

SPECIFICATION

TITLE OF INVENTION: ADHESIVE FILM, METHOD FOR PRODUCING ADHESIVE
FILM, AND METHOD FOR PRODUCING ELECTRONIC DEVICE

5

TECHNICAL FIELD

[0001]

The present invention relates to an adhesive film, a method
for producing an adhesive film, and a method for producing an
10 electronic device.

BACKGROUND ART

[0002]

As a technology capable of reducing the size and weight of
15 an electronic device (for example, a semiconductor device), a
fan-out type wafer level package (WLP) has been developed.

In embedded wafer level ball grid array (eWLB), which is
one of manufacturing methods of the fan-out type WLP, a
plurality of electronic components such as a semiconductor chip
20 are temporarily fixed on the adhesive film attached to the
support substrate in a spaced state, and the plurality of
electronic components are collectively sealed with a sealing
material. Here, the adhesive film needs to be fixed to the
electronic component and the support substrate in the sealing
25 process or the like and needs to be removed from the sealed
electronic component and the support substrate after the
sealing.

[0003]

Examples of a technique related to such a fan-out type WLP manufacturing method include the technique described in Patent Document 1.

5 [0004]

Patent Document 1 describes a heat-resistant adhesive sheet for use in manufacturing a semiconductor device, which is attached and used when a substrateless semiconductor chip is resin-sealed in a manufacturing method of a substrateless semiconductor package in which an adhesive sheet is used as a temporary fixing support, with a problem of occurrence of a shift of a chip position and breakage of a package, wherein the heat-resistant adhesive sheet has a base material layer and an adhesive layer, and the adhesive layer is a layer that is cured by being subjected to a stimulus until a completion point of a resin sealing step and has an adhesive force to SUS304 after bonding of 0.5 N/20 mm or more and a peel force with respect to a package of 2.0 N/20 mm or less.

20 RELATED DOCUMENT

PATENT DOCUMENT

[0005]

Patent Document 1: Japanese Unexamined Patent Publication No. 2011-134811

25

SUMMARY OF THE INVENTION

TECHNICAL PROBLEM

[0006]

The present invention provides an adhesive film capable of suppressing a residue of an adhesive on an electronic component.

SOLUTION TO PROBLEM

5 [0007]

The present inventors conducted a thorough investigation in order to achieve the above-described object. As a result, the present inventors have found that the residue of the adhesive on the electronic component can be suppressed by including the
10 electronic conjugated polymer layer, and have completed the present invention.

[0008]

According to the present invention, there is provided an adhesive film, a method for producing the adhesive film, and a
15 method for producing an electronic device described below.

[0009]

[1]

An adhesive film including
a base material layer (A),
20 an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface side of the base material layer (A),
an adhesive resin layer (C) on a second surface side of the base material layer (A), and
25 an electronic conjugated polymer layer between the base material layer (A) and the adhesive resin layer (B).

[2]

The adhesive film according to [1], in which an electronic conjugated polymer included in the electronic conjugated polymer layer includes one or two or more selected from the group consisting of polyacetylene, polyacene, poly(p-phenylene),
5 poly(p-phenylene vinylene), polypyrrole, polyaniline, polythiophene, and derivatives thereof.

[3]

The adhesive film according to [1] or [2], in which an electronic conjugated polymer included in the electronic
10 conjugated polymer layer includes one or two or more selected from the group consisting of polypyrrole, polythiophene, and derivatives thereof.

[4]

The adhesive film according to any one of [1] to [3], in
15 which a thickness of the electronic conjugated polymer layer is 0.01 μm or more and 10 μm or less.

[5]

The adhesive film according to any one of [1] to [4], in which a content of an electronic conjugated polymer in the
20 electronic conjugated polymer layer is 95% by mass or more in a case where the entire electronic conjugated polymer layer is set to 100% by mass.

[6]

The adhesive film according to any one of [1] to [5], in
25 which a content of a binder resin in the electronic conjugated polymer layer is 1.0% by mass or less in a case where the entire electronic conjugated polymer layer is set to 100% by mass.

[7]

The adhesive film according to any one of [1] to [6],
further including the electronic conjugated polymer layer
between the base material layer (A) and the adhesive resin layer
5 (C).

[8]

The adhesive film according to any one of [1] to [7], in
which the adhesive resin layer (B) includes one or two or more
selected from the group consisting of a (meth)acrylic adhesive
10 resin, a silicone adhesive resin, a urethane adhesive resin, an
olefin adhesive resin, and a styrene adhesive resin.

[9]

The adhesive film according to any one of [1] to [8], in
which the adhesive resin layer (C) is a layer in which an
15 adhesive force is reduced by an external stimulus.

[10]

The adhesive film according to any one of [1] to [9], in
which the adhesive resin layer (C) includes one or two or more
selected from the group consisting of a (meth)acrylic adhesive
20 resin, a silicone adhesive resin, a urethane adhesive resin, an
olefin adhesive resin, and a styrene adhesive resin.

[11]

The adhesive film according to any one of [1] to [10], in
which the base material layer (A) includes one or two or more
25 selected from the group consisting of polypropylene,
polyethylene terephthalate, polyethylene naphthalate, polyamide,
and polyimide.

[12]

The adhesive film according to any one of [1] to [11],
which can be used for temporarily fixing the electronic
component in a case of sealing the electronic component with a
5 sealing material.

[13]

A method for producing the adhesive film according to any
one of [1] to [12], the method including

a step of forming the electronic conjugated polymer layer
10 on a surface of the base material layer (A) by polymerizing a
monomer that can form the electronic conjugated polymer layer
while immersing the base material layer (A) in a treatment
liquid containing the monomer.

[14]

15 A method for producing an electronic device, the method
including

a step of preparing a structure including the adhesive film
according to any one of [1] to [12], the electronic component
attached to the adhesive resin layer (B) of the adhesive film,
20 and a support substrate attached to the adhesive resin layer (C)
of the adhesive film, and

a step of sealing the electronic component with a sealing
material.

[15]

25 The method for producing an electronic device according to
[14], further including a step of peeling the support substrate
from the structure by reducing an adhesive force of the adhesive

resin layer (C) by applying an external stimulus.

[16]

The method for producing an electronic device according to [14] or [15], further including a step of peeling the adhesive
5 film from the electronic component.

[17]

The method for producing an electronic device according to any one of [14] to [16], in which the sealing material includes an epoxy resin-based sealing material.

10 [18]

The method for producing an electronic device according to any one of [14] to [17], in which the electronic device includes a fan-out type package.

15 ADVANTAGEOUS EFFECTS OF INVENTION

[0010]

According to the present invention, an adhesive film capable of suppressing a residue of an adhesive on an electronic component can be provided.

20

BRIEF DESCRIPTION OF THE DRAWINGS

[0011]

[FIG. 1] A cross-sectional view schematically showing an example of a structure of an adhesive film of the present
25 embodiment.

[FIG. 2] A cross-sectional view schematically showing an example of the structure of the adhesive film of the present

embodiment.

[FIG. 3] A cross-sectional view schematically showing an example of the structure of the adhesive film of the present embodiment.

5 [FIG. 4] A cross-sectional view schematically showing an example of a method for producing an electronic device of the present embodiment.

DESCRIPTION OF EMBODIMENTS

10 [0012]

Hereinafter, an embodiment of the present invention will be described with reference to the drawings.

In all drawings, the same constituents are marked with the same reference signs and may not be repeatedly described as
15 appropriate. In addition, the drawings are schematic and do not necessarily correspond to actual dimensional ratios.

In the present specification, unless otherwise specified, an upper limit value and a lower limit value related to a numerical range can be optionally combined with each other.

20 In the specification, "(meth)acrylic" means acrylic, methacrylic, or both acrylic and methacrylic.

[0013]

<Adhesive Film>

The adhesive film 100 according to the present embodiment
25 will be described.

FIG. 1 is a cross-sectional view schematically showing an example of a structure of an adhesive film 100 according to the

present embodiment.

[0014]

An adhesive film 100 according to the present embodiment includes a base material layer (A), an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface A1 side of the base material layer (A), an adhesive resin layer (C) on a second surface A2 side of the base material layer (A), and an electronic conjugated polymer layer 1 between the base material layer (A) and the adhesive resin layer (B).

10 [0015]

In the method for producing the electronic device, the electronic component is disposed on the adhesive film attached to the support substrate in a spaced state, and is collectively sealed with a sealing material. Thereafter, the adhesive film needs to be peeled off from the sealed electronic component.

According to the studies of the present inventors, it has been clarified that, in a case of peeling the adhesive film from the sealed electronic component, the adhesive force between the adhesive resin layer on the electronic component side and the sealing material is higher than the adhesive force between the base material layer in the adhesive film and the adhesive resin layer on the electronic component side at an interface between the adhesive resin layer on the electronic component side and the sealing material, and the adhesive resin layer may be peeled off from the adhesive film and may be attached to the electronic component (hereinafter, also referred to as a residue of an adhesive).

As a result of intensive studies, the present inventors have found that the residue of the adhesive on the electronic component can be suppressed by including the electronic conjugated polymer layer between the base material layer (A) and the adhesive resin layer (B), and have completed the present invention.

[0016]

From the viewpoint of suppressing the residue of the adhesive on the electronic component, the adhesive film 100 according to the present embodiment can be suitably used for temporarily fixing the electronic component in a case of sealing the electronic component with the sealing material.

[0017]

In the adhesive film 100 according to the present embodiment, the electronic conjugated polymer layer 1 includes a polymer (electronic conjugated polymer) having a conjugated double bond. From the viewpoint of further suppressing the residue of the adhesive on the electronic component, the electronic conjugated polymer according to the present embodiment preferably includes one or two or more selected from the group consisting of polyacetylene, polyacene, poly(p-phenylene), poly(p-phenylene vinylene), polypyrrole, polyaniline, polythiophene, and derivatives thereof, more preferably includes one or two or more selected from the group consisting of polypyrrole, polythiophene, and derivatives thereof, still more preferably includes one or two or more selected from the group consisting of polypyrrole and

derivatives thereof, and even more preferably includes polypyrrole.

[0018]

In the adhesive film 100 according to the present
5 embodiment, from the viewpoint of further suppressing the
residue of the adhesive on the electronic component, a content
of the electronic conjugated polymer in the electronic
conjugated polymer layer 1 is preferably 95% by mass or more,
more preferably 96% by mass or more, still more preferably 97%
10 by mass or more, even more preferably 98% by mass or more, and
even still more preferably 99% by mass or more in a case where
the entire electronic conjugated polymer layer 1 is set to 100%
by mass.

