strength of 1 MPa to 50 MPa at 200% elongation at 170°C, and the release film has a xylene gas permeability of 5×10^{-15} (kmol·m/(s·m^2·kPa)) at 170°C.

Citation List

Patent Documents

[0004]

Patent Document 1: JP-A No. 2015-74201

Patent Document 2: WO2008/020543

Summary

Technical Problem

[0005]

The release film is used to facilitate the release of a molded article from a mold, as described above. It is desirable that the release film be easily released from a molded article after resin curing.

[0006]

When a release film is subjected to a high temperature in a mold, a component contained in the release film may move to the surface of the release film, and the component that moves to the surface may contaminate the mold or a molded article. When such contamination occurs, the component is required to be removed from a mold or a molded article. In addition, the component is often difficult to remove. Hence, it is desirable that no contamination of a mold or a molded article with the component occur.

[0007]

A release film not only usable in molding once but also repeatedly usable in molding multiple times can reduce molding costs. In order to repeatedly use a release film in molding multiple times, the release film is required to maintain its properties through multiple molding operations.

[0008]

In view of the above circumstances, the present disclosure is intended to provide a release film that does not contaminate a mold or a molded article. The present disclosure is also intended to provide a release film that does not contaminate a mold or a molded article and can be repeatedly used in multiple molding processes.

Solution to Problem

[0009]

The inventors of the present disclosure have found that a release film having a specific configuration has excellent mold release properties and low contamination properties and also can be used in molding multiple times.

[0009a]

In an aspect, there is provided a release film comprising:

an oligomer bleeding prevention layer formed of an acrylic resin or a siloxane resin and laminated on a first face of a base layer that is formed of a polyethylene terephthalate resin;

a surface layer formed of a fluororesin and laminated on the oligomer bleeding prevention layer; and

a surface layer formed of a fluororesin and laminated on a second face of the base layer, or

an oligomer bleeding prevention layer formed of an acrylic resin or a siloxane resin and laminated on a second face of the base layer, and a surface layer formed of a fluororesin and laminated on the oligomer bleeding prevention layer that is laminated on the second face;

wherein the fluororesin that forms the surface layer is a cured product of a fluororesin composition containing a reactive functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.

[0009b]

In another aspect, there is provided a method of manufacturing a release film, the method comprising:

a first applying step of applying an acrylic resin composition or a siloxane resin composition onto one face of a base layer formed of a polyethylene terephthalate resin;

a first curing step of curing the resin composition applied in the first applying step to give an oligomer bleeding prevention layer;

after the first curing step, a second applying step of applying a fluororesin composition onto the oligomer bleeding prevention layer and an other face of the base layer; and

after the second applying step, a second curing step of curing the fluororesin composition to give surface layers;

wherein the fluororesin that forms the surface layer formed in the second curing step is a cured product of a fluororesin composition containing a reactive

functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.

[0009c]

In another aspect, there is provided a method of manufacturing a release film, the method comprising:

a first applying step of applying an acrylic resin composition or a siloxane resin composition onto both faces of a base layer formed of a polyethylene terephthalate resin;

a first curing step of curing the resin composition applied in the first applying step to give two oligomer bleeding prevention layers;

after the first curing step, a second applying step of applying a fluororesin composition onto the two oligomer bleeding prevention layers; and

after the second applying step, a second curing step of curing the fluororesin composition to give surface layers;

wherein the fluororesin that forms the surface layer formed in the second curing step is a cured product of a fluororesin composition containing a reactive functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.

[0010]

The present disclosure provides a release film comprising,

an oligomer bleeding prevention layer formed of an acrylic resin or a siloxane resin and laminated on a first face of a base layer that is formed of a polyethylene terephthalate resin;

a surface layer formed of a fluororesin and laminated on the oligomer bleeding prevention layer; and

a surface layer formed of a fluororesin and laminated on a second face of the base layer, or

molding.

The release film may be used for molding two or more times.

[0011]

The present technique also provides a method of manufacturing a release film. The method comprises a first applying step of applying an acrylic resin composition or a siloxane resin composition onto one face of a base layer formed of a polyethylene terephthalate resin, a first curing step of curing the resin composition applied in the first applying step to give an oligomer bleeding prevention layer, after the first curing step, a second applying step of applying a fluororesin composition onto the oligomer bleeding prevention layer and an other face of the base layer, and after the second applying step, a second curing step of curing the fluororesin composition to give surface layers.

The present technique also provides a method of manufacturing a release film. The method comprises a first applying step of applying an acrylic resin composition or a siloxane resin composition onto both faces of a base layer formed of a polyethylene terephthalate resin, a first curing step of curing the resin composition applied in the first applying step to give two oligomer bleeding prevention layers, after the first curing step, a second applying step of applying a fluororesin composition onto the two oligomer bleeding prevention layers, and after the second applying step, a second curing step of curing the fluororesin composition to give surface layers.

