glycol monoethyl ether acetate, diethylene glycol monopropyl ether acetate, diethylene glycol monobutyl ether acetate, methyl acetate, ethyl acetate, butyl acetate, isobutyl acetate, acetate-tert-butyl, ethyl pyruvate, methyl 3-methoxypropionate, ethyl 3-ethoxypropionate, tert-butyl propionate, 3-methoxybutyl acetate, and ethyl-3-ethoxypropionate; lactone solvents, such as γ-butyrolactone; nitrile solvents, such as acetonitrile; halogen-based solvents, such as methyl chloride, methylene chloride, chloroform, carbon tetrachloride, 1,2-dichloroethane, and 1,1,2,2-tetrachloroethane; polar nonprotic solvents, such as N-methylpyrrolidone, N,N'-dimethylformamide, N,N'-dimethylacetamide, dimethyl sulfoxide, and hexamethylphosphoramide; and the like.

[0152]

The organic solvent is added in an amount within preferably 20 parts by mass or more and 500 parts by mass or less, more preferably 25 parts by mass or more and 100 parts by mass or less, per 100 parts by mass of the total amount of the polyurethane constituent components (polyisocyanate, high-molecular-weight polyol, chain extender, crosslinking agent).

[0153]

The organic solvent may be removed by distillation under reduced pressure or by crystallization after the polymerization reaction, or may be applied to a conductive paste composition in a form of polyurethane solution without being removed.

[0154]

Catalyst

In the polyurethane synthesis, a catalyst is preferably added to promote the urethane bond formation reaction, as necessary.

[0157]

Examples of the ammonium salt-based catalysts include quaternary ammonium salts, such as tetraethyl hydroxyl ammonium; ammonium salts of 1,8-diazabicyclo(5,4,0)-undecene-7 or 1,5-diazabicyclo(4,3,0)-nonene-5 with octylic acid, oleic acid, p-toluenesulfonic acid, formic acid, phenolic acid, ortho-phthalic acid, acetic acid, maleic acid, or boric acid; and the like.

[0158]

Examples of the potassium salt-based catalysts include potassium carbonate, potassium acetate, potassium octylate, and the like.

[0159]

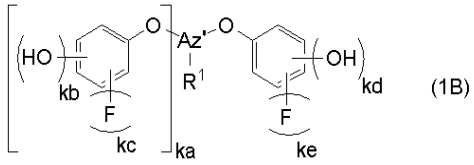
Examples of the organometallic catalysts include: organotin compounds, such as tin acetate, tin octylate (tin 2-ethylhexaonate), tin oleate, tin laurate, dibutyltin diacetate, dimethyltin dilaurate, dibutyltin dilaurate, dibutyltin dimercaptide, dibutyltin maleate, dibutyltin dineodecanoate, dioctyltin dimercaptide, dioctyltin dilaurate, dibutyltin dichloride; organolead compounds, such as lead octoate and lead naphthenate; organonickel compounds, such as nickel naphthenate; organocobalt compounds, for example, cobalt naphthenate; organocopper compounds, such as copper octenoate; organobismuth compounds, such as bismuth octylate and bismuth neodecanoate; and the like.

[0160]

Since the polyurethane used as the elastomer as the component (C) of the present invention contains the structures represented by the general formulae (1a) to (1c), and therefore may be capable of inhibiting the activity of a basic catalyst, it is preferable to use an organometallic

CLAIMS

1. A conductive paste composition, comprising (A) a conductive filler, (B) a phenol compound, (C) an elastomer resin, and (D) a solvent, wherein the phenol compound as the component (B) is the phenol compound represented by the following general formula (1B),

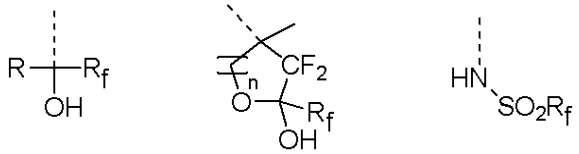


(1B)

wherein Az’ represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or fluorinated hydrocarbon group having 1 to 19 carbon atoms, and -$CH_2$- constituting the (ka+2)-valent hydrocarbon group is optionally substituted with -O-, -C(=O)- or -Si($R^2R^3$)-; “ka” represents 0 or 1, “kb”, “kc”, “kd”, and “ke” each represent 1 or 2; $R^1$ represents a hydrogen atom, a halogen atom, a cyano group, or a hydroxyl group; and each of $R^2$ and $R^3$ is a linear, branched, or cyclic alkyl group having 1 to 6 carbon atoms, or a phenyl group.

2. The conductive paste composition according to claim 1, wherein the elastomer resin as the component (C) is polyurethane.