In addition, an upper limit value of the content of the
15 electronic conjugated polymer in the electronic conjugated
polymer layer 1 is not particularly limited, but is, for
example, 100% by mass or less.

In addition, in the adhesive film 100 according to the
present embodiment, from the viewpoint of further suppressing
20 the residue of the adhesive on the electronic component, a
content of the electronic conjugated polymer in the electronic
conjugated polymer layer 1 is preferably 95% by mass or more and
100% by mass or less, more preferably 96% by mass or more and
100% by mass or less, still more preferably 97% by mass or more
25 and 100% by mass or less, even more preferably 98% by mass or
more and 100% by mass or less, and even still more preferably
99% by mass or more and 100% by mass or less in a case where the

entire electronic conjugated polymer layer 1 is set to 100% by mass.

[0019]

In the adhesive film 100 according to the present
5 embodiment, from the viewpoint of further suppressing the
residue of the adhesive on the electronic component, a content
of the binder resin in the electronic conjugated polymer layer 1
is preferably 1.0% by mass or less, more preferably 0.8% by mass
or less, still more preferably 0.6% by mass or less, even more
10 preferably 0.4% by mass or less, even still more preferably 0.2%
by mass or less, and even still more preferably 0.1% by mass or
less in a case where the entire electronic conjugated polymer
layer 1 is set to 100% by mass.

In addition, a lower limit value of the content of the
15 binder resin is not particularly limited, but is, for example,
0% by mass or more.

In addition, in the adhesive film 100 according to the
present embodiment, from the viewpoint of further suppressing
the residue of the adhesive on the electronic component, a
20 content of the binder resin in the electronic conjugated polymer
layer 1 is preferably 0% by mass or more and 1.0% by mass or
less, more preferably 0% by mass or more and 0.8% by mass or
less, still more preferably 0% by mass or more and 0.6% by mass
or less, even more preferably 0% by mass or more and 0.4% by
25 mass or less, even still more preferably 0% by mass or more and
0.2% by mass or less, and even still more preferably 0% by mass
or more and 0.1% by mass or less in a case where the entire

electronic conjugated polymer layer 1 is set to 100% by mass.

[0020]

The binder resin refers to a resin that disperses the electronic conjugated polymer and functions as a form agent, an adhesive, and a fixing agent of the electronic conjugated polymer layer 1.

Examples of the binder resin include a thermoplastic resin and a thermosetting resin. Examples of the thermoplastic resin include a polyolefin-based resin, a polystyrene-based resin, a (meth)acrylic resin, a silicone-based resin, a polyester-based resin, a polyamide-based resin, and a fluorine-based resin. Examples of the thermosetting resin include an epoxy resin, a phenol resin, a melamine resin, a urea resin, a urethane-based resin, a maleimide resin, and a cyanate resin.

[0021]

From the viewpoint of further suppressing the residue of the adhesive on the electronic component, a thickness of the electronic conjugated polymer layer 1 according to the present embodiment is preferably 0.01 μm or more, more preferably 0.03 μm or more, and still more preferably 0.05 μm or more, and is preferably 10 μm or less, more preferably 8 μm or less, still more preferably 5 μm or less, even more preferably 3 μm or less, even still more preferably 1 μm or less, even still more preferably 0.5 μm or less, even still more preferably 0.3 μm or less, and even still more preferably 0.1 μm or less.

In addition, from the viewpoint of further suppressing the residue of the adhesive on the electronic component, a thickness

of the electronic conjugated polymer layer 1 according to the present embodiment is preferably 0.01 μm or more and 10 μm or less, more preferably 0.01 μm or more and 8 μm or less, still more preferably 0.01 μm or more and 5 μm or less, even more
5 preferably 0.01 μm or more and 3 μm or less, even still more preferably 0.01 μm or more and 1 μm or less, even still more preferably 0.01 μm or more and 0.5 μm or less, even still more preferably 0.03 μm or more and 0.3 μm or less, and even still more preferably 0.05 μm or more and 0.1 μm or less.

10 [0022]

As shown in FIG. 2, from the viewpoint of further suppressing the residue of the adhesive on the electronic component, the adhesive film 100 according to the present embodiment preferably further includes the electronic conjugated
15 polymer layer 1 between the base material layer (A) and the adhesive resin layer (C).

[0023]

From the viewpoint of further improving the performance balance between the mechanical characteristics and the
20 handleability, a thickness of the entire adhesive film 100 according to the present embodiment is preferably 25 μm or more, more preferably 30 μm or more, and still more preferably 50 μm or more, and is preferably 800 μm or less, more preferably 500 μm or less, still more preferably 300 μm or less, even more
25 preferably 200 μm or less, and even still more preferably 150 μm or less.

In addition, from the viewpoint of further improving the

performance balance between the mechanical characteristics and the handleability, a thickness of the entire adhesive film 100 according to the present embodiment is preferably 25 μm or more and 800 μm or less, more preferably 25 μm or more and 500 μm or less, still more preferably 25 μm or more and 300 μm or less, even more preferably 30 μm or more and 200 μm or less, and even still more preferably 50 μm or more and 150 μm or less.

[0024]

Hereinafter, each layer of the adhesive film 100 will be described.

[0025]

[Base Material Layer (A)]

The base material layer (A) is a layer provided for the purpose of further improving the handleability, the mechanical characteristics, the heat resistance, and the like of the adhesive film 100.

The base material layer (A) is not particularly limited, but examples thereof include a resin film.

Examples of the resin constituting the resin film include thermoplastic resins, and examples thereof include one or two or more selected from polyolefin such as polyethylene, polypropylene, poly(4-methyl-1-pentene), and poly(1-butene); polyester such as polyethylene terephthalate, polybutylene terephthalate, and polyethylene naphthalate; polyamide such as nylon-6, nylon-66, and poly-metaxylene adipamide; polyacrylate; polymethacrylate; polyvinyl chloride; polyvinylidene chloride; polyimide; polyetherimide; ethylene-vinyl acetate copolymer;

polyacrylonitrile; polycarbonate; polystyrene; ionomer;
polysulfone; polyethersulfone; and polyphenylene ether.

Among these, from the viewpoint of excellent balance of
transparency, mechanical strength, price, and the like, the
5 resin constituting the resin film preferably includes one or two
or more selected from the group consisting of polypropylene,
polyethylene terephthalate, polyethylene naphthalate, polyamide,
and polyimide, more preferably includes one or two or more
selected from the group consisting of polyethylene terephthalate
10 and polyethylene naphthalate, and still more preferably includes
polyethylene terephthalate.

[0026]

The base material layer (A) may be a single layer or two or
more layers.

15 In addition, the resin film for forming the base material
layer (A) may be a stretched film or a film stretched in the
uniaxial or biaxial direction; however, from the viewpoint of
improving the mechanical strength of the base material layer
(A), a film stretched in the uniaxial or biaxial direction is
20 preferable.

[0027]

From the viewpoint of obtaining more favorable film
characteristics, a thickness of the base material layer (A) is
preferably 1 μm or more, more preferably 5 μm or more, still
25 more preferably 10 μm or more, and even more preferably 20 μm or
more, and is preferably 500 μm or less, more preferably 300 μm
or less, still more preferably 250 μm or less, even more

preferably 150 μm or less, and even still more preferably 100 μm or less.

In addition, from the viewpoint of obtaining more favorable film characteristics, a thickness of the base material layer (A) is preferably 1 μm or more and 500 μm or less, more preferably 1 μm or more and 300 μm or less, still more preferably 5 μm or more and 250 μm or less, even more preferably 10 μm or more and 150 μm or less, and even still more preferably 20 μm or more and 100 μm or less.

The base material layer (A) may be subjected to a surface treatment in order to further improve the adhesive force to other layers. Specifically, the base material layer (A) may be subjected to a corona treatment, a plasma treatment, an undercoat treatment, a primer coating treatment, or the like, but from the viewpoint of further improving the adhesive force to other layers, a corona treatment is preferable.

[0028]

[Adhesive Resin Layer (B)]

The adhesive resin layer (B) is a layer on the first surface A1 side of the base material layer (A). The adhesive resin layer (B) is a layer for contacting the surface of the electronic component to temporarily fix the electronic component when the electronic component is sealed with a sealing material in the electronic device manufacturing process.

[0029]

The adhesive resin constituting the adhesive resin layer (B) preferably includes one or two or more selected from the

group consisting of a (meth)acrylic adhesive resin, a silicone adhesive resin, a urethane adhesive resin, an olefin adhesive resin, and a styrene adhesive resin, and from the viewpoint of easily adjusting the adhesive force and the like, more

5 preferably includes a (meth)acrylic adhesive resin.

[0030]

As the adhesive resin layer (B), a radiation crosslinking type adhesive resin layer that can reduce the adhesive force by radiation can be used. Since the radiation crosslinking type
10 adhesive resin layer (B) is crosslinked by irradiation with radiation and the adhesive force is significantly reduced, the electronic component is easily picked up from the adhesive resin layer (B) in a pickup step of the electronic component. Examples of the radiation include ultraviolet rays, electron
15 beams, infrared rays, and the like.

As the radiation crosslinking type adhesive resin layer, an ultraviolet crosslinking type adhesive resin layer is preferable.

[0031]

20 Examples of the (meth)acrylic adhesive resin include a copolymer including a (meth)acrylic acid alkyl ester monomer unit (b1) and a monomer unit (b2) having a functional group that can react with a crosslinking agent.

In the present embodiment, the (meth)acrylic acid alkyl
25 ester means an acrylic acid alkyl ester, a methacrylic acid alkyl ester, or a mixture thereof.

[0032]

The (meth)acrylic adhesive resin according to the present embodiment can be obtained, for example, by copolymerizing a monomer mixture including a monomer forming a (meth)acrylic acid alkyl ester monomer unit (b1) and a monomer forming a monomer unit (b2) having a functional group that can react with a crosslinking agent.

