl tin oxide, dioctyl tin dilaurate and dibutyl tin dilaurate.

[0086] Release films are bonded, respectively, to surfaces of the pressure sensitive adhesive sheet to obtain a pressure sensitive adhesive sheet in which a release film is temporarily attached to each of both surfaces as shown in FIG. 1. The substrate and the cover sheet used for formation of the pressure sensitive adhesive sheet may be remain attached to the pressure sensitive adhesive to be used as release films.

[0087] When release films are disposed on both surfaces of the pressure sensitive adhesive sheet, the thickness of one release film and the thickness of the other release film may be the same, or different. The peeling strength in peeling of the release film temporarily attached to one surface from the pressure sensitive adhesive sheet and the peeling strength in peeling of the release film temporarily attached to the other surface from the pressure sensitive adhesive sheet may be the same or different.

[0088] The pressure sensitive adhesive sheet 21 used for bonding the polarizer 11 to the cover window 70 preferably has a thickness of 30 μm or more, more preferably 40 μm or more, further preferably 50 μm or more. Increase in the thickness of the pressure sensitive adhesive sheet 21 tends to lead to improvement in the impact resistance. In the case where the cover window 70 has a printing level difference by decorative printing, the pressure sensitive adhesive sheet 21 may have a level difference absorbing property. The upper limit of the thickness of the pressure sensitive adhesive sheet 21 is not particularly limited, and is preferably 500 μm or less, more preferably 300 μm or less, further preferably 250 μm or less, from the viewpoint of the productivity of the pressure sensitive adhesive sheet and the like.

[0089] The pressure sensitive adhesive sheet 21 preferably has a total light transmittance of 85% or more, more preferably 90% or more. The pressure sensitive adhesive sheet preferably has a haze of 1.5% or less, more preferably 1% or less.

[0090] The light transmittance through the pressure sensitive adhesive sheet 21 at

a wavelength of 380 nm is preferably 5% or less, more preferably 4% or less, and may be 3% or less. By enhancing the ultraviolet shielding property of the pressure sensitive adhesive sheet 21, photodegradation such as yellowing of the polarizer 11 due to an ultraviolet ray incident from the outside can be suppressed. If the pressure sensitive adhesive composition contains an ultraviolet absorber as described above, the pressure sensitive adhesive sheet 21 can have ultraviolet absorbency while maintaining the transparency for visible light.

[0091] [Polarizing Plate]

<Polarizer>

The polarizing plate 10 includes a polarizer 11. The polarizer 11 is an iodine-containing polyvinyl alcohol-based film. Examples of material of the polyvinyl alcohol-based film to be used as the polarizer include polyvinyl alcohol and derivatives thereof. Examples of the derivative of polyvinyl alcohol include polyvinyl formal and polyvinyl acetal as well as polyvinyl alcohol modified with an olefin such as ethylene or propylene, an unsaturated carboxylic acid such as acrylic acid, methacrylic acid or crotonic acid, or an alkyl ester thereof, and an acryl amide. As the polyvinyl alcohol, one having a polymerization degree of about 1000 to 10000 and a saponification degree of about 80 to 100% by mol is generally used.

[0092] The polarizer can be obtained by iodine-dyeing and stretching the polyvinyl alcohol-based film. A thin polarizer having a thickness of 10 μm or less may also be used. Examples of the thin polarizer include thin polarizers as described in JP 51-069644 A, JP 2000-338329 A, WO 2010/100917, JP 4691205 B, JP 4751481 B, and so on. These thin polarizers are obtained by, for example, a production method including the steps of stretching a laminate of polyvinyl alcohol-based resin layer and a stretchable resin base material; and performing iodine dyeing to the PVA-based resin layer.

[0093] <Optical Layer>

On the first principal surface (viewing-side surface) of the polarizer 11, no optical layer is provided, and as described above, the pressure sensitive adhesive sheet 21 is provided in contact with the polarizer 11. The polarizing plate 10 may include only the polarizer 11, or an appropriate optical layer 15 may be placed on the second principal surface (surface on the image display cell 60-side) of the polarizer 11.

