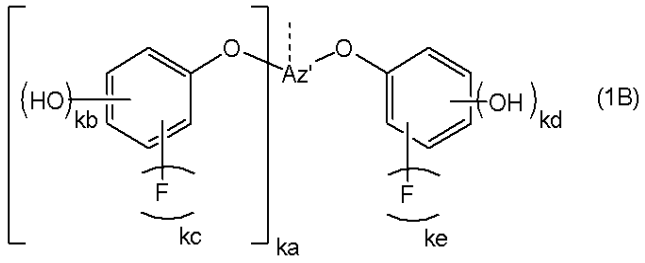
CLAIMS

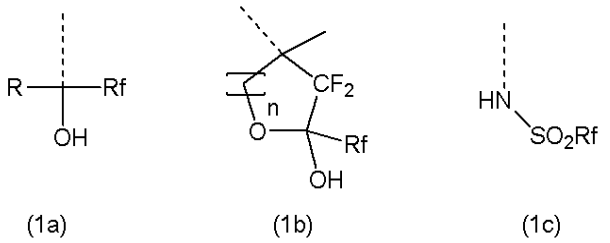
1. A polyurethane comprising a phenolic hydroxyl group represented by the following general formula (1B),



(1B)

wherein Az’ represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or a fluorinated hydrocarbon group having 1 to 19 carbon atoms, and $-CH_2-$ constituting the (ka+2)-valent hydrocarbon group is optionally substituted with -O-, $-NR^4-$, -C(=O)-, or $-Si(R^2R^3)-$; “ka” represents an integer of 0 to 2; “kb”, “kc”, “kd”, and “ke” each represent 1 or 2; 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; R^4 is a hydrogen atom, or a linear or branched alkyl group having 1 to 4 carbon atoms; and a dashed line represents a bonding arm.

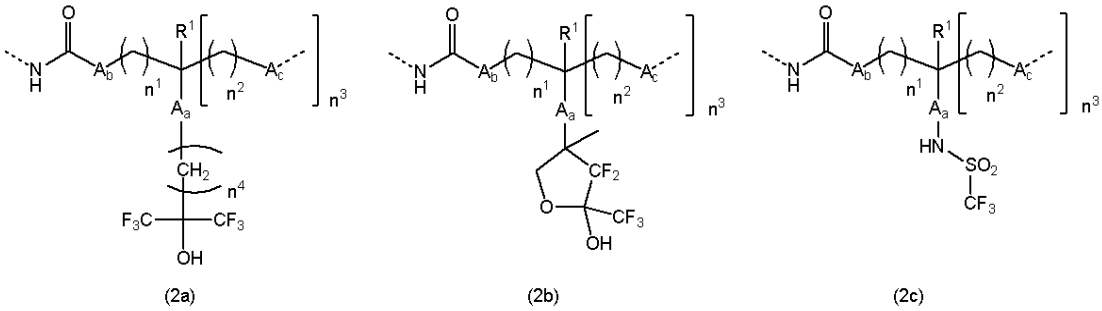
2. The polyurethane according to claim 1, further comprising one or more weakly acidic functional group represented by the following general formulae (1a) to (1c),



(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; Rf 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.

3. The polyurethane according to claim 1 or 2, further comprising one or more structures represented by the following general formulae (2a) to (2c),

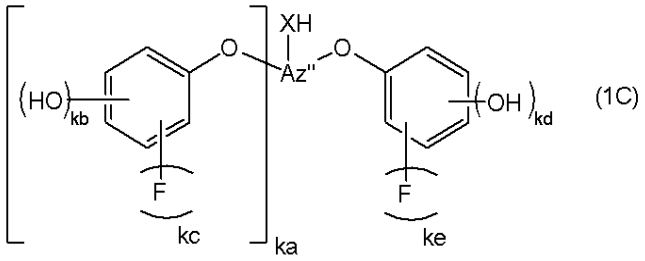


(2a) (2b) (2c)

wherein R^1 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 is optionally $-NR^4-C(=O)-$; each of A_b and A_c independently represents any group selected from the group consisting of -O-, -O-C(=O)-NR^4-, $-NR^4-$, and -

C(=O)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; R^4 is as defined above; and a dashed line represents a bonding arm.

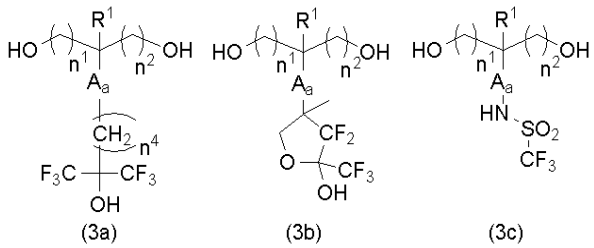
4. A method for producing the polyurethane according to claim 1, comprising introducing the phenolic hydroxyl group to a polyurethane by using an alcohol or amine represented by the following general formula (1C) after a chain extension reaction,



(1C)

wherein Az" represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or a 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 $-Si(R^2R^3)-$; X represents an oxygen atom or NR^4; "ka" represents an integer of 0 to 2; "kb", "kc", "kd", and "ke" each represent 1 or 2; and R^2, R^3, and R^4 are as defined above.

