film, black or white printing is performed on a side surface on which an optical adhesive layer is formed. Since a printed portion requires concealability, a printing ink layer having a certain thickness or more is formed thereon. Upon multistage printing of the cover glass or the cover plastic film and the optical adhesive layer, it is necessary to attach the optical adhesive layer to a stepped portion of the printing ink layer without a gap therebetween. Accordingly, the optical adhesive layer is required to have step-filling properties by which the adhesive layer fills a gap due to the stepped portion of the printing ink layer.

Examples of an adhesive (or a bonding agent) for optical films, an adhesive layer for optical films and a stacked structure are disclosed in JP Patent Unexamined Publication No. 2017-125195, JP Patent Publication No. 2015-524011, and the like.

Summary

In an aspect, there is provided a photocurable adhesive composition for optical films, comprising: a main component and a chain transfer agent,

wherein the main component comprises (a): a (meth)acrylic acid ester copolymer comprising:

15 wt% to 55 wt% of a constituent unit derived from a component (a1): a (meth)acrylic acid ester monomer having a linear or branched C_1 to C_{14} alkyl group, selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, isopropyl (meth)acrylate, n-butyl (meth)acrylate, isobutyl (meth)acrylate, tert-butyl (meth)acrylate, n-pentyl (meth)acrylate, isopentyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, n-hexyl (meth)acrylate, n-heptyl (meth)acrylate, n-octyl (meth)acrylate, n-nonyl (meth)acrylate, n-decyl (meth)acrylate, and n-dodecyl (meth)acrylate (n-lauryl (meth)acrylate);

10 wt% to 55 wt% of a constituent unit derived from a component (a2): a (meth)acrylic acid ester monomer having a cyclic C_3 to C_{14} alkyl group selected from the group consisting of cyclopentyl (meth)acrylate, cyclohexyl (meth)acrylate, isobornyl (meth)acrylate, dicyclopentanyl (meth)acrylate and adamantyl (meth)acrylate;

5 wt% to 35 wt% of a constituent unit derived from a component (a3): a hydroxyl group-containing (meth)acrylic acid ester monomer selected from the group

consisting of 4-hydroxybutyl (meth)acrylate, 2-hydroxyethyl (meth)acrylate, hydroxymethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, and 1,4-cyclohexane dimethanol monoacrylate; and

5 wt% to 35 wt% of a constituent unit derived from a component (a4): an amide group-containing monomer selected from the group consisting of N-hydroxymethyl (meth)acryl amide, N-hydroxyethyl (meth)acryl amide, N-(meth)acryloylmorpholine, N,N-dimethyl (meth)acryl amide, N,N-diethyl (meth)acryl amide, (meth)acryl amide, N-isopropyl (meth)acryl amide, and N-t-butyl (meth)acryl amide,

(provided that the sum of the constituent units derived from the components (a1) to (a4) is 100 wt% and the constituent unit derived from the component (a1) is present in an amount of 20 wt% to 60 wt% based on the total amount of the constituent units derived from the components (a1) and (a2)), and

wherein the chain transfer agent is present in an amount of 0.01 parts by weight to 5 parts by weight, relative to 100 parts by weight of the main component.

In another aspect, there is provided a photocurable adhesive composition for optical films, comprising: a syrup obtained through partial polymerization of a (meth)acrylic acid ester monomer composition comprising a cyclic C_3 to C_{14} alkyl group-containing (meth)acrylic acid ester monomer or an aromatic hydrocarbon group-containing (meth)acrylic acid ester monomer; a UV absorbent; and a chain transfer agent, wherein the UV absorbent is present in an amount of 0.010 parts by weight to 5 parts by weight and the chain transfer agent is present in an amount of 0.010 parts by weight to 5 parts by weight, relative to 100 parts by weight of the syrup.

In another aspect, there is provided a photocurable adhesive layer for optical films formed of the photocurable adhesive composition for optical as defined above.

In another aspect, there is provided an optical member comprising a cured product of the photocurable adhesive layer for optical films as defined above and a first optical member disposed on one surface of the cured product of the adhesive layer.

In another aspect, there is provided a display apparatus comprising at least one optical member as defined above.

In another aspect, there is provided a method of forming a photocurable adhesive layer for optical films, comprising:

coating the photocurable adhesive composition for optical films as defined above onto a surface of a first release sheet subjected to release treatment to form a coating layer;

stacking a second release sheet on the coating layer such that a surface of the second release sheet subjected to release treatment adjoins a surface of the coating layer; and

irradiating the coating layer with actinic energy through at least one of the first release sheet and the second release sheet.