[0094] The optical layer 15 may be a transparent protective film for protecting the polarizer 11. The optical layer 15 may have a function such as an optical compensation

layer for wide viewing angle, etc., a quarter wave plate for forming a circular polarizing plate together with the polarizer 11, or the like. The optical layer 15 may have functions of both a transparent protective film and a retarder.

[0095] Examples of the material that forms the optical layer 15 include a thermoplastic resin excellent in transparency, mechanical strength and heat stability. Specific examples of the resin material include cellulose-based resins such as triacetyl cellulose, polyester-based resins, polyether sulfone-based resins, polysulfone-based resins, polycarbonate-based resins, polyamide-based resins, polyimide-based resins, polyolefin-based resins, (meth)acryl-based resin, cyclic polyolefin-based resins (norbornene-based resins), polyarylate-based resins, polystyrene-based resins, polyvinyl alcohol-based resins, and mixtures thereof. The optical layer 15 may be a liquid crystal material. For example, a liquid crystal layer in which liquid crystal molecules are aligned in a specific direction may be used as the optical layer 15.

[0096] The optical layer 15 may be in direct contact with the second principal surface of the polarizer 11, or may be bonded via an appropriate adhesive layer. The optical layer 15 may be a laminate of two or more layers. For example, the optical layer 15 may be a laminate of two or more film layers, a laminate in which a liquid crystal layer is formed on a film substrate, or a laminate in which two or more liquid crystal layers are stacked. The optical layer 15 may include an alignment film for aligning liquid crystal molecules in a specific direction.

[0097] [Pressure Sensitive Adhesive-Equipped Polarizing Plate]

As shown in FIG. 2, the pressure sensitive adhesive sheet 21 may be provided as a pressure sensitive adhesive-equipped polarizing plate 81 in which the pressure sensitive adhesive sheet 21 and the polarizing plate 10 are stacked into a laminate. In the pressure sensitive adhesive-equipped polarizing plate, the pressure sensitive adhesive sheet 21 is arranged in contact with the first principal surface of the polarizer 11. Although the optical layer 15 is provided on the second principal surface of the polarizer 11 in FIG. 2, as described above, the polarizing plate 10 may have no optical layer on the second principal surface of the polarizer.

[0098] The method of disposing the pressure sensitive adhesive sheet 21 on the first principal surface of the polarizer 11 is not particularly limited. The pressure sensitive adhesive sheet 21 prepared in advance on a substrate may be bonded to the polarizer 11, or the pressure sensitive adhesive sheet 21 may be formed using the polarizer 11 as a substrate.

[0099] In the pressure sensitive adhesive-equipped polarizing plate 81, it is preferable a release film 41 is releasably adhered to the pressure sensitive adhesive sheet 21. The release film has a function of protecting the exposed surface of the pressure sensitive adhesive sheet 21 until the pressure sensitive adhesive sheet 21 is bonded to the cover window 70. The substrate used for forming (applying) the pressure sensitive adhesive sheet may be used as it is as the release film 41 on the pressure sensitive adhesive sheet 21.

[0100] As shown in FIG. 3, the pressure sensitive adhesive-equipped polarizing plate may be both sides pressure sensitive adhesive-equipped polarizing plate in which the pressure sensitive adhesive sheet 21 is arranged in contact with the polarizer 11 on the viewing-side principal surface of the polarizing plate 10 and another pressure sensitive adhesive sheet 22 is provided on the other principal surface of the polarizing plate. It is preferable a release film 42 is releasably adhered to the pressure sensitive adhesive sheet 22.

[0101] In the pressure sensitive adhesive-equipped polarizing plate 81 shown in FIG. 3, the polarizing plate 10 includes the optical layer 15 on the second principal surface of the polarizer 11, and the pressure sensitive adhesive sheet 22 is placed on the optical layer 15. On the second principal surface of the polarizer 11, the polarizer 11 and the pressure sensitive adhesive sheet 22 may be stacked in contact with each other without another layer interposed therebetween.

[0102] When the both sides pressure sensitive adhesive-equipped polarizing plate, in which a pressure sensitive adhesive layer is disposed in advance on both the sides of the polarizing plate 10, is used as described above, after bonding the polarizing plate onto a surface of the image display cell, a process of disposing another pressure sensitive adhesive sheet on the polarizing plate can be omitted. Accordingly, manufacturing process of the image display device can be simplified.