[0033]

The monomer forming the (meth)acrylic acid alkyl ester monomer unit (b1) is preferably a (meth)acrylic acid alkyl ester having an alkyl group having 1 to 12 carbon atoms, and more preferably a (meth)acrylic acid alkyl ester having an alkyl group having 1 to 8 carbon atoms. Specific examples of the monomer forming the (meth)acrylic acid alkyl ester monomer unit (b1) include methyl acrylate, methyl methacrylate, ethyl acrylate, ethyl methacrylate, butyl acrylate, butyl methacrylate, 2-ethylhexyl acrylate, and 2-ethylhexyl methacrylate. These may be used alone or in a combination of two or more types.

In the (meth)acrylic adhesive resin according to the present embodiment, a content of the monomer unit (b1) is preferably 10% by mass or more and 98.9% by mass or less, more preferably 50% by mass or more and 98% by mass or less, and still more preferably 85% by mass or more and 97% by mass or less, in a case where the total of all the monomer units in the (meth)acrylic adhesive resin is set to 100% by mass.

[0034]

Examples of the monomer forming the monomer unit (b2)

having a functional group capable of reacting with the crosslinking agent include acrylic acid, methacrylic acid, itaconic acid, mesaconic acid, citraconic acid, fumaric acid, maleic acid, itaconic acid monoalkyl ester, mesaconic acid monoalkyl ester, citraconic acid monoalkyl ester, fumaric acid monoalkyl ester, maleic acid monoalkyl ester, glycidyl acrylate, glycidyl methacrylate, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, acrylamide, methacrylamide, tert-butylaminoethyl acrylate, tert-butylaminoethyl methacrylate, and the like.

Preferable are acrylic acid, methacrylic acid, 2-hydroxyethyl acrylate, 2-hydroxyethyl methacrylate, acrylamide, methacrylamide, and the like. These may be used alone or in a combination of two or more types.

In the (meth)acrylic adhesive resin according to the present embodiment, a content of the monomer unit (b2) is preferably 1% by mass or more and 40% by mass or less, more preferably 2% by mass or more and 20% by mass or less, and still more preferably 3% by mass or more and 15% by mass or less in a case where the total of all monomer units in the (meth)acrylic adhesive resin is set to 100% by mass.

[0035]

The (meth)acrylic adhesive resin according to the present embodiment may further include a bifunctional monomer unit (b3) or a specific comonomer unit having a property as a surfactant (hereinafter, referred to as a polymerizable surfactant) in addition to the monomer unit (b1) and the monomer unit (b2).

The polymerizable surfactant has a property of

copolymerizing with the monomer unit (b1), the monomer unit (b2), and the bifunctional monomer unit (b3), and has an action as an emulsifier in a case of emulsion polymerization.

[0036]

5 Examples of the monomer forming the bifunctional monomer unit (b3) include allyl methacrylate, allyl acrylate, divinylbenzene, vinyl methacrylate, vinyl acrylate, trimethylolpropane tri(meth)acrylate, pentaerythritol tri(meth)acrylate, dipentaerythritol hexa(meth)acrylate, 10 tetraethylene glycol di(meth)acrylate, or, for example, monomers in which a main chain structure is a propylene glycol type with diacrylate or dimethacrylate at both ends (for example, manufactured by NOF Corp., trade name: PDP-200, PDP-400, ADP-200, and ADP-400), tetramethylene glycol type monomers (for 15 example, manufactured by NOF Corp., trade name: ADT-250, ADT-850), mixtures thereof (for example, manufactured by NOF Corp., trade name: ADET-1800 and ADPT-4000), and the like.

[0037]

20 In the (meth)acrylic adhesive resin according to the present embodiment, a content of the bifunctional monomer unit (b3) is preferably 0.1% by mass or more and 30% by mass or less, more preferably 0.1% by mass or more and 15% by mass or less, still more preferably 0.1% by mass or more and 20% by mass or less, and even more preferably 0.1% by mass or more and 5% by 25 mass or less, in a case where the total of all the monomer units in the (meth)acrylic adhesive resin is set to 100% by mass.

[0038]

Examples of the polymerizable surfactant include a surfactant in which a polymerizable 1-propenyl group is introduced into a benzene ring of polyoxyethylene nonylphenyl ether (manufactured by Daiichi Kogyo Seiyaku Co., Ltd.; trade name: Aqualon RN-10, RN-20, RN-30, RN-50, and the like), a surfactant in which a polymerizable 1-propenyl group is introduced into a benzene ring of ammonium salt of sulfuric acid ester of polyoxyethylene nonylphenyl ether (manufactured by Daiichi Kogyo Seiyaku Co., Ltd.; trade name: Aqualon HS-10, HS-20, HS-1025, and the like), and a sulfosuccinate diester-based surfactant having a polymerizable double bond in the molecule (manufactured by Kao Corp.; trade name: Latemul S-120A, S-180A, and the like), or the like.

In the (meth)acrylic adhesive resin according to the present embodiment, a content of the polymerizable surfactant is preferably 0.1% by mass or more and 30% by mass or less, more preferably 0.1% by mass or more and 15% by mass or less, still more preferably 0.1% by mass or more and 20% by mass or less, and even more preferably 0.1% by mass or more and 5% by mass or less, in a case where the total of all the monomer units in the (meth)acrylic adhesive resin is set to 100% by mass.

[0039]

The (meth)acrylic adhesive resin according to the present embodiment may further include a monomer unit formed of a monomer having a polymerizable double bond such as vinyl acetate, acrylonitrile, styrene, or the like, as necessary.

[0040]

Examples of the polymerization reaction mechanism of the (meth)acrylic adhesive resin according to the present embodiment include radical polymerization, anionic polymerization, cationic polymerization, and the like.

5 When the (meth)acrylic adhesive resin according to the present embodiment is polymerized by a radical polymerization reaction, specific examples of radical polymerization initiators include organic peroxides such as benzoyl peroxide, di-t-butyl peroxide, dicumyl peroxide, 3,3,5-trimethylhexanoyl peroxide, 10 di-2-ethylhexylperoxy dicarbonate, methyl ethyl ketone peroxide, t-butylperoxyphthalate, t-butylperoxybenzoate, di-t-butylperoxyacetate, t-butylperoxyisobutyrate, t-butylperoxy-2-hexanoate, t-butylperoxy-2-ethylhexanoate, t-butylperoxy-3,5,5-trimethylhexanoate, acetyl peroxide, isobutyryl peroxide, 15 octanoyl peroxide, t-butyl peroxide, and di-t-amyl peroxide; inorganic peroxides such as ammonium persulfate, potassium persulfate, and sodium persulfate; azo compounds such as 2,2'-azobisisobutyronitrile, 2,2'-azobis-2-methylbutyronitrile, and 4,4'-azobis-4-cyanovaleric acid.

20 [0041]

From the viewpoint of further suppressing the residue of the adhesive on the electronic component in the adhesive resin layer (B), the radical polymerization initiator in the (meth)acrylic adhesive resin according to the present embodiment 25 is preferably an inorganic peroxide such as water-soluble ammonium persulfate, potassium persulfate, or sodium persulfate, or a water-soluble azo compound having a carboxyl group in the

molecule such as 4,4'-azobis-4-cyanovaleric acid, and from the viewpoint of the influence of ions on the surface of the electronic component, more preferably ammonium persulfate, or an azo compound having a carboxyl group in the molecule such as

5 4,4'-azobis-4-cyanovaleric acid, and still more preferably an azo compound having a carboxyl group in the molecule such as 4,4'-azobis-4-cyanovaleric acid.

[0042]

It is preferable that the adhesive resin layer (B)

10 according to the present embodiment further includes a crosslinking agent having two or more crosslinkable functional groups in one molecule, in addition to the adhesive resin.

Examples of such a crosslinking agent include epoxy-based compounds such as sorbitol polyglycidyl ether, polyglycerol

15 polyglycidyl ether, pentaerythritol polyglycidyl ether, diglycerol polyglycidyl ether, glycerol polyglycidyl ether, neopentyl glycol diglycidyl ether, and resorcin diglycidyl ether; isocyanate-based compounds such as tetramethylene diisocyanate, hexamethylene diisocyanate, toluene diisocyanate 3

20 adducts of trimethylolpropane, polyisocyanate, diphenylmethane diisocyanate, and tolylene diisocyanate; aziridine-based compounds such as trimethylolpropane-tri- β -aziridinypropionate, tetramethylolmethane-tri- β -aziridinypropionate, N,N'-diphenylmethane-4,4'-bis(1-aziridinecarboxamide), N,N'-

25 hexamethylene-1,6-bis(1-aziridinecarboxamide), N,N'-toluene-2,4-bis(1-aziridinecarboxamide), and trimethylolpropane-tri- β -(2-methylaziridine) propionate; tetrafunctional epoxy-based

compounds such as N,N,N',N'-tetraglycidyl-m-xylenediamine and 1,3-bis(N,N'-diglycidylaminomethyl) cyclohexane; and melamine-based compounds such as hexamethoxymethylmelamine.

Among these, it is preferable to contain one or two or more
5 selected from the group consisting of an epoxy-based compound, an isocyanate-based compound, and an aziridine-based compound.

[0043]

From the viewpoint of further suppressing the residue of the adhesive on the electronic component, a content of the
10 crosslinking agent in the adhesive resin layer (B) is preferably 0.1 parts by mass or more, more preferably 1 part by mass or more, and still more preferably 2 parts by mass or more, and is preferably 15 parts by mass or less, more preferably 10 parts by mass or less, still more preferably 8 parts by mass or less, and
15 even more preferably 5 parts by mass or less with respect to 100 parts by mass of the adhesive resin.

In addition, from the viewpoint of further suppressing the residue of the adhesive on the electronic component, a content of the crosslinking agent in the adhesive resin layer (B) is
20 preferably 0.1 parts by mass or more and 15 parts by mass or less, more preferably 0.1 parts by mass or more and 10 parts by mass or less, still more preferably 1 part by mass or more and 8 parts by mass or less, and even more preferably 2 parts by mass or more and 5 parts by mass or less with respect to 100 parts by
25 mass of the adhesive resin.

[0044]

The adhesive resin layer (B) may include additives such as

plasticizers and adhesion-imparting resins as other components. In a case where the adhesive resin layer (B) is a radiation crosslinking type adhesive resin layer, various additives for radiation crosslinking may be contained. From the viewpoint of further suppressing the residue of the adhesive on the electronic component, a total content of the adhesive resin and the crosslinking agent in the adhesive resin layer (B) is preferably 50% by mass or more, more preferably 70% by mass or more, still more preferably 90% by mass or more, and even more preferably 95% by mass or more in a case where the entire adhesive resin layer (B) is set to 100% by mass.