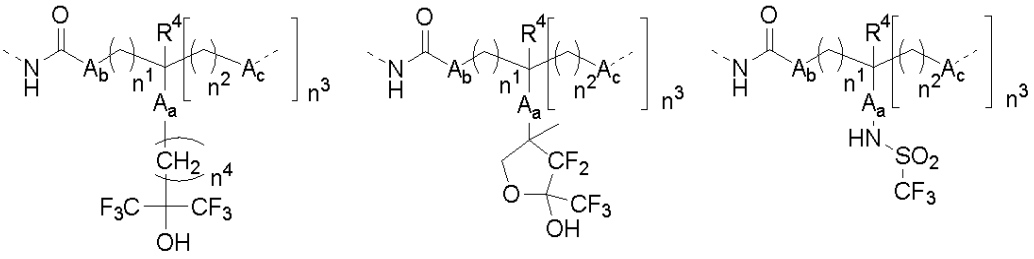
3. The conductive paste composition according to claim 2, wherein the elastomer resin as the component (C) is a polyurethane comprising a structure represented by the following general formulae (1a) to (1c),



(1a) (1b) (1c)

wherein R represents a hydrogen atom, a fluorine atom, or a linear, branched, or cyclic hydrocarbon group having 1 to 10 carbon atoms optionally substituted with a fluorine atom; $R_f$ represents a fluorine atom, or a linear, branched, or cyclic fluorinated hydrocarbon group having 1 to 10 carbon atoms; “n” is an integer of 1 or 2; and a dashed line represents a bonding arm.

4. The conductive paste composition according to claim 3, wherein the elastomer resin as the component (C) is a polyurethane comprising a structure represented by the following general formulae (2a) to (2c),



(2a) (2b) (2c)

wherein $R^4$ is a hydrogen atom or a monovalent hydrocarbon group having 1 to 3 carbon atoms; $A_a$ represents a single bond, or a linear, branched, or cyclic divalent hydrocarbon group having 1 to 20 carbon atoms; and $-CH_2-$ constituting $A_a$ is optionally substituted with -O-, -C(=O)-, -C(=O)O- or $-C_6H_4-$, or $-NR^8-C(=O)-$; $R^8$ is a hydrogen atom, or a linear or branched alkyl group having 1 to 4 carbon atoms; $A_b$ represents -O-, $-NR^8-$, or -C(=O)O-; $A_c$ represents -O-, $-NR^8-$, -C(=O)O-, or $-NR^8-C(=O)-$; each of $n^1$, $n^2$, and $n^4$ is

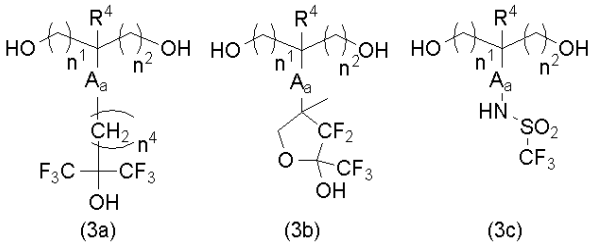
an integer of 0 to 10; $n^3$ is an integer of 0 or 1; and a dashed line represents a bonding arm.

5. The conductive paste composition according to any one of claims 1 to 4, wherein the conductive filler as the component (A) is contained in a proportion exceeding 70 parts by mass relative to 100 parts by mass of a total of the components (A) and (C).

6. The conductive paste composition according to any one of claims 1 to 5, wherein the conductive filler as the component (A) is selected from the group consisting of gold, silver, silver chloride, platinum, copper, tin, iron, titanium, nickel, palladium, aluminum, tungsten, molybdenum, ruthenium, chromium, indium, solder, carbon, and composites thereof.

7. The conductive paste composition according to any one of claims 1 to 6, wherein the conductive filler as the component (A) is a silver powder having an average particle size of 5 nm to 10 μm.

8. A method for producing the conductive paste composition according to claim 4, wherein the elastomer resin as the component (C) is produced using an alcohol represented by the following general formulae (3a) to (3c) as a chain extender,




(3a) (3b) (3c)

wherein $R^4$, $A_a$, $n^1$, $n^2$ and $n^4$ are as defined above.

9. A conductive wire formed on a substrate, the conductive wire comprising a baked product of the conductive paste composition according to any one of claims 1 to 7.

10. The conductive wire according to claim 9, wherein the substrate is stretchable.

11. The conductive wire according to claim 9 or 10, wherein the substrate is a thermoplastic polyurethane.

12. The conductive wire according to any one of claims 9 to 11, wherein a change in electric resistance upon 20% elongation is 500% or less.

13. The conductive wire according to any one of claims 9 to 12, wherein a maximum electric resistance when the conductive wire is elongated and shrunk repeatedly 1000 times with an elongation ratio of 20% is 5000% or less of an electric resistance before the elongations and the shrinkages.

14. A method for producing a conductive wire by using the conductive paste composition according to any one of claims 1 to 7 to form a conductive wire on a substrate, wherein the conductive wire is formed with a baking temperature of 60°C to 160°C.

15. A method for producing a conductive wire, comprising printing the conductive paste composition according to any one of claims 1 to 7, followed by heating to form a conductive wire on a substrate.