[0103] The pressure sensitive adhesive sheet 22 is used for bonding the polarizing plate 10 to the image display cell 60. The pressure sensitive adhesive sheet 22 preferably has a thickness of 3 μm to 30 μm , more preferably 5 μm to 27 μm , further preferably 10 μm to 25 μm . As the pressure sensitive adhesive sheet 22, various pressure sensitive adhesives can be used that are used for bonding a polarizing plate to an image display cell. As the pressure sensitive adhesive of the pressure sensitive adhesive sheet 22, acryl-based pressure sensitive adhesives are preferably

used.

[0104] [Image Display Device]

As shown in FIG. 1, an image display device 100 includes the cover window 70 bonded to the viewing-side of the polarizing plate 10 via the pressure sensitive adhesive sheet 21. The image display cell 60 such as a liquid crystal cell or an OLED cell is bonded to the other surface of the polarizing plate 10 via the pressure sensitive adhesive sheet 22. The image display cell 60 may be bendable.

[0105] As the cover window 70, a transparent plate having an appropriate mechanical strength and thickness is used. As the transparent plate, a transparent resin plate of an acryl-based resin, a polycarbonate-based resin, or the like, or a glass plate is used. When the image display cell 60 is foldable, the cover window 70 may also be foldable. The cover window may be a laminate of a plurality of transparent films with a pressure sensitive adhesive or an adhesive interposed therebetween. The cover window may be equipped with a touch panel sensor. As the touch panel, a touch panel of any type such as resistive film type, capacitance type, optical type or ultrasonic type may be used.

[0106] The order of bonding of the polarizing plate 10 to the cover window 70 via the pressure sensitive adhesive sheet 21 and bonding of the pressure sensitive adhesive sheet 22 to the image display cell 60 is not particularly limited. As described above, a pressure sensitive adhesive-equipped polarizing plate may be used in which a pressure sensitive adhesive sheet is provided in advance on the surface of the polarizing plate.

[0107] After the polarizing plate 10 and the cover window 70 are bonded with the pressure sensitive adhesive layer 21 interposed therebetween, degassing may be performed for removing bubbles at the bonding interface or near the printing level difference. As a degassing method, an appropriate method such as heating, pressurization or pressure reduction can be employed. For example, bonding is performed while ingress of bubbles is suppressed under reduced pressure and heating, and then pressurization may be performed in parallel with heating through autoclave or the like for the purpose of, for example, suppressing delay bubbles.

[0108] In the case where the pressure sensitive adhesive sheet 21 includes a photocurable pressure sensitive adhesive composition, the polarizing plate 10 and the cover window 70 are bonded to each other, and then the pressure sensitive adhesive composition is photocured. The polymerization reaction of the photopolymerizable polyfunctional compound proceeds by light irradiation to

enhance the adhesion reliability of the pressure sensitive adhesive sheet.

[0109] The irradiation light amount during the photocuring is not particularly limited as long as the irradiation light amount is within the range in which the pressure sensitive adhesive sheet can be photocured. For example, the integrated
5 light amount is about 50 to 10,000 mJ/cm². Although the pressure sensitive adhesive sheet 21 may be irradiated with light from either the polarizing plate 10-side or the cover window 70-side, it is preferable the cover window 10-side is irradiated with an ultraviolet ray from the viewpoint of preventing deterioration of the polarizer 11 due to the ultraviolet ray. Even if the pressure sensitive adhesive
10 sheet 21 is irradiated with an ultraviolet ray for photocuring, the pressure sensitive adhesive sheet 21 having an ultraviolet shielding property absorbs most of the ultraviolet ray to reduce the ultraviolet irradiation to the polarizer.

[0110] In the image display device 100, the pressure sensitive adhesive sheet 21 arranged in contact with the viewing-side of the polarizer 11 has the composition as
15 described above. Therefore, even when the image display device is exposed to a high-temperature and high-humidity environment or exposed to external light for a long time, deterioration such as fading or yellowing of the polarizer is suppressed, and the adhesion reliability between the polarizing plate 10 and the cover window 70 is excellent.

EXAMPLES

[0111] 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.