It is one example of the present disclosure to provide a photocurable adhesive composition for optical films, which can form an adhesive layer having good step-filling properties.

It is another example of the present disclosure to provide a photocurable adhesive composition that can form an adhesive layer having durability under harsh conditions (high temperature, high humidity, thermal shock), exhibiting good property in terms of haze after moist heat durability testing, good properties in terms of processability and adhesive strength, and allowing reduction in permittivity.

In accordance with one example of the present disclosure, a photocurable adhesive composition for optical films includes a main component and a chain transfer agent, wherein the main component includes (a) a (meth)acrylic acid ester copolymer, the (meth)acrylic acid ester copolymer including about 15 wt% to about 55 wt% of a constituent unit derived from a component (a1): a linear or branched C_1 to C_{14} alkyl group-containing (meth)acrylic acid ester monomer; about 10 wt% to about 55 wt% of a constituent unit derived from a component (a2): a cyclic C_3 to C_{14} alkyl group-containing (meth)acrylic acid ester monomer; about 5 wt% to about 35 wt% of a constituent unit derived from a component (a3): a hydroxyl group-containing (meth)acrylic acid ester monomer; and about 5 wt% to about 35 wt% of a constituent unit derived from a

WHAT IS CLAIMED IS:

1. A photocurable adhesive composition for optical films, comprising: a main component and a chain transfer agent,

wherein the main component comprises (a): a (meth)acrylic acid ester copolymer comprising:

15 wt% to 55 wt% of a constituent unit derived from a component (a1): a (meth)acrylic acid ester monomer having a linear or branched C_1 to C_{14} alkyl group, selected from the group consisting of methyl (meth)acrylate, ethyl (meth)acrylate, propyl (meth)acrylate, isopropyl (meth)acrylate, n-butyl (meth)acrylate, isobutyl (meth)acrylate, tert-butyl (meth)acrylate, n-pentyl (meth)acrylate, isopentyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, n-hexyl (meth)acrylate, n-heptyl (meth)acrylate, n-octyl (meth)acrylate, n-nonyl (meth)acrylate, n-decyl (meth)acrylate, and n-dodecyl (meth)acrylate (n-lauryl (meth)acrylate);

10 wt% to 55 wt% of a constituent unit derived from a component (a2): a (meth)acrylic acid ester monomer having a cyclic C_3 to C_{14} alkyl group selected from the group consisting of cyclopentyl (meth)acrylate, cyclohexyl (meth)acrylate, isobornyl (meth)acrylate, dicyclopentanyl (meth)acrylate and adamantyl (meth)acrylate;

5 wt% to 35 wt% of a constituent unit derived from a component (a3): a hydroxyl group-containing (meth)acrylic acid ester monomer selected from the group consisting of 4-hydroxybutyl (meth)acrylate, 2-hydroxyethyl (meth)acrylate, hydroxymethyl (meth)acrylate, 2-hydroxypropyl (meth)acrylate, and 1,4-cyclohexane dimethanol monoacrylate; and

5 wt% to 35 wt% of a constituent unit derived from a component (a4): an amide group-containing monomer selected from the group consisting of N-hydroxymethyl (meth)acryl amide, N-hydroxyethyl (meth)acryl amide, N-(meth)acryloylmorpholine, N,N-dimethyl (meth)acryl amide, N,N-diethyl (meth)acryl amide, (meth)acryl amide, N-isopropyl (meth)acryl amide, and N-t-butyl (meth)acryl amide,

provided that the sum of the constituent units derived from the components (a1) to (a4) is 100 wt% and the constituent unit derived from the component (a1) is present in an

amount of 20 wt% to 60 wt% based on the total amount of the constituent units derived from the components (a1) and (a2), and

wherein the chain transfer agent is present in an amount of 0.01 parts by weight to 5 parts by weight, relative to 100 parts by weight of the main component.

2. A photocurable adhesive composition for optical films, comprising: a syrup obtained through partial polymerization of a (meth)acrylic acid ester monomer composition comprising a cyclic C_3 to C_{14} alkyl group-containing (meth)acrylic acid ester monomer or an aromatic hydrocarbon group-containing (meth)acrylic acid ester monomer; a UV absorbent; and a chain transfer agent, wherein the UV absorbent is present in an amount of 0.010 parts by weight to 5 parts by weight and the chain transfer agent is present in an amount of 0.010 parts by weight to 5 parts by weight, relative to 100 parts by weight of the syrup.