5. The method for producing the polyurethane according to claim 4, comprising introducing a weakly acidic functional group to a polyurethane by using one or more alcohols represented by the following general formulae (3a) to (3c) as a chain extender,



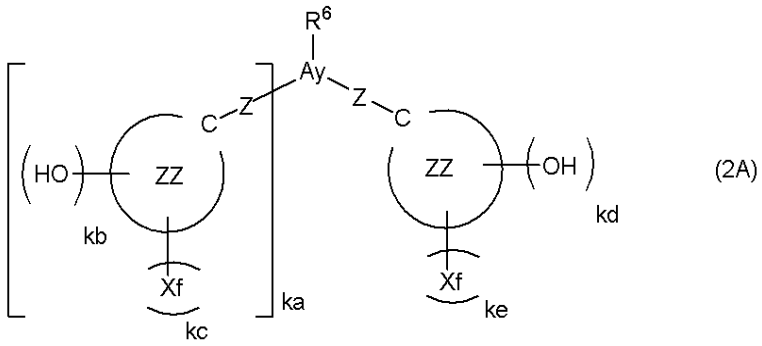
(3a) (3b) (3c)

wherein R^1 is a hydrogen atom or a monovalent hydrocarbon group having 1 to 3 carbon atoms; A_a is 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 is optionally $-NR^4-C(=O)-$; R^4 is a hydrogen atom, or a linear or branched alkyl group having 1 to 4 carbon atoms; and each of n^1, n^2, and n^4 is an integer of 0 to 10.

6. A conductive paste composition comprising (A) a conductive filler, (B) the polyurethane according to any one of claims 1 to 3, and (C) a solvent.

7. The conductive paste composition according to claim 6, further comprising (D) a phenol compound.

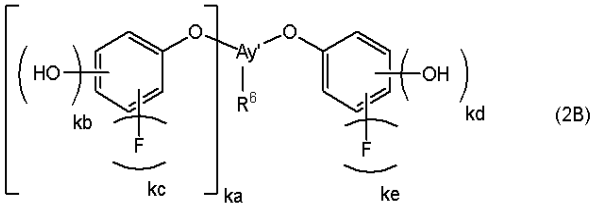
8. The conductive paste composition according to claim 7, wherein the phenol compound as the component (D) comprises a structure represented by the following general formula (2A),



(2A)

wherein R^6 represents a hydrogen atom, a halogen atom, a cyano group, or a hydroxyl group; Ay represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or a fluorinated hydrocarbon group having 1 to 20 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 an integer of 0 to 2; “kb” and “kd” each represent 1 or 2; “kc” and “ke” each represent an integer of 0 to 2; Z represents a single bond or an oxygen atom; each Xf independently represents a hydrogen atom, a halogen atom, a linear, branched, or cyclic monovalent hydrocarbon group having 1 to 10 carbon atoms optionally substituted with a fluorine atom, an alkoxy group having 1 to 10 carbon atoms optionally substituted with a fluorine atom, or an electron-withdrawing group; each of ring ZZ independently represents an aromatic monocyclic or polycyclic ring having 5 to 20 carbon atoms; each carbon atom of the ring ZZ is optionally substituted with a nitrogen atom, an oxygen atom, or a sulfur atom; R^2, and R^3 are as defined above.

9. The conductive paste composition according to claim 8, wherein the phenol compound as the component (D) comprises a structure represented by the following general formula (2B),



(2B)

wherein Ay’ represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or a 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 an integer of 0 to 2; “kb”, “kc”, “kd”, and “ke” each represent 1 or 2; and R^2, R^3, and R^6 are as defined above.

10. The conductive paste composition according to any one of claims 6 to 9, 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 (B).

11. The conductive paste composition according to any one of claims 6 to 10, wherein the conductive filler as the component (A) is a powder selected from the group consisting of gold, silver, silver chloride, platinum, copper, tin, iron, magnesium, titanium, nickel, palladium, aluminum, tungsten, molybdenum, ruthenium, chromium, indium, solder, carbon, and composites thereof.

12. The conductive paste composition according to claim 11, wherein the conductive filler as the component (A) is a silver powder.

13. The conductive paste composition according to any one of claims 6 to 12, wherein the conductive filler as the component (A) has an average particle size of 5 nm to 10 μm.

14. 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 6 to 13.

15. The conductive wire according to claim 14, wherein the substrate is stretchable.

16. The conductive wire according to claim 15, wherein the substrate is a thermoplastic polyurethane.

17. The conductive wire according to claim 15 or 16, wherein electric resistance upon 20% elongation is 500% or less of electric resistance before the elongation.

18. The conductive wire according to any one of claims 15 to 17, 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 electric resistance before the elongations and shrinkages.

19. A method for producing a conductive wire by using the conductive paste composition according to any one of claims 6 to 13 to form a conductive wire on a substrate, wherein the conductive wire is formed with a baking temperature of 60 to 160°C.

20. A method for producing a conductive wire, comprising printing the conductive paste composition according to any one of claims 6 to 13 to form a conductive wire on a substrate.