[0112] [Preparation of Pressure Sensitive Adhesive Sheets 1 to 14]

<Polymerization of Base Polymer>

A reaction vessel equipped with a thermometer, a stirrer, a cooler, and a nitrogen gas introduction tube was charged with monomer components at the ratios shown in Table 1 (100 parts by weight in total), azobisisobutyronitrile (AIBN) as a
30 thermopolymerization initiator, and 233 parts by weight of ethyl acetate, and the mixture was stirred in a nitrogen atmosphere at 23°C for 1 hour to perform nitrogen substitution. Then, the mixture was reacted at 56°C for 5 hours, and subsequently reacted at 70°C for 3 hours to prepare an acryl-based base polymer solution.

[0113] Table 1 describes the monomers with the following abbreviations.

BA: butyl acrylate

CHA: cyclohexyl acrylate

IBXA: isobornyl acrylate

5 DCPA: dicyclopentenyl acrylate

4HBA: 4-hydroxybutyl acrylate

NVP: N-vinyl-2-pyrrolidone

AM: acrylamide

HEAA: hydroxyethyl acrylamide

10 [0114] <Preparation of Photocurable Pressure Sensitive Adhesive Composition>

To the acryl-based base polymer solution obtained above, the following post-addition components were added in the amounts shown in Table 1 based on 100 parts by weight of the base polymer, and then the resulting mixture was uniformly mixed to prepare a photocurable pressure sensitive adhesive composition.

15 Isocyanate-based crosslinker: trimethylolpropane adduct of xylylene diisocyanate ("TAKENATE D 110N" manufactured by Mitsui Chemicals, Inc.)

Polyfunctional acrylate: dipentaerythritol hexaacrylate (DPHA)

Silane coupling agent: 3-glycidoxypentyltrimethoxysilane ("KBM-403" manufactured by Shin-Etsu Chemical Co., Ltd.)

20 Antioxidant: pentaerythritol tetrakis[3-(3,5-di-tert-butyl-4-hydroxyphenyl)propionate] ("Irganox 1010" manufactured by BASF SE)

Photopolymerization initiator: 2,2-dimethoxy-2-phenylacetophenone ("Omnirad 651" manufactured by IGM Resins): 0.2 parts by weight; and

25 Ultraviolet absorber: 5,5'-bis(2-ethylhexyloxy)-2,2'-[6-(4-methoxyphenyl)-1,3,5-triazine-2,4-diyl]diphenol ("Tinosorb S" manufactured by BASF SE)

[0115] <Preparation of Pressure Sensitive Adhesive Sheet>

The above photocurable pressure sensitive adhesive composition was applied onto a release film (a polyethylene terephthalate film having a silicone-based release layer on a surface thereof), and heated at 100°C for 3 minutes to remove the solvent, followed by
30 laminating another release film on a surface thereof. The laminate was aged in an atmosphere of 25°C for 3 days to promote crosslinking, thereby obtaining a pressure sensitive adhesive sheet with a release film temporarily attached on each of both sides.

[0116] [Pressure Sensitive Adhesive Sheet A]

A reaction vessel equipped with a thermometer, a stirrer, a cooler, and a

nitrogen gas introduction tube was charged with 99 parts by weight of butyl acrylate and 1 part by weight of 4-hydroxybutyl acrylate as monomer components, 0.2 parts by weight of AIBN as a thermopolymerization initiator, and 233 parts by weight of ethyl acetate, and the mixture was stirred in a nitrogen atmosphere at 23°C for 1 hour to perform nitrogen substitution. Then, the mixture was reacted at 60°C for 5 hours to obtain a solution of an acryl-based base polymer having a weight average molecular weight (Mw) of 1.1 million. To this base polymer solution, 0.8 parts by weight of trimethylolpropane tolylene diisocyanate ("Coronate L" manufactured by Nippon Polyurethane Industry Co., Ltd.) as an isocyanate-based crosslinker and 0.1 parts by weight of a silane coupling agent ("KBM 403" manufactured by Shin-Etsu Chemical Co., Ltd.) were added, and then the resulting mixture was uniformly mixed to prepare a pressure sensitive adhesive composition solution.