[0045]

In addition, in the adhesive film 100 according to the present embodiment, from the viewpoint of stably holding the electronic component 70 on the adhesive resin layer (B) in a case of reducing the adhesive force of the adhesive resin layer (C) by the heating treatment to peel the support substrate from the adhesive resin layer (C), a total content of the gas generating component and the thermally expandable microspheres in the adhesive resin layer (B) is preferably 0.1% by mass or less, more preferably 0.05% by mass or less, and still more preferably 0.01% by mass or less, and it is even more preferable that the adhesive resin layer (B) does not contain the gas generating component and the thermally expandable microspheres, in a case where the entire adhesive resin layer (B) is set to 100% by mass.

[0046]

From the viewpoint of further suppressing the residue of the adhesive on the electronic component, a thickness of the adhesive resin layer (B) is preferably 1 μm or more, more preferably 3 μm or more, and still more preferably 5 μm or more, 5 and is preferably 40 μm or less, more preferably 35 μm or less, still more preferably 30 μm or less, even more preferably 25 μm or less, and even still more preferably 20 μm or less.

In addition, from the viewpoint of further suppressing the residue of the adhesive on the electronic component, a thickness 10 of the adhesive resin layer (B) is preferably 1 μm or more and 40 μm or less, more preferably 1 μm or more and 35 μm or less, still more preferably 1 μm or more and 30 μm or less, even more preferably 3 μm or more and 25 μm or less, and even still more preferably 5 μm or more and 20 μm or less.

15 [0047]

[Adhesive Resin Layer (C)]

The adhesive resin layer (C) is a layer on the second surface A2 side of the base material layer (A).

The adhesive resin layer (C) is preferably a layer in which 20 the adhesive force is reduced by an external stimulus. As a result, the adhesive film 100 can be peeled off from the support substrate by applying an external stimulus.

Examples of the adhesive resin layer (C) in which the adhesive force is reduced by an external stimulus include a 25 heat-peeling type adhesive resin layer in which the adhesive force is reduced by heating, and a light-peeling type adhesive resin layer in which the adhesive force is reduced by light such

as ultraviolet rays and radiation. Examples of a method of applying the external stimulus include light irradiation and a heating treatment.

[0048]

5 Examples of the heat-peeling type adhesive resin layer include an adhesive resin layer formed of a heat-expansion type adhesive including an adhesive resin (C1) and a gas generating component; an adhesive resin layer formed of a heat-expansion type adhesive including an adhesive resin (C1) and thermally
10 expandable microspheres capable of reducing the adhesive force by expansion; and an adhesive resin layer formed of a heat-expansion type adhesive in which the adhesive force is reduced by a crosslinking reaction of an adhesive component by heat. Among these, from the viewpoint of further suppressing the
15 displacement of the electronic component and further simplifying the manufacturing method, the adhesive resin layer (C) according to the present embodiment preferably includes an adhesive resin layer formed of a heat-expansion type adhesive.

[0049]

20 From the viewpoint of further improving the heat peelability, the adhesive resin layer (C) according to the present embodiment preferably contains one or two or more selected from the group consisting of a gas generating component and thermally expandable microspheres, and more preferably
25 contains thermally expandable microspheres.

[0050]

The heat-expansion type adhesive in the adhesive resin

layer (C) is preferably an adhesive whose adhesive force is reduced or lost by heating at a temperature exceeding 100°C, more preferably a temperature of 110°C or higher, still more preferably a temperature of 120°C or higher, even more preferably a temperature of 130°C or higher, even still more preferably a temperature of 150°C or higher, even still more preferably a temperature of 180°C or higher, even still more preferably a temperature of 200°C or higher, even still more preferably a temperature of 210°C or higher, and even still more preferably a temperature of 230°C or higher.

As the heat-expansion type adhesive in the adhesive resin layer (C), for example, a material that is not peeled off at 100°C or lower and is peeled off at a temperature exceeding 100°C can be selected, and it is preferable that the adhesive force is such that the adhesive film 100 is not peeled off from the support substrate during the manufacturing step of the electronic device.

Such an adhesive resin layer (C) can be obtained by selecting the type of the gas generating component or the thermally expandable microspheres in the adhesive resin layer (C).

Here, it is possible to evaluate the reduction or loss of the adhesive force by heating at a temperature over 100°C, for example, by the peeling strength from a stainless steel plate, measured after attaching the adhesive resin layer (C) side to the stainless-steel plate, performing a heating treatment at 90°C for one hour, and then heating at a temperature exceeding

100°C for two minutes. The specific heating temperature when heating at a temperature exceeding 100°C is set to a temperature exceeding the temperature at which gas is generated or the temperature at which thermally expandable microspheres undergo
5 heat expansion and is set as appropriate depending on the type of gas to be generated or the thermally expandable microspheres. In the present embodiment, loss of adhesive force means, for example, a case where the 180° peeling strength measured under conditions of 23°C and a tensile speed of 300 mm/min is less
10 than 0.5 N/25 mm.

[0051]

As the gas generating component, for example, it is possible to use an azo compound, an azide compound, a Meldrum's acid derivative, or the like. In addition, as the gas
15 generating component, for example, it is also possible to use inorganic foaming agents such as ammonium carbonate, ammonium hydrogen carbonate, sodium hydrogen carbonate, ammonium nitrite, sodium borohydride, and various azides, and water; chlorofluoroalkane-based compounds such as
20 trichloromonofluoromethane and dichloromonofluoromethane; azo-based compounds such as azobisisobutyronitrile, azodicarbonamide, and barium azodicarboxylate; hydrazine-based compounds such as paratoluenesulfonyl hydrazide, diphenylsulfone-3,3'-disulfonylhydrazide, 4,4'-
25 oxybis(benzenesulfonyl hydrazide) and allylbis(sulfonylhydrazide); semicarbazide-based compounds such as p-toluylenesulfonyl semicarbazide, and 4,4'-

oxybis(benzenesulfonyl semicarbazide); triazole-based compounds such as 5-morpholyl-1,2,3,4-thiatriazole; organic foaming agents such as N-nitroso compounds such as N,N'-

dinitrosopentamethylenetetramine, and N,N'-dimethyl-N,N'-

5 dinitrosoterephthalamide, and the like. The gas generating component may be mixed with the adhesive resin (C1) or may be directly bonded to the adhesive resin (C1).

[0052]

As the thermally expandable microspheres, for example, a
10 foaming agent that is microencapsulated can be used. Examples of such thermally expandable microspheres include microspheres in which a substance that is easily gasified and expanded by heating such as isobutane, propane, and pentane is sealed in a shell having elasticity, or the like. Examples of the material
15 forming the shell include vinylidene chloride-acrylonitrile copolymer, polyvinyl alcohol, polyvinyl butyral, polymethyl methacrylate, polyacrylonitrile, polyvinylidene chloride, polysulfone, and the like. It is possible to manufacture thermally expandable microspheres by, for example, a
20 coacervation method, an interfacial polymerization method, or the like.

[0053]

A total content of the gas generating component and the thermally expandable microspheres in the adhesive resin layer
25 (C) can be appropriately set according to an expansion ratio of the adhesive resin layer (C), a decrease in adhesive force, and the like, and is not particularly limited, but is preferably 1

part by mass or more, more preferably 10 parts by mass or more, and still more preferably 12 parts by mass or more, and is preferably 150 parts by mass or less, more preferably 130 parts by mass or less, still more preferably 100 parts by mass or
5 less, even more preferably 50 parts by mass or less, even still more preferably 25 parts by mass or less, and even still more preferably 20 parts by mass or less with respect to 100 parts by mass of the adhesive resin (C1) in the adhesive resin layer (C).

In addition, a total content of the gas generating
10 component and the thermally expandable microspheres in the adhesive resin layer (C) is preferably 1 part by mass or more and 150 parts by mass or less, more preferably 1 part by mass or more and 130 parts by mass or less, still more preferably 1 part by mass or more and 100 parts by mass or less, even more
15 preferably 1 part by mass or more and 50 parts by mass or less, even still more preferably 10 parts by mass or more and 25 parts by mass or less, and even still more preferably 12 parts by mass or more and 20 parts by mass or less with respect to 100 parts by mass of the adhesive resin (C1) in the adhesive resin layer
20 (C).

It is preferable that the temperature at which the gas is generated or the temperature at which the thermally expandable microspheres are thermally expanded is a temperature higher than 100°C.

25 [0054]

As the adhesive resin (C1) constituting the adhesive resin layer (C), it is preferably an adhesive resin (C1) including one

or two or more selected from the group consisting of a (meth)acrylic adhesive resin, an urethane adhesive resin, a silicone adhesive resin, an olefin adhesive resin, a polyester adhesive resin, a polyamide adhesive resin, a fluorine adhesive resin, and a styrene adhesive resin, and from the viewpoint of further improving the heat peelability, it is more preferably an adhesive resin (C1) including one or two or more selected from the group consisting of a (meth)acrylic adhesive resin, a silicone adhesive resin, an urethane adhesive resin, an olefin adhesive resin, and a styrene adhesive resin, and from the viewpoint of easily adjusting the adhesive force and the like, it is still more preferably an adhesive resin (C1) including a (meth)acrylic adhesive resin.

[0055]

The adhesive resin layer (C) according to the present embodiment preferably further includes a crosslinking agent (C2) having two or more crosslinkable functional groups in one molecule, in addition to the adhesive resin (C1).

The crosslinking agent (C2) having two or more crosslinkable functional groups in one molecule is used to react with the functional group of the adhesive resin (C1) and adjust the adhesive force and cohesive force.

Examples of such a crosslinking agent (C2) include epoxy-based compounds such as sorbitol polyglycidyl ether, polyglycerol polyglycidyl ether, pentaerythritol polyglycidyl ether, diglycerol polyglycidyl ether, glycerol polyglycidyl ether, neopentyl glycol diglycidyl ether, and resorcin

diglycidyl ether; isocyanate-based compounds such as tetramethylene diisocyanate, hexamethylene diisocyanate, toluene diisocyanate 3 adducts of trimethylolpropane, polyisocyanate, diphenylmethane diisocyanate, and tolylene diisocyanate;

5 aziridine-based compounds such as trimethylolpropane-tri- β -aziridinypropionate, tetramethylolmethane-tri- β -aziridinypropionate, N,N'-diphenylmethane-4,4'-bis(1-aziridinecarboxamide), N,N'-hexamethylene-1,6-bis(1-aziridinecarboxamide), N,N'-toluene-2,4-bis(1-

10 aziridinecarboxamide), and trimethylolpropane-tri- β -(2-methylaziridine) propionate; tetrafunctional epoxy-based compounds such as N,N,N',N'-tetraglycidyl-m-xylenediamine and 1,3-bis(N,N'-diglycidylaminomethyl) cyclohexane; and melamine-based compounds such as hexamethoxymethylmelamine. These may

15 be used alone or in a combination of two or more types.

