electronic equipment, the heat as a causative factor is a major problem. Thus, there has been an increase in demand for a highly thermally conductive adhesive that conducts heat evolved from electronic parts without loss from the parts and circuit boards to the housing and heat sinks.

[0003]

As a material used for the highly thermally conductive adhesive, a resin composition prepared by adding high heat dissipation inorganic filler to a thermosetting resin such as an epoxy resin to increase the thermal conductivity has been proposed (See, for example, Patent Literature 1 and 2). Moreover, with regard to adhesives containing a polyimide resin or a polyimide silicone resin, an adhesive composition improved in thermal conductivity, heat resistance and adhesive properties by addition of high heat dissipation inorganic filler has been proposed (See, for example, Patent Literatures 3, 4 and 5).

Citation List

Patent Literature

[0004]

Patent Literature 1: Japanese Patent Laid-Open No. 2008-266378

Patent Literature 2: Japanese Patent Laid-Open No. 2009-292881

Patent Literature 3: Japanese Patent Laid-Open No. 2010-84072

Patent Literature 4: Japanese Patent Laid-Open No. 2005-113059

Patent Literature 5: United States Patent Publication No. 2007/098995.

Summary of Invention

Technical Problem

[0005]

However, there are problems such that when an inorganic filler is incorporated into the conventional composition in large quantities, the thermal conductivity is not significantly enhanced because the dispersibility of the filler in resins deteriorates, and the toughness and adhesive properties are remarkably lowered.

[0006]

Thus, an object of the present invention is to provide an adhesive composition being capable of controlling the dispersibility of a thermally conductive filler, having high thermal conductivity and being excellent in adhesion to heating elements and heat sink materials.

Solution to Problem

[0007]

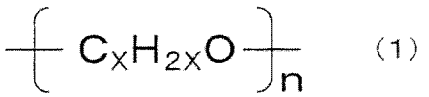
In order to solve the above-mentioned problems, the present invention is directed to an adhesive composition

Claims

[Claim 1]

An adhesive composition containing an organic-solvent-soluble polyimide (A), an epoxy resin (B) and a thermally conductive filler (C), an organic-solvent-soluble polyimide (A) containing a structure represented by the following general formula (1) as a component derived from a diamine, and the content of a thermally conductive filler (C) in the adhesive composition being not less than 60% by volume, and wherein the thermally conductive filler (C) includes a filler that the pH of the liquid prepared when 10 g of the thermally conductive filler is added to 100 g of water is not more than 6.0.

[Formula 1]



(1)

(In general formula (1), X represents an integer of 1 to 10 inclusive and n represents an integer of 1 to 20 inclusive.)

[Claim 2]

The adhesive composition according to claim 1, wherein the thermally conductive filler (C) includes two or more fillers differing in the average particle diameter and at least one filler has an average particle diameter of 6 μm or more.

[Claim 3]

The adhesive composition according to claim 1 or 2, wherein the thermally conductive filler (C) includes two or more fillers differing in the average particle diameter and contains at least a filler with an average particle diameter of 6 μm or more and 15 μm or less and a filler with an average particle diameter of 30 μm or more.

~~[Claim 4]~~

~~The adhesive composition according to any one of claims 1 to 3, wherein the thermally conductive filler (C) includes a filler that the pH of the liquid prepared when 10 g of the thermally conductive filler is added to 100 g of water is not more than 6.0.~~

[Claim 4~~5~~]

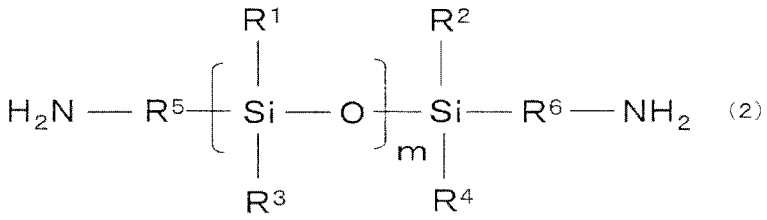
The adhesive composition according to any one of claims 1 to 3~~4~~, wherein the thermally conductive filler (C) includes alumina.

[Claim 5~~6~~]

The adhesive composition according to any one of claims 1 to 4~~5~~, wherein the organic-solvent-soluble polyimide (A) has a residue of a diamine represented by the following general

formula (2).