Advantageous Effects

[0012]

According to the present disclosure, a release film having excellent mold release properties and low contamination properties and repeatedly usable for molding multiple times is provided.

The effect of the disclosure is not necessarily limited to that described in this paragraph and may be any of the effect described in the present description.

Brief Description of Drawings

[0013]

Fig. 1A is a view showing an example structure of a release film of the present invention.

Fig. 1B is a view showing an example structure of a release film of the present invention.

Figs. 2 are views showing an example usage of a release film of the present invention in transfer molding.

Figs. 3 are views showing an example usage of a release film of the present invention in compression molding.

Fig. 4 is a view showing an FT-IR spectrum.

Figs. 5 are each an electron micrograph of a mold-side surface of a release film after molding.

Fig. 6 is an electron micrograph of a mold-side surface of a release film after molding.

Figs. 7 are each a micrograph of a surface of a release film after heating.

Figs. 8 are each a micrograph of a surface of a release film after

CLAIMS:

1. A release film comprising:

an oligomer bleeding prevention layer formed of an acrylic resin or a siloxane resin and laminated on a first face of a base layer that is formed of a polyethylene terephthalate resin;

a surface layer formed of a fluororesin and laminated on the oligomer bleeding prevention layer; and

a surface layer formed of a fluororesin and laminated on a second face of the base layer, or

an oligomer bleeding prevention layer formed of an acrylic resin or a siloxane resin and laminated on a second face of the base layer, and a surface layer formed of a fluororesin and laminated on the oligomer bleeding prevention layer that is laminated on the second face;

wherein the fluororesin that forms the surface layer is a cured product of a fluororesin composition containing a reactive functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.

2. The release film according to claim 1, wherein the oligomer bleeding prevention layer on the first face is formed of an acrylic resin.

3. The release film according to claim 1 or 2, wherein

the release film has a tensile breaking strength of 40 MPa to 200 MPa as determined at 175°C in accordance with JIS K7127, and

the release film has a tensile elongation at break of 200% to 500% as determined at 175°C in accordance with JIS K7127.

4. The release film according to any one of claims 1 to 3, wherein the release film has an oxygen gas permeability of 5,000 to 50,000 cc/m^2·24 hr·atm as determined at 175°C in accordance with JIS K7126-1.

5. The release film according to any one of claims 1 to 4, wherein the base layer has a tensile breaking strength of 40 MPa to 200 MPa as determined at 175°C in accordance with JIS K7127.

6. The release film according to any one of claims 1 to 5, wherein the base layer has a tensile elongation at break of 200% to 500% as determined at 175°C in accordance with JIS K7127.

7. The release film according to any one of claims 1 to 6, wherein the fluororesin that forms the surface layer on at least one face of the base layer comprises particles having an average particle size of 1 μm to 10 μm determined by laser diffraction particle size analysis.

8. The release film according to any one of claims 1 to 7, used for transfer molding or compression molding.

9. The release film according to any one of claims 1 to 8, used for molding two or more times.

10. A method of manufacturing a release film, the method comprising:

a first applying step of applying an acrylic resin composition or a siloxane resin composition onto one face of a base layer formed of a polyethylene terephthalate resin;

a first curing step of curing the resin composition applied in the first applying step to give an oligomer bleeding prevention layer;

after the first curing step, a second applying step of applying a fluororesin composition onto the oligomer bleeding prevention layer and an other face of the base layer; and

after the second applying step, a second curing step of curing the fluororesin composition to give surface layers;

wherein the fluororesin that forms the surface layer formed in the second curing step is a cured product of a fluororesin composition containing a reactive functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.

11. A method of manufacturing a release film, the method

comprising:

a first applying step of applying an acrylic resin composition or a siloxane resin composition onto both faces of a base layer formed of a polyethylene terephthalate resin;

a first curing step of curing the resin composition applied in the first applying step to give two oligomer bleeding prevention layers;

after the first curing step, a second applying step of applying a fluororesin composition onto the two oligomer bleeding prevention layers; and

after the second applying step, a second curing step of curing the fluororesin composition to give surface layers;

wherein the fluororesin that forms the surface layer formed in the second curing step is a cured product of a fluororesin composition containing a reactive functional group-containing fluoropolymer and a curing agent, the reactive functional group-containing fluoropolymer is a hydroxy group-containing tetrafluoroethylene polymer, the curing agent is an isocyanate curing agent, and the isocyanate curing agent is a combination of an isocyanurate-type polyisocyanate and an adduct-type polyisocyanate.