The adhesive resin layer (C) according to the present embodiment preferably includes one or two or more selected from the group consisting of an epoxy-based compound, an isocyanate-based compound, and an aziridine-based compound.

20 [0056]

A content of the crosslinking agent (C2) in the adhesive resin layer (C) is preferably in a range in which the number of functional groups in the crosslinking agent (C2) does not exceed the number of functional groups in the adhesive resin (C1).

25 However, in a case where a functional group is newly generated in the cross-linking reaction, a case where the cross-linking reaction is slow, or the like, the amount thereof may be greater

as necessary.

From the viewpoint of further improving the performance balance between the adhesive force and the heat peelability, a content of the crosslinking agent (C2) in the adhesive resin layer (C) is preferably 0.1 parts by mass or more, more preferably 0.5 parts by mass or more, still more preferably 1.0 parts by mass or more, and even more preferably 2.0 parts by mass or more, and from the viewpoint of the storage stability, it is preferably 10.0 parts by mass or less, more preferably 5.0 parts by mass or less, and still more preferably 3.0 parts by mass or less with respect to 100 parts by mass of the adhesive resin (C1).

In addition, from the viewpoint of further improving the performance balance between the adhesive force, the heat peelability, and the storage stability, a content of the crosslinking agent (C2) in the adhesive resin layer (C) is preferably 0.1 parts by mass or more and 10.0 parts by mass or less, more preferably 0.5 parts by mass or more and 10.0 parts by mass or less, still more preferably 1.0 part by mass or more and 5.0 parts by mass or less, and even more preferably 2.0 parts by mass or more and 3.0 parts by mass or less, with respect to 100 parts by mass of the adhesive resin (C1).

[0057]

From the viewpoint of improving the adhesive force to the support substrate, the adhesive resin layer (C) according to the present embodiment preferably contains an adhesion-imparting resin in addition to the adhesive resin (C1). Containing an

adhesion-imparting resin in the adhesive resin layer (C) is preferable for facilitating adjustment of the adhesion to the support substrate near room temperature. The adhesion-imparting resin in which the softening point is 100°C or higher is

5 preferable. Specific examples of adhesion-imparting resins include rosin-based resins such as rosin-based derivatives subjected to a treatment such as esterification; terpene-based resins such as α -pinene-based, β -pinene-based, dipentene-based, and terpene phenol-based resins; natural rosin such as gum-

10 based, wood-based, and tall oil-based rosin; petroleum resins obtained by hydrogenating, disproportionating, polymerizing, or maleating the natural rosin; and coumarone-indene resins.

Among these, the adhesive resin layer (C) according to the present embodiment more preferably has a softening point in a

15 range of 100°C to 160°C, and still more preferably has a softening point in a range of 120°C to 150°C.

[0058]

From the viewpoint of further improving the adhesive force to the support substrate during the operation, a content of the

20 adhesion-imparting resin in the adhesive resin layer (C) is preferably 1 part by mass or more, and more preferably 2 parts by mass or more, and from the viewpoint of further improving the performance balance between the adhesive force to the support substrate and the attachability at room temperature, it is

25 preferably 100 parts by mass or less and more preferably 50 parts by mass or less, with respect to 100 parts by mass of the adhesive resin (C1).

In addition, from the viewpoint of further improving the performance balance between the adhesive force to the support substrate during work and the attachability at room temperature, a content of the adhesion-imparting resin in the adhesive resin layer (C) is preferably 1 part by mass or more and 100 parts by mass or less, and more preferably 2 parts by mass or more and 50 parts by mass or less with respect to 100 parts by mass of the adhesive resin (C1).

[0059]

10 The adhesive resin layer (C) may include additives such as plasticizers as other components. In a case where the entire adhesive resin layer (C) is set to 100% by mass, the lower limit value of the total content of the adhesive resin (C1), the crosslinking agent (C2), and the adhesion-imparting resin in the adhesive resin layer (C) is preferably 50% by mass or more, more
15 preferably 70% by mass or more, still more preferably 90% by mass or more, and even more preferably 95% by mass or more. Further, in a case where the adhesive resin layer (C) is a heat expansion type adhesive resin layer, in a case where the entire
20 adhesive resin layer (C) is set to 100% by mass, a lower limit value of the total content of the adhesive resin (C1), the crosslinking agent (C2), the adhesion-imparting resin, the gas generating component, and the thermally expandable microspheres in the adhesive resin layer (C) is preferably 50% by mass or
25 more, more preferably 70% by mass or more, still more preferably 90% by mass or more, and even more preferably 95% by mass or more.

The upper limit value thereof is not particularly limited, but is, for example, 100% by mass or less.

[0060]

Examples of the light-peeling type adhesive resin layer (C) include an adhesive resin layer composed of an ultraviolet expandable adhesive containing an ultraviolet reactive adhesive (C3), further containing a gas generating component, an ultraviolet expandable adhesive containing ultraviolet expandable microspheres that can reduce the adhesive force upon expansion, and an ultraviolet expandable adhesive in which the adhesive force is reduced by a crosslinking reaction of an adhesive component by ultraviolet irradiation.

The light source used in this case is not particularly limited, but it is preferable to use a light source capable of emitting ultraviolet rays or visible light having a wavelength of 200 nm or more and 500 nm or less. Examples of such a light source include a high-pressure mercury lamp, a low-pressure mercury lamp, a metal halide lamp, and a super UV lamp.

In a case of UV crosslinking, for example, the adhesive resin layer (C) is irradiated with ultraviolet rays having a main wavelength of 365 nm at an irradiation intensity of 10 to 350 mW/cm² under conditions of an ultraviolet ray dose of 100 to 20,000 mJ/cm² in an environment of 0°C to 60°C using a high-pressure mercury lamp, whereby the adhesive resin layer (C) in the adhesive film 100 is expanded to reduce the adhesive force to the support substrate, and the adhesive film 100 can be peeled off from the support substrate.

[0061]

The adhesive resin layer (C) may be a single layer or a multilayer. For example, by laminating two or more layers having different degrees of expansion by heating to form the adhesive resin layer (C), the adhesive force and the heat peelability can be changed between one surface and the other surface of the adhesive resin layer (C).

From the viewpoint of further improving the performance balance between the adhesive force and the heat peelability, a thickness of the adhesive resin layer (C) is preferably 3 μm or more and more preferably 20 μm or more, and from the viewpoint of improving the handleability of the adhesive film 100, it is preferably 300 μm or less and more preferably 150 μm or less.

In addition, from the viewpoint of further improving the performance balance between the adhesive force, the heat peelability, and the handleability of the adhesive film 100, a thickness of the adhesive resin layer (C) is preferably 3 μm or more and 300 μm or less, and more preferably 20 μm or more and 150 μm or less.

[0062]

[Intermediate Layer (D)]

The adhesive film 100 according to the present embodiment may further include the intermediate layer (D).

The adhesive film 100 according to the present embodiment preferably further includes an intermediate layer (D) in at least one of between the base material layer (A) including the electronic conjugated polymer layer 1 on the surface and the

adhesive resin layer (B) or between the base material layer (A) including the electronic conjugated polymer layer 1 on the surface and the adhesive resin layer (C), and more preferably further includes an intermediate layer (D) between the base
5 material layer (A) including the electronic conjugated polymer layer 1 on the surface and the adhesive resin layer (C). FIG. 3 is a cross-sectional view schematically showing a structure of the adhesive film 100 in a case where the intermediate layer (D) is located between the base material layer (A) including the
10 electronic conjugated polymer layer 1 on the surface and the adhesive resin layer (C).

The intermediate layer (D) can be provided for a purpose such as an unevenness absorbing resin layer and an impact absorbing layer.

15 [0063]

The intermediate layer (D) preferably contains a thermoplastic resin, more preferably contains one or two or more resins selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, a (meth)acrylic resin, a
20 urethane-based resin, a silicone-based resin, a polyester-based resin, a polyamide-based resin, and a fluorine-based resin, and still more preferably contains one or two or more resins selected from the group consisting of a polyolefin-based resin, a polystyrene-based resin, and a (meth)acrylic resin.

25 [0064]

From the viewpoint of improving the unevenness absorbing property of the adhesive film 100, a thickness of the

intermediate layer (D) is preferably 1 μm or more, more preferably 5 μm or more, still more preferably 10 μm or more, even more preferably 20 μm or more, even still more preferably 30 μm or more, and even still more preferably 50 μm or more, and
5 is preferably 500 μm or less, more preferably 400 μm or less, still more preferably 300 μm or less, even more preferably 200 μm or less, and even still more preferably 150 μm or less.

In addition, from the viewpoint of improving the unevenness absorbing property of the adhesive film 100, a thickness of the
10 intermediate layer (D) is preferably 1 μm or more and 500 μm or less, more preferably 5 μm or more and 500 μm or less, still more preferably 10 μm or more and 400 μm or less, even more preferably 20 μm or more and 300 μm or less, even still more preferably 30 μm or more and 200 μm or less, and even still more
15 preferably 50 μm or more and 150 μm or less.

[0065]

[Method for Producing Adhesive Film]

Next, an example of a method for producing the adhesive film 100 according to the present embodiment will be described.

20 The method for producing the adhesive film 100 according to the present embodiment includes a step of forming the electronic conjugated polymer layer 1 on a surface of the base material layer (A) by polymerizing a monomer that can form the electronic conjugated polymer layer 1 while immersing the base material
25 layer (A) in a treatment liquid containing the monomer.

[0066]

The treatment liquid preferably contains a monomer that can

form the electronic conjugated polymer layer 1 and an oxidizing polymerization agent. The monomer that can form the electronic conjugated polymer layer 1 is polymerized by coming into contact with the oxidizing polymerization agent in the treatment liquid, and can form the electronic conjugated polymer layer 1 on the surface of the base material layer (A).