[0117] The pressure sensitive adhesive composition was applied to a release film so that the pressure sensitive adhesive composition after being dried has a thickness of 20 μm , dried at 100°C for 3 minutes to remove the solvent, and then another release film was bonded to the surface. The resulting laminate was aged in an atmosphere at 50°C for 2 days to promote crosslinking, and thus, a pressure sensitive adhesive sheet A was obtained to which the release films are temporarily attached on both the surfaces.

[0118] [Evaluation of Pressure Sensitive Adhesive Sheets 1 to 14]

<Ultraviolet Transmittance>

One of the release films was released from the surface of the pressure sensitive adhesive sheet, the pressure sensitive adhesive sheet was bonded to an alkali-free glass plate, and then the other release film was released to prepare a measurement sample. The transmittance spectrum was measured with an ultraviolet-visible spectrophotometer, and the transmittance at a wavelength of 380 nm was read.

[0119] <Adhesion Reliability>

A polarizer made of a 25 μm -thick stretched polyvinyl alcohol film impregnated with iodine was bonded to an alkali-free glass plate via each of the pressure sensitive adhesive sheets 1 to 14. To the polarizer, an aluminum foil was bonded via the pressure sensitive adhesive sheet A, then the alkali-free glass plate-

side was irradiated with an ultraviolet ray in an integrated light amount of 3,000 mJ/cm² with a metal halide lamp (300 mW/cm²) to cure the pressure sensitive adhesive, and thus, a sample for evaluation was prepared.

[0120] The sample for evaluation was held in a thermo-hygrostat at a temperature of 85°C and a relative humidity of 85% for 100 hours to perform a moisture and heat resistance test. The range of 10 cm × 10 cm of the sample after the test was observed with a digital microscope at a magnification of 20 times, and the presence or absence of an air bubble was confirmed. A sample in which no air bubble having a diameter of 20 μm or more was confirmed was evaluated as OK, and a sample in which one or more air bubbles having a diameter of 20 μm or more were confirmed was evaluated as NG.

[0121] <Fading Property and Weather Resistance>

A polarizer including a 25 μm-thick stretched polyvinyl alcohol film impregnated with iodine was bonded to a first alkali-free glass plate via the pressure sensitive adhesive sheet A. To the polarizer, a second alkali-free glass plate was bonded via each of the pressure sensitive adhesive sheets 1 to 14, then the second alkali-free glass plate-side was irradiated with an ultraviolet ray in an integrated light amount of 3,000 mJ/cm² with a metal halide lamp (300 mW/cm²) to cure the pressure sensitive adhesive, and thus, a sample for evaluation was prepared.

[0122] (Moisture and Heat Resistance)

The sample for evaluation was held in a thermo-hygrostat at a temperature of 85°C and a relative humidity of 85% for 100 hours to perform a moisture and heat resistance test. The difference between the transmittance at a wavelength of 550 nm before the test (T_0) and the light transmittance at a wavelength of 550 nm after the test (T_1), $\Delta T = T_1 - T_0$ was determined.

[0123] (Weather Resistance)

The sample for evaluation was attached to a fixture so that no light was incident from the first alkali-free glass plate-side, and the second alkali-free glass plate-side was irradiated with carbon arc lamp light using an ultraviolet fade meter ("U48AU" manufactured by Suga Test Instruments Co., Ltd.) in an environment of a temperature of 40°C and a relative humidity of 20% under the condition of a radiation intensity (integrated illuminance at 300 to 700 nm) of 500 ± 50 W/m² for

100 hours to perform a weather resistance and fade test. The difference between b^*_0 of the transmitted light through the sample before the test and b^*_1 of the transmitted light through the sample after the test, $\Delta b^* = b^*_1 - b^*_0$ was determined. Note that b^* is the chromaticness index b^* of the CIE 1976 color space, and for measurement of b^* , the sample was placed on a backlight unit.

[0124] Table 1 shows the composition and the evaluation results of the pressure sensitive adhesive of each pressure sensitive adhesive sheet.