3. The photocurable adhesive composition for optical films according to claim 1, further comprising: a constituent unit derived from a component (a5): one radical polymerizable functional group-containing (meth)acrylic acid ester monomer other than the components (a1), (a2), (a3), and (a4).

4. The photocurable adhesive composition for optical films according to claim 3, wherein the component (a5) comprises an aromatic hydrocarbon group-containing (meth)acrylic acid ester monomer.

5. The photocurable adhesive composition for optical films according to claim 3, wherein the component (a5) comprises a branched C_{18} to C_{36} alkyl group-containing (meth)acrylic acid ester monomer.

6. The photocurable adhesive composition for optical films according to claim 3, wherein the constituent unit derived from the component (a5) is present in an amount of 8 parts by weight to 45 parts by weight, relative to 100 parts by weight of the total of the

constituent units derived from the components (a1) to (a4).

7. The photocurable adhesive composition for optical films according to claim 1, wherein the component (a2) comprises at least one of isobornyl (meth)acrylate and cyclohexyl (meth)acrylate.

8. The photocurable adhesive composition for optical films according to claim 1, wherein the (meth)acrylic acid ester copolymer (a) has a glass transition temperature of -40°C to less than 20°C.

9. The photocurable adhesive composition for optical films according to claim 1, further comprising: a crosslinking agent.

10. The photocurable adhesive composition for optical films according to claim 9, wherein the crosslinking agent is present in an amount of 0.01 parts by weight to 5 parts by weight, relative to 100 parts by weight of the main component.

11. The photocurable adhesive composition for optical films according to claim 9, wherein the crosslinking agent comprises at least one of an isocyanate compound, a carbodiimide compound, an oxazoline compound, an epoxy compound, a multifunctional (meth)acrylic acid ester monomer, a multifunctional allyl monomer, and a peroxide.

12. The photocurable adhesive composition for optical films according to claim 1, further comprising:

0.001 parts by weight to 5 parts by weight of a silane coupling agent, relative to 100 parts by weight of the main component.

13. The photocurable adhesive composition for optical films according to claim 1, further comprising: a high softening point resin.

14. The photocurable adhesive composition for optical films according to claim 13, wherein the high softening point resin is a rosin ester based resin.

15. The photocurable adhesive composition for optical films according to claim 2, wherein a partial polymer contained in the syrup has a glass transition temperature of about -60°C to less than about 20°C.

16. A photocurable adhesive layer for optical films formed of the photocurable adhesive composition for optical films according to any one of claims 1 to 15, wherein the adhesive layer has a weight average molecular weight of 50,000 to 1,000,000.

17. The photocurable adhesive layer for optical films according to claim 16, wherein the adhesive layer has a thickness of 20 μm to 1 mm.

18. An optical member comprising a cured product of the photocurable adhesive layer for optical films according to claim 16 and a first optical member disposed on one surface of the cured product of the adhesive layer.

19. The optical member according to claim 18, further comprising:

glass, a poly(methyl methacrylate) plate, a polycarbonate plate, or a second optical film on a surface of the cured product of the adhesive layer opposite to the surface thereof on which the first optical member is disposed.

20. The optical member according to claim 18, further comprising:

at least one bonding facilitation layer between the first optical film and the cured product of the photocurable adhesive layer for optical films.

21. The optical member according to claim 18, wherein the bonding facilitation layer comprises a first bonding facilitation layer and a second bonding facilitation layer, and the optical member has a structure comprising the first optical film, the first bonding

facilitation layer, the second bonding facilitation layer and the cured product of the photocurable adhesive layer sequentially stacked in this sequence.

22. A display apparatus comprising at least one optical member according to claim 18.

23. A method of forming a photocurable adhesive layer for optical films, comprising:

coating the photocurable adhesive composition for optical films according to any one of claims 1 to 15 onto a surface of a first release sheet subjected to release treatment to form a coating layer;

stacking a second release sheet on the coating layer such that a surface of the second release sheet subjected to release treatment adjoins a surface of the coating layer; and

irradiating the coating layer with actinic energy through at least one of the first release sheet and the second release sheet.

24. The method according to claim 23, wherein a cumulative quantity of the actinic energy is in the range of 300 mJ/cm^2 to 2,000 mJ/cm^2.