[0067]

The monomer that can form the electronic conjugated polymer layer 1 is, for example, a substance having a conjugated double bond in a molecular structure and causing polymerization by oxidation, and examples thereof include a 5-membered heterocyclic compound. Specific examples of the 5-membered heterocyclic compound include pyrrole such as N-methylpyrrole; thiophene such as 3-methylthiophene; furan such as 3-methylfuran; indole such as 3-methylindole; and derivatives thereof.

[0068]

Examples of the oxidizing polymerization agent include halogens such as chlorine, bromine, and iodine; peroxyoxo salts such as peroxydisulfuric acid and potassium peroxydisulfate; and transition metal chlorides such as iron(III) chloride.

[0069]

In addition, from the viewpoint of improving the formation efficiency of the electronic conjugated polymer layer 1, the treatment liquid may further contain a dopant.

As the dopant, generally used acceptor-type dopants can be used. Examples of the acceptor-type dopant include a Lewis acid

such as phosphorus pentafluoride; a proton acid such as hydrogen chloride, sulfuric acid, and paratoluenesulfonic acid; and a transition metal compound such as silver perchlorate and silver boron fluoride.

5 [0070]

In a case where the monomer and the oxidizing polymerization agent are liquids, these can be used as they are as the treatment liquid, but from the viewpoint of controlling the formation of the electronic conjugated polymer in the
10 treatment liquid, the treatment liquid may further contain a solvent.

As the solvent, water or a generally used organic solvent can be used. Examples of the organic solvent include aliphatic alcohols such as methanol and ethanol; aliphatic ketones such as
15 acetone and methyl ethyl ketone; ethers such as diethyl ether and tetrahydrofuran; halogenated hydrocarbons such as methylene chloride and chloroform; esters such as ethyl acetate and butyl acetate; aliphatic hydrocarbons such as hexane; nitrogen-containing compounds such as acetonitrile and benzonitrile; and
20 mixtures thereof.

These solvents may be used alone or in combination of two or more thereof, and can be appropriately selected and used depending on the monomer, the oxidizing polymerization agent, and the material of the base material layer (A).

25 [0071]

Specific methods of forming the electronic conjugated polymer layer 1 on the surface of the base material layer (A)

include, for example, the following.

First, the oxidizing polymerization agent and the dopant are supplied to a treatment tank, and the base material layer (A) is immersed in the treatment tank. Next, the monomer is
5 supplied to the treatment tank, mixed quickly with a stirrer, and the base material layer (A) is immersed and held in the treatment liquid while being stirred slowly. In this manner, the electronic conjugated polymer layer 1 can be formed on the surface of the base material layer (A) by polymerizing the
10 monomer while immersing the base material layer (A) in the treatment liquid containing the monomer.

[0072]

From the viewpoint of improving the formation efficiency of the electronic conjugated polymer layer 1, a temperature of the
15 treatment liquid is preferably -10°C or higher, more preferably -5°C or higher, and is preferably 30°C or lower, more preferably 20°C or lower, still more preferably 10°C or lower, and even more preferably 5°C or lower.

From the viewpoint of improving the formation efficiency of
20 the electronic conjugated polymer layer 1, a treatment time for holding the base material layer (A) immersed is preferably 1 minute or longer, more preferably 3 minutes or longer, and still more preferably 5 minutes or longer, and is preferably 1 hour or shorter, more preferably 45 minutes or shorter, and still more
25 preferably 30 minutes or shorter.

[0073]

The adhesive film 100 according to the present embodiment

can be formed by, for example, a method of imparting the adhesive resin layer (B) and the adhesive resin layer (C) to the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted, a method of transferring the adhesive resin layer (B) and the adhesive resin layer (C) formed on the separator to the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted, or the like.

In addition, the adhesive film 100 according to the present embodiment may be formed by laminating (stacking) the adhesive resin layer (B), the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted, and the adhesive resin layer (C) in this order.

In a case where the adhesive film 100 according to the present embodiment includes the intermediate layer (D), for example, the adhesive film 100 can be formed by a method of laminating (stacking) the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted and the intermediate layer (D) and then imparting the adhesive resin layer (B) and the adhesive resin layer (C), a method of laminating (stacking) the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted and the intermediate layer (D) and then transferring the adhesive resin layer (B) and the adhesive resin layer (C) formed on the separator to the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted and the intermediate layer (D), or the like.

[0074]

Examples of a method of imparting the adhesive resin layer (B) and the adhesive resin layer (C) to the base material layer (A) on which the electronic conjugated polymer layer 1 is imparted include a method of applying an adhesive coating solution capable of forming the adhesive resin layer (B) and the adhesive resin layer (C). As a method for coating the adhesive coating solution, it is possible to adopt a coating method known in the related art, for example, a roll coater method, a reverse roll coater method, a gravure roll method, a bar coating method, a comma coater method, a die coater method, or the like. The drying conditions of the adhesive coating solution are not particularly limited, but are generally preferably drying for 10 seconds to 10 minutes in a temperature range of 80°C to 200°C. More preferably, the drying is performed at 80°C to 170°C for 15 seconds to 5 minutes.

In the adhesive coating solution, in order to sufficiently promote the crosslinking reaction between the crosslinking agent and the adhesive resin, the adhesive coating solution may be heated at 40°C to 80°C for about 5 to 300 hours after the drying of the adhesive coating solution is completed.

[0075]

[Method for Producing Electronic Device]

The method for producing the electronic device according to the present embodiment will be described with reference to the drawings. FIG. 4 is a cross-sectional view schematically showing a method for producing an electronic device of the embodiment according to the present invention.

The method for producing the electronic device according to the present embodiment includes a step of preparing a structure 200 including the adhesive film 100, the electronic component 70 attached to the adhesive resin layer (B) of the adhesive film 100, and the support substrate 80 attached to the adhesive resin layer (C) of the adhesive film 100, and a step of sealing the electronic component 70 with a sealing material 90.

[0076]

From the viewpoint of further suppressing the displacement of the electronic component 70, the support substrate 80 preferably includes at least one selected from the group consisting of a stainless steel substrate and a glass substrate.

[0077]

Examples of the electronic component 70 include a semiconductor chip such as an IC, LSI, discrete component, light emitting diode, or light receiving element, a semiconductor panel, a semiconductor package, and the like.

The surface of the electronic component 70 has the uneven structure, for example, by having electrodes.

In addition, the electrodes are, for example, bonded with respect to the electrodes formed on the mounting surface when the electronic device is mounted on the mounting surface, so as to form an electrical connection between the electronic device and the mounting surface (mounting surface of a printed substrate or the like).

Examples of electrodes include bump electrodes such as ball bumps, printing bumps, stud bumps, plating bumps, pillar bumps,

and the like. That is, the electrode is, for example, a protruding electrode. These bump electrodes may be used alone or in combination of two or more kinds thereof.

In addition, the type of the metal forming the bump electrode is not particularly limited and examples thereof include silver, gold, copper, tin, lead, bismuth, alloys thereof, and the like. These types of metal may be used alone or in combination of two or more kinds thereof.

[0078]

10 In the step of sealing the electronic component 70 with the sealing material 90, a plurality of the electronic components 70 may be collectively sealed with the sealing material 90, or may be individually sealed.

As a method of individually coating each of the plurality of electronic components 70 with the sealing material 90, it is preferable to use one or two or more methods selected from the group consisting of a 3D printer method, a spray method, a screen printing method, and an ink jet method, and it is more preferable to use the 3D printer method.

20 By individually coating each of the plurality of electronic components 70 with the sealing material 90 using the above-described method, it is possible to suppress the displacement of the electronic component 70 in the step of sealing the electronic component 70 with the sealing material 90.

25 [0079]

As the sealing material 90, a known sealing material can be used as long as the sealing material has high insulating

properties, but from the viewpoint of further improving the affinity of the sealing material 90 to the adhesive film 100 and further sealing the electronic component 70 more uniformly, the sealing material 90 preferably includes an epoxy resin-based
5 sealing material.

As such an epoxy resin-based sealing material, for example, it is possible to use the T693/R4000 series, the T693/R1000 series, the T693/R5000 series, and the like, manufactured by Nagase Chemtex Corporation.

10 The sealing material 90 may be in a solid state or a liquid state, but from the viewpoint of being able to perform the sealing step at a low temperature and low pressure and further suppress the displacement of the electronic component 70 in the sealing step, the sealing material is preferably in a liquid
15 state.

[0080]

From the viewpoint of further suppressing the displacement of the electronic component 70, a thickness of the sealing material 90 after coating the electronic component 70 is
20 preferably 1.0 μm or more, more preferably 1.5 μm or more, still more preferably 5.0 μm or more, even more preferably 10.0 μm or more, even still more preferably 30.0 μm or more, even still more preferably 50.0 μm or more, even still more preferably 100.0 μm or more, even still more preferably 200.0 μm or more,
25 and even still more preferably 300.0 μm or more, and is preferably 2000.0 μm or less, more preferably 1500.0 μm or less, still more preferably 1000.0 μm or less, and even more

preferably 500.0 μm or less.

In addition, from the viewpoint of further suppressing the displacement of the electronic component 70, a thickness of the sealing material 90 after the coating of the electronic

5 component 70 is preferably 1.0 μm or more and 2000.0 μm or less, more preferably 1.5 μm or more and 2000.0 μm or less, still more preferably 5.0 μm or more and 2000.0 μm or less, even more preferably 10.0 μm or more and 2000.0 μm or less, even still more preferably 30.0 μm or more and 2000.0 μm or less, even
10 further preferably 50.0 μm or more and 2000.0 μm or less, even further preferably 100.0 μm or more and 1500.0 μm or less, even further preferably 200.0 μm or more and 1000.0 μm or less, and even further preferably 300.0 μm or more and 500.0 μm or less.

[0081]

15 From the viewpoint of further improving the work efficiency of the step of sealing the electronic component 70 with the sealing material 90, a sealing temperature in the step of sealing the electronic component 70 with the sealing material 90 is preferably 10°C or higher, more preferably 15°C or higher,
20 and still more preferably 20°C or higher, and from the viewpoint of further suppressing the displacement of the electronic component 70, it is preferably 45°C or lower, more preferably 40°C or lower, still more preferably 35°C or lower, and even more preferably 30°C or lower.