[0125] Table 1

Pressure sensitive Adhesive Composition		1	2	3	4	5	6	7	8	9	10	11	12	13	14
Base polymer	BA	80	65	65	65	65	60	57	57	57	65	65	40	45	25
	CHA	15	30	30	-	-	30	30	30	30	32	34	50	50	70
	IBXA	-	-	-	30	-	-	-	-	-	-	-	-	-	-
	DCPA	-	-	-	-	30	-	-	-	-	-	-	-	-	-
	4HBA	5	5	5	5	5	5	5	5	5	3	1	10	5	5
	NVP	-	-	-	-	-	5	8	-	-	-	-	-	-	-
	AM	-	-	-	-	-	-	-	8	-	-	-	-	-	-
	HEAA	-	-	-	-	-	-	-	-	8	-	-	-	-	-
Post-Addition Components	Isocyanate Crosslinker	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Polyfunctional Acrylate	3	3	3	3	3	3	3	3	3	3	3	3	3	3
	Silane Coupling Agent	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Antioxidant	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	Photopolymerization Initiator	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3	0.3
	UV Absorber	0.6	0.6	-	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6	0.6
Evaluation Results															
UV transmittance (%)		2.0	2.4	92.0	2.8	2.5	2.0	2.1	2.2	2.5	2.3	2.0	2.1	2.3	2.6
Adhesion Reliability		NG	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK	OK
ΔT (%)		+2.4	+3.1	+3.0	+3.1	+2.7	+4.8	+15	+11	+9.6	1.9	+1.6	+7.2	+2.1	+2.3
Δb^*		+2.1	+2.5	+5.3	+2.0	+3.2	+3.5	+3.8	+2.6	+3.0	+1.7	+1.6	+4.2	+2.7	+2.4

[0126] In the example in which a composition 3 containing no ultraviolet absorber was used, the increase in Δb^* in the sample after the weather resistance test was large, and the polarizer was yellowed. Comparison between a composition 2 and the composition 3 shows that the pressure sensitive adhesive sheet containing an ultraviolet absorber improves the weather resistance to suppress yellowing of the polarizer.

[0127] In the sample in which a composition 7 was used that contained 8 parts by weight of NVP based on 100 parts by weight of the monomer components of the base polymer, the change in the transmittance before and after the moisture and heat resistance test (ΔT) was large, and the moisture and heat resistance was insufficient. The same applies to a composition 8 containing 8 parts by weight of AM and a composition 9 containing 8 parts by weight of HEAA. Comparison of the compositions 2, 6, and 7 revealed that the smaller the amount of NVP was, the smaller ΔT tended to be. These results show that through reducing the amount of the nitrogen atom-containing monomer in the monomer components of the base polymer, the moisture and heat resistance is improved to suppress fading of the polarizer.

[0128] Comparison of the compositions 2, 10, 11, and 12 each having a different amount of 4HBA in the monomer components of the base polymer revealed that the smaller the amount of 4HBA was, the smaller ΔT tended to be. These results show that through reducing the amount of the hydroxy group-containing monomer in the monomer components of the base polymer, the moisture and heat resistance is improved to suppress fading of the polarizer.

[0129] The sample in which a composition 1 was used that had an amount of CHA of 15 parts by weight in the monomer components of the base polymer had insufficient adhesion reliability compared with the sample in which the composition 2 was used that had an amount of CHA of 30 parts by weight. The sample in which a composition 13 or 14 was used that had an increased proportion of CHA showed sufficient adhesion reliability. Furthermore, the samples in Example 4 in which IBXA was used and Example 5 in which DCPA was used instead of CHA also showed sufficient adhesion reliability. These results show that increase in the ratio of the high-Tg monomer in the constituent monomer of the base polymer allows the pressure sensitive adhesive sheet to exhibit excellent adhesion reliability even if the

ratio of the nitrogen atom-containing monomer or the hydroxy group-containing monomer is small.

DESCRIPTION OF REFERENCE CHARACTERS

5	[0130]	10 polarizing plate
		11 polarizer
		15 optical layer
		21, 22 pressure sensitive adhesive sheet
		81, 82 pressure sensitive adhesive-equipped polarizing plate
10		60 image display cell
		70 cover window
		100 image display device

CLAIMS

1. A pressure sensitive adhesive sheet used for bonding a polarizer composed of an iodine-containing polyvinyl alcohol-based film to a cover window of an image display device, and arranged in contact with the polarizer.

wherein the pressure sensitive adhesive sheet is composed of a pressure sensitive adhesive composition comprising: an acryl-based base polymer; and an ultraviolet absorber.

