are 15 to 90 parts by weight and 0.1 to 50 parts by weight, respectively, with respect to 100 parts by weight of the epoxy compound (b), and an inorganic particle (d) content is 30 wt% or more but 80 wt% or less with respect to a total amount of (a) to (d).

[0007a]

According to a first aspect, there is provided an adhesive composition comprising:

an organic-solvent-soluble polyimide (a);

an epoxy compound (b);

hardening accelerator particles (c); and

inorganic particles (d), wherein an organic-solvent-soluble polyimide (a) content and a hardening accelerator particle (c) content are 15 to 90 parts by weight and 0.1 to 50 parts by weight, respectively, with respect to 100 parts by weight of the epoxy compound (b), the content ratio of the inorganic particles (d) to the hardening accelerator particles (c) (i.e., (d)/(c)) is larger than 2.0 but 4,000 or less, and the inorganic particles (d) have an average particle size of 10 nm or more but 1 μm or less, and the inorganic particles (d) content is 30 wt% or more but 80 wt% or less with respect to a total amount of (a) to (d).

[0007b]

According to a second aspect, there is provided an adhesive sheet obtained by forming the adhesive composition as defined above into a sheet shape.

[0007c]

According to a third aspect, there is provided a hardened article of the adhesive composition as defined above or of the adhesive sheet as defined above.

[0007d]

According to a fourth aspect, there is provided a circuit board comprising a semiconductor chip bonded thereto using the adhesive composition as defined above or the adhesive sheet as defined above.

[0007e]

According to a fifth aspect, there is provided a method for producing a circuit board comprising a semiconductor chip mounted thereon, the method comprising: interposing the adhesive composition as defined above or the adhesive sheet as defined above between a semiconductor chip and a circuit board; and electrically connecting the semiconductor chip and the circuit board to each other through application of heat and pressure.

[0007f]

According to a sixth aspect, there is provided a semiconductor device having a hardened article of the adhesive composition as defined above or a hardened article of the adhesive sheet as defined above.

[0007g]

According to a seventh aspect, there is provided a method for producing a semiconductor device, the method comprising: interposing the adhesive composition as defined above or the adhesive sheet as defined above between a first circuit member and a second circuit member; and electrically connecting the first circuit member and the second circuit member to each other through application of heat and pressure.

EFFECTS OF THE INVENTION

[0008]

According to the present invention, it is possible to obtain an adhesive composition excellent in both storage stability and connection reliability.

BRIEF DESCRIPTION OF THE DRAWING

[0009]

Fig. 1 is a schematic diagram of a circuit board with a semiconductor having three silicon interposer layers.

MODE FOR CARRYING OUT THE INVENTION

[0010]

An adhesive composition according to the present invention comprises: an organic-solvent-soluble polyimide (a); an epoxy compound (b); hardening accelerator particles (c); and inorganic particles (d), wherein an organic-solvent-soluble polyimide (a) content and a hardening accelerator particle (c) content are 15 to 90 parts by weight

preferably phenolic hydroxyl groups, sulfonic acid groups, or thiol groups. By setting the ratio of these groups to the total of R^5s and R^6s to 20% or more, it is possible to improve chemical resistance and heat resistance, and by setting the ratio to 90% or less, it is possible to suppress the cross-linking density within an appropriate range to maintain the elongation and toughness of film.

[0047]

X as a structural component of the general formulas (3), (5), and (6) is a component derived from a primary monoamine that is an end capping agent~~, and may be either a single end capping group or a combination of two or more end capping groups~~. The primary monoamine is preferably an aromatic amine, and specific examples thereof include 5-aminoquinoline, 4-aminoquinoline, 3-aminonaphthalene, 2-aminonaphthalene, 1-aminonaphthalene, and aniline. Among them, aniline is preferably used.

[0048]

As the primary monoamine, one not having another substituent that reacts with the epoxy compound is preferably used. This makes it possible to obtain an organic-solvent-soluble polyimide not having a substituent that reacts with the epoxy compound at the end of the polyimide having high molecular mobility. The use of such an organic-solvent-soluble polyimide makes it possible to

weight-average molecular weight of the organic-solvent-soluble polyimide as measured by gel filtration chromatography is preferably 4,000 to 80,000, particularly preferably 8,000 to 60,000. By setting m to 8 or more, it is possible to increase the viscosity of the adhesive composition to achieve a thick coating, and by setting m to 200 or less, it is possible to improve the solubility of the adhesive composition in a solvent. Here, the weight-average molecular weight of the organic-solvent-soluble polyimide (a) can be determined in the following manner. A polyimide solution having a solid concentration of 0.1 wt% is prepared by dissolving the soluble polyimide in N-methylpyrrolidone (NMP), and the polystyrene equivalent weight-average molecular weight of the soluble polyimide is calculated using the polyimide solution and a GPC apparatus Waters 2690 (manufactured by Waters Corporation). GPC measurement is performed using NMP containing 0.05 mol/L of LiCl and 0.05 mol/L of phosphoric acid dissolved therein as a mobile phase at a developing speed of 0.4 mL/min. A GPC measurement system used includes, for example, the following.

Detector: Waters 996

System controller: Waters 2690

Column oven: Waters HTR-B

Thermo controller: Waters TCM

Columns: TOSOH grard column, TOSOH TSK-GEL α-4000, TOSOH TSK-GEL