25 In addition, from the viewpoint of further improving the work efficiency of the step of sealing the electronic component 70 with the sealing material 90 and further suppressing the

displacement of the electronic component 70, a sealing temperature in the step of sealing the electronic component 70 with the sealing material 90 is preferably 10°C or higher and 45°C or lower, more preferably 10°C or higher and 40°C or lower, 5 still more preferably 15°C or higher and 35°C or lower, and even more preferably 20°C or higher and 30°C or lower.

The sealing temperature in the present embodiment refers to a set temperature in a device used for sealing the electronic component 70.

10 [0082]

From the viewpoint of improving the reliability of the electronic device, a sealing pressure in the step of sealing the electronic component 70 with the sealing material 90 is preferably 30 kPa or more, more preferably 50 kPa or more, still 15 more preferably 70 kPa or more, and even more preferably 90 kPa or more, and from the viewpoint of further suppressing the displacement of the electronic component 70, the sealing pressure is preferably 150 kPa or less, more preferably 130 kPa or less, and still more preferably 110 kPa or less.

20 In addition, from the viewpoint of improving the reliability of the electronic device and further suppressing the displacement of the electronic component 70, a sealing pressure in the step of sealing the electronic component 70 with the sealing material 90 is preferably 30 kPa or higher and 150 kPa 25 or lower, more preferably 50 kPa or higher and 150 kPa or lower, still more preferably 70 kPa or higher and 130 kPa or lower, and even more preferably 90 kPa or higher and 110 kPa or lower. In

addition, the sealing pressure in the step of sealing the electronic component 70 with the sealing material 90 is still more preferably normal pressure.

The sealing pressure in the present embodiment refers to a
5 set pressure in a device used for sealing the electronic component 70.

[0083]

It is preferable that the method for producing the electronic device according to the present embodiment further
10 includes a step of curing the sealing material 90. As a result, the electronic component 70 can be fixed, and the displacement of the electronic component 70 can be further suppressed.

Examples of a method of curing the sealing material 90 include a method of treating the sealing material 90 with one or
15 two methods selected from the group consisting of light irradiation and a heating treatment, and from the viewpoint of further suppressing the displacement of the electronic component 70, it is preferable to cure the sealing material 90 by light irradiation.

20 [0084]

The method of curing the sealing material 90 by light irradiation is preferably a method of curing the sealing material 90 by crosslinking the sealing material 90 by irradiating the sealing material 90 with light such as
25 ultraviolet rays. As the light source used in this case, it is preferable to use a light source capable of emitting ultraviolet rays including a wavelength component capable of exciting a

photoinitiator, and it is more preferable to use a light source capable of emitting ultraviolet rays including a component having a wavelength of less than 300 nm.

The method of curing the sealing material 90 by the heating treatment is preferably a method of curing the sealing material 90 by thermal crosslinking with an oven, thermal crosslinking with a hot plate, thermal crosslinking with infrared irradiation, or the like. In a case of thermal crosslinking, the heating temperature is, for example, 100°C to 180°C, and the heating treatment time is, for example, 10 to 180 minutes. The heating temperature is preferably a temperature not exceeding a temperature at which the gas is generated in the adhesive film 100 or a temperature at which the thermally expandable microspheres are thermally expanded.

15 [0085]

It is preferable that the method for producing the electronic device according to the present embodiment further includes a step of peeling the support substrate 80 from the structure 200 by reducing the adhesive force of the adhesive resin layer (C) by applying an external stimulus.

After sealing the electronic component 70, for example, it is possible to easily remove the support substrate 80 from the adhesive film 100 by heating to a temperature exceeding 100°C to reduce the adhesive force of the adhesive resin layer (C).

25 It is preferable that the step of peeling the support substrate 80 from the structure 200 by reducing the adhesive force of the adhesive resin layer (C) by applying an external

stimulus is performed after the step of sealing the electronic component 70 with the sealing material 90, and it is more preferable that the step is performed after the step of curing the sealing material 90.

5 [0086]

In the method for producing the electronic device according to the present embodiment, it is preferable to further include a step of peeling the adhesive film 100 from the plurality of electronic components 70. As a result of this step, the
10 electronic device is obtained.

Examples of the method for peeling the adhesive film 100 from the electronic component 70 include a mechanical peeling method, a method of peeling after reducing the adhesive force on the surface of the adhesive film 100, or the like.

15 It is preferable that the step of peeling the adhesive film 100 from the plurality of electronic components 70 is performed after the step of sealing the electronic component 70 with the sealing material 90, it is more preferable that the step is performed after the step of curing the sealing material 90, and
20 it is still more preferable that the step is performed after the step of peeling the support substrate 80 from the structure 200 by reducing the adhesive force of the adhesive resin layer (C) by applying an external stimulus.

[0087]

25 The adhesive film 100 according to the present embodiment can be preferably used for manufacturing an electronic device including a fan-out type package. That is, the electronic

device obtained by the method for producing the electronic device according to the present embodiment includes a fan-out type package. In the fan-out type package, since the terminals can be spread to the outside of the chip (fan out), the fan-out type package can be adopted even in an application in which the number of terminals is larger than the chip area. In addition, since the package substrate is not required, thinning is also possible.

[0088]

10 The embodiments according to the present invention have been described above. However, these are examples of the present invention, and various configurations other than the above can be adopted.

[0089]

15 In addition, the present invention is not limited to the above-described embodiments, and modifications, improvements, and the like within a range where the object of the present invention can be achieved are included in the present invention.

Examples

20 [0090]

Hereinafter, the present invention will be specifically described using Examples, but the present invention is not limited to thereto.

Details of the method of producing the adhesive film are as follows.

[0091]

<Synthesis of Adhesive Raw Material>

(Meth)acrylic resin emulsion 1:

0.5 parts by mass of ammonium persulfate as a polymerization initiator was used, and 63 parts by mass of 2-ethylhexyl acrylate, 21 parts by mass of n-butyl acrylate, 9 parts by mass of methyl methacrylate, 3 parts by mass of 2-hydroxyethyl methacrylate, 2 parts by mass of methacrylic acid, 1 part by mass of acrylamide, 1 part by mass of polytetramethylene glycol diacrylate (manufactured by NOF Corporation, trade name: BLEMMER A DT-250), and 2 parts by mass of an aqueous solution of ammonium salt of polyoxyethylene nonyl propenyl phenyl ether (manufactured by Daiichi Kogyo Seiyaku Co., Ltd., trade name: AQUARON HS-1025) were emulsion-polymerized in deionized water at 70°C for 8 hours.

After the polymerization was completed, the pH was adjusted to 7 with ammonia water.

In this manner, (meth)acrylic resin emulsion 1 having a concentration of solid contents of 56.5% was obtained.

[0092]

(Meth)acrylic resin emulsion 2:

0.5 parts by mass of 4,4'-azobis-4-cyanobutyric acid (manufactured by Otsuka Chemical Co., Ltd., trade name: ACVA) was used as a polymerization initiator, and 74 parts by mass of butyl acrylate, 14 parts by mass of methyl methacrylate, 9 parts by mass of 2-hydroxyethyl methacrylate, 2 parts by mass of methacrylic acid, 1 part by mass of acrylamide, and 3 parts by mass of an aqueous solution of ammonium sulfate of polyoxyethylene nonyl propenyl phenyl ether (manufactured by

Daiichi Kogyo Seiyaku Co., Ltd., trade name: AQUARON HS-1025) were emulsion-polymerized in deionized water at 70°C for 8 hours.

After the polymerization was completed, the pH was adjusted to 7 with ammonia water.

As a result, (meth)acrylic resin emulsion 2 having a concentration of solid contents of 42.5% was obtained.

[0093]

(Meth)acrylic resin solution:

49 parts by mass of ethyl acrylate, 20 parts by mass of 2-ethylhexyl acrylate, 21 parts by mass of methyl acrylate, 10 parts by mass of glycidyl methacrylate, and 0.5 parts by mass (in terms of solid contents) of a benzoyl peroxide-based polymerization initiator as a polymerization initiator were reacted in 65 parts by mass of toluene and 50 parts by mass of ethyl acetate at 80°C for 10 hours. After the reaction was completed, the obtained solution was cooled, and 25 parts by mass of xylene, 5 parts by mass of acrylic acid, and 0.5 part by mass of tetradecyl dimethylbenzyl ammonium chloride were added to the cooled solution, and reacted at 85°C for 32 hours while blowing air. In this manner, a (meth)acrylic resin solution was obtained.

[0094]

<Formula of Adhesive Coating Solution>

Adhesive coating solution B1 for forming adhesive resin layer (B):

42.6 parts by mass of (meth)acrylic resin emulsion 1, 57.4

parts by mass of (meth)acrylic resin emulsion 2, 0.4 parts by mass of dimethylethanolamine, 1.45 parts by mass of an epoxy-based compound (manufactured by Nagase Chemtex Corporation, trade name: EX-1610) as a crosslinking agent, 13 parts by mass of diethylene glycol monobutyl ether, and 20 parts by mass of H₂O were mixed to prepare an adhesive coating solution B1.

[0095]

Adhesive coating solution B2 for forming adhesive resin layer (B):

42.6 parts by mass of (meth)acrylic resin emulsion 1, 57.4 parts by mass of (meth)acrylic resin emulsion 2, 0.4 parts by mass of dimethylethanolamine, 1.10 parts by mass of an epoxy-based compound (manufactured by Nagase Chemtex Corporation, trade name: EX-1610) as a crosslinking agent, 13 parts by mass of diethylene glycol monobutyl ether, and 20 parts by mass of H₂O were mixed to prepare an adhesive coating solution B2.

[0096]

Adhesive coating solution C1 for forming adhesive resin layer (C):

100 parts by mass of (meth)acrylic resin solution (concentration of solid contents: 45%), 2.4 parts by mass (in terms of 5.3 parts by mass with respect to 100 parts by mass of the adhesive resin in terms of solid contents) of rosin-based resin (manufactured by Arakawa Chemical Industries, Ltd., trade name: PENSEL D-125), 1.3 parts by mass (in terms of 2.9 parts by mass with respect to 100 parts by mass of the adhesive resin in terms of solid contents) of an isocyanate-based crosslinking

agent (manufactured by Mitsui Chemicals, Inc., trade name: OLESTER P49-75S), and 7.1 parts by mass (in terms of 15.8 parts by mass with respect to 100 parts by mass of the adhesive resin in terms of solid contents) of thermally expandable microspheres (manufactured by Sekisui Chemical Co., Ltd., trade name: ADVANCEL EM-503) were mixed, 37 parts by mass of toluene and 37 parts by mass of ethyl acetate were added thereto, and an adhesive coating solution C1 was prepared.