2. The pressure sensitive adhesive sheet according to claim 1, having wherein a light transmittance at a wavelength of 380 nm is 5% or less.

3. The pressure sensitive adhesive sheet according to claim 1 or 2, wherein a content of a nitrogen-containing monomer in the acryl-based base polymer is 5 parts by weight or less based on 100 parts by weight of the total of the monomer components.

4. The pressure sensitive adhesive sheet according to any one of claims 1 to 3, wherein the acryl-based base polymer contains 0.1 to 8 parts by weight of a hydroxy group-containing monomer based on 100 parts by weight of the total of the monomer components.

5. The pressure sensitive adhesive sheet according to any one of claims 1 to 4, wherein a content of a carboxy group-containing monomer in the acryl-based base polymer is 1 part by weight or less based on 100 parts by weight of the total of the monomer components.

6. The pressure sensitive adhesive sheet according to any one of claims 1 to 5, wherein the acryl-based base polymer contains 20 to 75 parts by weight of a high-Tg monomer based on 100 parts by weight of the total of the monomer components,

wherein the high-Tg monomer is free of hydroxy group, carboxy group and nitrogen atom, and has a homopolymer glass transition temperature of 10°C or more.

7. The pressure sensitive adhesive sheet according to claim 6, wherein the high-Tg monomer is a (meth)acrylic acid ester having an alicyclic structure.

8. The pressure sensitive adhesive sheet according to any one of claims 1 to 7, wherein the acryl-based base polymer contains 20 to 79 parts by weight of a (meth)acrylic acid ester having a homopolymer glass transition temperature of -40°C or less, based on 100 parts by weight of the total of the monomer components.

5

9. The pressure sensitive adhesive sheet according to any one of claims 1 to 8, wherein the acryl-based base polymer has a crosslinking structure introduced by a thermal crosslinker.

10 10. The pressure sensitive adhesive sheet according to any one of claims 1 to 9, wherein the pressure sensitive adhesive composition includes a photopolymerizable polyfunctional compound and a photopolymerization initiator,

wherein the photopolymerizable polyfunctional compound contains two or more photopolymerizable functional groups in one molecule.

15

11. A pressure sensitive adhesive-equipped polarizing plate comprising: a polarizer composed of an iodine-containing polyvinyl alcohol-based film having a first principal surface and a second principal surface; and a first pressure sensitive adhesive sheet arranged in contact with the first principal surface of the polarizer, wherein

20 the first pressure sensitive adhesive sheet is the pressure sensitive adhesive sheet set forth in any one of claims 1 to 10.

12. The pressure sensitive adhesive-equipped polarizing plate according to claim 11, further comprising a second pressure sensitive adhesive sheet arranged on a second
25 principal surface-side of the polarizer.

13. The pressure sensitive adhesive-equipped polarizing plate according to claim 12, wherein the second pressure sensitive adhesive sheet is arranged in contact with the second principal surface of the polarizer.

30

14. The pressure sensitive adhesive-equipped polarizing plate according to claim 12, wherein the second pressure sensitive adhesive sheet is arranged on the second principal surface of the polarizer with another layer interposed therebetween.

15. An image display device comprising: an image display cell; and a second pressure sensitive adhesive sheet, a polarizer composed of an iodine-containing polyvinyl alcohol-based film, a first pressure sensitive adhesive sheet and a cover window arranged in this order on a surface of the image display cell,

wherein

the first pressure sensitive adhesive sheet is the pressure sensitive adhesive sheet according to any one of claims 1 to 10, and is arranged in contact with the polarizer.

16. A method for manufacturing an image display device,

the image display device comprising: an image display cell; and a second pressure sensitive adhesive sheet, a polarizer composed of an iodine-containing polyvinyl alcohol-based film, a first pressure sensitive adhesive sheet and a cover window arranged in this order on a surface of the image display cell, and

the first pressure sensitive adhesive sheet being the pressure sensitive adhesive sheet set forth in claim 10,

wherein

the method comprising:

bonding the polarizer to the cover window via the first pressure sensitive adhesive sheet; and

after the bonding, irradiating the cover window with an active ray to photocure the pressure sensitive adhesive composition.