[Formula 2]



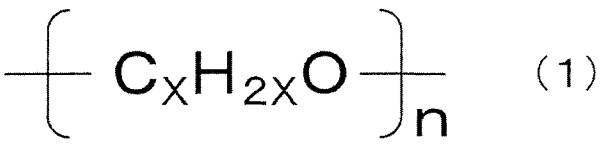
(2)

(In the general formula (2), m represents an integer of 1 to 30. Moreover, R^5 and R^6 may be the same or different and represent an alkylene group with 1 to 30 carbon atoms or a phenylene group. R^1 to R^4 each may be the same or different and represent an alkyl group with 1 to 30 carbon atoms, a phenyl group or a phenoxy group.)

[Claim 67]

An adhesive sheet containing an organic-solvent-soluble polyimide (A), an epoxy resin (B) and a thermally conductive filler (C), an organic-solvent-soluble polyimide (A) containing a structure represented by the following general formula (1) as a component derived from a diamine, and the content of a thermally conductive filler (C) in the sheet being not less than 60% by volume, and wherein the thermally conductive filler (C) includes a filler that the pH measured when 10 g of the thermally conductive filler is added to 100 g of water is not more than 6.0.

[Formula 3]



(1)

(In general formula (1), X represents an integer of 1 to 10 inclusive and n represents an integer of 1 to 20 inclusive.)

[Claim 7~~8~~]

The adhesive sheet according to claim 6~~7~~, wherein the thermally conductive filler (C) includes two or more fillers differing in the average particle diameter and at least one filler has an average particle diameter of 6 μm or more.

[Claim 8~~9~~]

The adhesive sheet according to claim 6~~7~~ or 7~~8~~, wherein the thermally conductive filler (C) includes two or more fillers differing in the average particle diameter and contains at least a filler with an average particle diameter of 6 μm or more and 15 μm or less and a filler with an average particle diameter of 30 μm or more.

~~[Claim 10]~~

~~The adhesive sheet according to any one of claims 7 to 9, wherein the thermally conductive filler (C) includes a filler~~

~~that the pH measured when 10 g of the thermally conductive filler is added to 100 g of water is not more than 6.0.~~

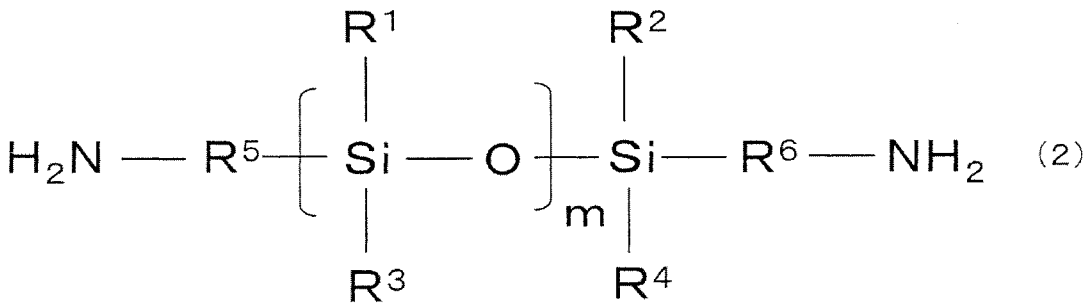
[Claim 9~~11~~]

The adhesive sheet according to any one of claims 6~~7~~ to 8~~10~~, wherein the thermally conductive filler (C) includes alumina.

[Claim 10~~12~~]

The adhesive sheet according to any one of claims 6~~7~~ to 9~~11~~, wherein the organic-solvent-soluble polyimide (A) has a residue of a diamine represented by the following general formula (2).

[Formula 4]



(2)

(In the general formula (2), m represents an integer of 1 to 30. Moreover, R^5 and R^6 may be the same or different and represent an alkylene group with 1 to 30 carbon atoms or a phenylene group. R^1 to R^4 each may be the same or different and represent an alkyl

group with 1 to 30 carbon atoms, a phenyl group or a phenoxy group.)

[Claim 11~~3~~]

A cured product of an adhesive composition according to any one of claims 1 to 5~~6~~ or of an adhesive sheet according to any one of claims 6~~7~~ to 10~~2~~.

[Claim 12~~4~~]

A semiconductor device comprising a cured product of an adhesive composition according to any one of claims 1 to 6~~5~~ or of an adhesive sheet according to any one of claims ~~7~~6 to 10~~2~~.