[0097]

10 [Example 1]

 <Manufacture of Adhesive Film>

 500 mL of a 0.1 mol/L aqueous solution of potassium peroxydisulfate was placed in a 1 L glass beaker, and a polyethylene terephthalate film (manufactured by Toray Industries, Inc., trade name: 38S10, thickness: 38 μm , product subjected to a corona treatment on both surfaces) as the base material layer (A) was immersed in the solution. Next, 100 mL of a 0.2 mol/L pyrrole aqueous solution was added to the beaker, and the mixture was stirred with a magnetic stirrer while being maintained at 2°C to 3°C. Thereafter, the base material layer was taken out from the beaker, washed with distilled water, and dried at 60°C for 1 hour to obtain a base material layer including an electronic conjugated polymer layer having a thickness of 0.1 μm on the surface.

25 Next, the adhesive coating solution B1 was applied onto a silicone release-treated separator, and dried at 120°C for 3 minutes to form a resin film. Then, the resin film was attached

to the first surface of the base material layer (A) including the electronic conjugated polymer layer on the surface to form an adhesive resin layer (B) having a thickness of 7 μm .

Further, the adhesive coating solution C1 was applied onto the separator, and dried at 120°C for 3 minutes to form a resin film. The resin film was laminated on the second surface of the base material layer (A) including the electronic conjugated polymer layer on the surface. As a result, an adhesive resin layer (C) having a thickness of 47 μm was obtained.

As a result, an adhesive film including the base material layer (A), the adhesive resin layer (B) for temporarily fixing the electronic component on the first surface side of the base material layer (A), the adhesive resin layer (C) on the second surface side of the base material layer (A), the electronic conjugated polymer layer between the base material layer (A) and the adhesive resin layer (B), and the electronic conjugated polymer layer between the base material layer (A) and the adhesive resin layer (C) was obtained.

[0098]

[Example 2]

An adhesive film was obtained in the same manner as in Example 1, except that the adhesive coating solution B2 was used instead of the adhesive coating solution B1.

[0099]

[Comparative Example 1]

An adhesive film was obtained in the same manner as in Example 1, except that a polyethylene terephthalate film

(manufactured by Toray Industries, Inc., trade name: 38S10, thickness: 38 μm , product not subjected to a corona treatment on both surfaces) was used as the base material layer (A), and the electronic conjugated polymer layer was not formed on the surface of the base material layer (A).

[0100]

[Comparative Example 2]

An adhesive film was obtained in the same manner as in Example 1, except that the electronic conjugated polymer layer was not formed.

[0101]

[Comparative Example 3]

An adhesive film was obtained in the same manner as in Example 2, except that the electronic conjugated polymer layer was not formed.

[0102]

<Evaluation>

[Residue of Adhesive]

The adhesive resin layer (C) side of the adhesive film obtained in each of Examples and Comparative Examples was bonded to a stainless steel plate ($\phi 320$ mm, thickness: 2.0 mm) for compression molding.

Next, as the electronic component, 500 silicon chips having a pattern of 1.5 mm $\times$ 1.5 mm were placed on the adhesive resin layer (B) of the adhesive film to obtain a structure.

Thereafter, the structure was heated at 150°C for 1 hour.

Next, using a compression molding machine, the silicon chip

on the adhesive resin layer (B) was sealed by compression molding (125°C, 500 seconds) with a liquid epoxy resin-based sealing material (manufactured by Nagase Chemtex Corporation, trade name: R4212-2C). As a result, a structure in which a
5 sealing resin wafer (ϕ 300 mm, thickness: 550 μ m) was formed on the stainless steel plate was obtained.

The obtained structure was post-mold cured under conditions of 150°C and 1 hour.

Thereafter, the adhesive film was peeled off from the
10 stainless steel plate by heating at 195°C for 60 seconds. Further, the adhesive film was peeled off from the sealing resin wafer by heating at 150°C for 60 seconds.

For the obtained sealing resin wafer, the residue of the adhesive on the peeling surface (surface to which the adhesive
15 film was adhered) of the sealing resin wafer was observed using a shape analysis laser microscope (manufactured by KEYENCE CORPORATION, trade name: VK-X1000), and evaluated according to the following standard.

A: The residue of the adhesive was not confirmed on the
20 peeling surface of the sealing resin wafer.

B: The residue of the adhesive was confirmed in a range of more than 0% and 50% or less of the peeling surface of the sealing resin wafer.

C: The residue of the adhesive was confirmed in a range of
25 more than 50% and 75% or less of the peeling surface of the sealing resin wafer.

D: The residue of the adhesive was confirmed in a range of

more than 75% and 100% or less of the peeling surface of the sealing resin wafer.

E: In a case of peeling the adhesive film off from the sealing resin wafer, only the base material layer was peeled off.

[0103]

[Table 1]

	Example 1	Example 2	Comparative Example 1	Comparative Example 2	Comparative Example 3
adhesive coating solution for forming adhesive resin layer (B)	B1	B2	B1	B1	B2
Presence or absence of corona treatment on base material layer (A)	Present	Present	Absent	Present	Present
Presence or absence of electronic conjugated polymer	Present	Present	Absent	Absent	Absent
Residue of adhesive	A	A	E	C	D

[0104]

It was confirmed that the adhesive film 100 according to the present embodiment could suppress the residue of the adhesive on the electronic component by including the electronic conjugated polymer layer.

[0105]

This application claims priority based on Japanese Patent Application No. 2023-197553 filed on November 21, 2023, the entirety of the disclosure of which is incorporated herein.

REFERENCE SIGNS LIST

[0106]

A base material layer (A)
B adhesive resin layer (B)

	C adhesive resin layer (C)
	D intermediate layer (D)
	A1 first surface of base material layer (A)
	A2 second surface of base material layer (A)
5	1 electronic conjugated polymer layer
	70 electronic component
	80 support substrate
	90 sealing material
	100 adhesive film
10	200 structure

CLAIMS

[Claim 1]

An adhesive film comprising:

5 a base material layer (A);

an adhesive resin layer (B) for temporarily fixing an electronic component on a first surface side of the base material layer (A);

10 an adhesive resin layer (C) on a second surface side of the base material layer (A); and

an electronic conjugated polymer layer between the base material layer (A) and the adhesive resin layer (B).

[Claim 2]

15 The adhesive film according to Claim 1,

wherein an electronic conjugated polymer included in the electronic conjugated polymer layer includes one or two or more selected from the group consisting of polyacetylene, polyacene, poly(p-phenylene), poly(p-phenylene vinylene), polypyrrole, 20 polyaniline, polythiophene, and derivatives thereof.

[Claim 3]

The adhesive film according to Claim 1 or 2,

25 wherein an electronic conjugated polymer included in the electronic conjugated polymer layer includes one or two or more selected from the group consisting of polypyrrole, polythiophene, and derivatives thereof.

[Claim 4]

The adhesive film according to any one of Claims 1 to 3,
wherein a thickness of the electronic conjugated polymer
5 layer is 0.01 μm or more and 10 μm or less.

[Claim 5]

The adhesive film according to any one of Claims 1 to 4,
wherein a content of an electronic conjugated polymer in
10 the electronic conjugated polymer layer is 95% by mass or more
in a case where the entire electronic conjugated polymer layer
is set to 100% by mass.

[Claim 6]

15 The adhesive film according to any one of Claims 1 to 5,
wherein a content of a binder resin in the electronic
conjugated polymer layer is 1.0% by mass or less in a case where
the entire electronic conjugated polymer layer is set to 100% by
mass.

20

[Claim 7]

The adhesive film according to any one of Claims 1 to 6,
further comprising:

the electronic conjugated polymer layer between the base
25 material layer (A) and the adhesive resin layer (C).

[Claim 8]

The adhesive film according to any one of Claims 1 to 7,
wherein the adhesive resin layer (B) includes one or two or
more selected from the group consisting of a (meth)acrylic
adhesive resin, a silicone adhesive resin, a urethane adhesive
5 resin, an olefin adhesive resin, and a styrene adhesive resin.

[Claim 9]

The adhesive film according to any one of Claims 1 to 8,
wherein the adhesive resin layer (C) is a layer in which an
10 adhesive force is reduced by an external stimulus.

[Claim 10]

The adhesive film according to any one of Claims 1 to 9,
wherein the adhesive resin layer (C) includes one or two or
15 more selected from the group consisting of a (meth)acrylic
adhesive resin, a silicone adhesive resin, a urethane adhesive
resin, an olefin adhesive resin, and a styrene adhesive resin.

[Claim 11]

20 The adhesive film according to any one of Claims 1 to 10,
wherein the base material layer (A) includes one or two or
more selected from the group consisting of polypropylene,
polyethylene terephthalate, polyethylene naphthalate, polyamide,
and polyimide.

25

[Claim 12]

The adhesive film according to any one of Claims 1 to 11,

which can be used for temporarily fixing the electronic component in a case of sealing the electronic component with a sealing material.

5 [Claim 13]

A method for producing the adhesive film according to any one of Claims 1 to 12,

the method comprising:

a step of forming the electronic conjugated polymer layer
10 on a surface of the base material layer (A) by polymerizing a monomer that can form the electronic conjugated polymer layer while immersing the base material layer (A) in a treatment liquid containing the monomer.

15 [Claim 14]

A method for producing an electronic device,

the method comprising:

a step of preparing a structure including the adhesive film according to any one of Claims 1 to 12, the electronic component
20 attached to the adhesive resin layer (B) of the adhesive film, and a support substrate attached to the adhesive resin layer (C) of the adhesive film; and

a step of sealing the electronic component with a sealing material.

25

[Claim 15]

The method for producing an electronic device according to

Claim 14, further comprising:

a step of peeling the support substrate from the structure by reducing an adhesive force of the adhesive resin layer (C) by applying an external stimulus.

5

[Claim 16]

The method for producing an electronic device according to Claim 14 or 15, further comprising:

a step of peeling the adhesive film from the electronic
10 component.

[Claim 17]

The method for producing an electronic device according to any one of Claims 14 to 16,

15 wherein the sealing material includes an epoxy resin-based sealing material.

[Claim 18]

The method for producing an electronic device according to
20 any one of Claims 14 to 17,

wherein the electronic device includes a fan-out type package.