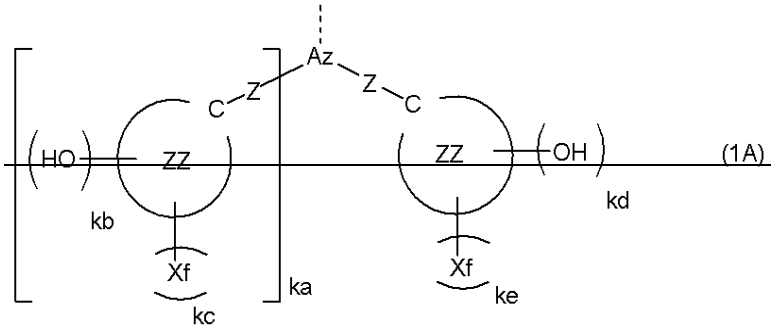
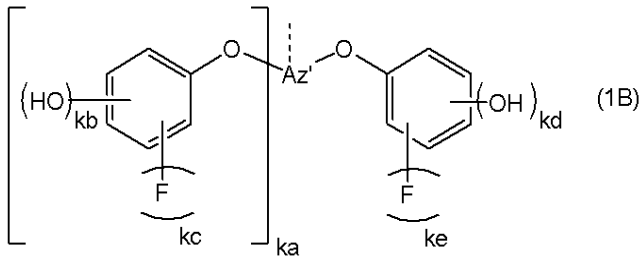
CLAIMS

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

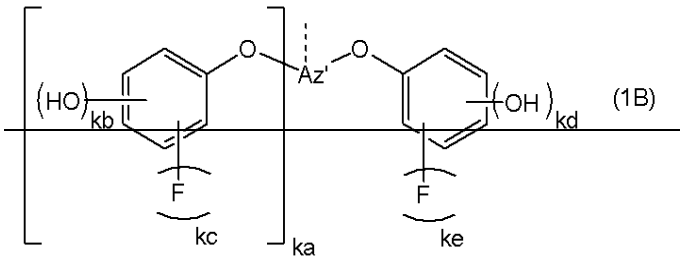




wherein ~~Az~~ Az' represents a linear, branched, or cyclic (ka+2)-valent hydrocarbon group or a fluorinated hydrocarbon group having 1 to ~~20~~ 19 carbon atoms, and -CH_2- constituting the (ka+2)-valent hydrocarbon group is optionally substituted with -O-, -NR^4-, -C(=O)-, or -$Si(R^2R^3)$-; ~~each 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; 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~~

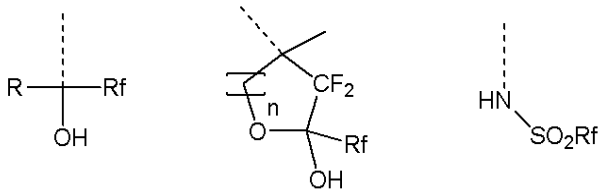
~~with a fluorine atom, an alkoxy group having 1 to 10 carbon atoms optionally substituted with a fluorine atom, or an electron-withdrawing group; each of ring ZZ independently represents an aromatic monocyclic or polycyclic ring having 5 to 20 carbon atoms; each carbon atom of the ring ZZ is optionally substituted with a nitrogen atom, an oxygen atom, or a sulfur atom;~~ "ka" represents an integer of 0 to 2; "kb", ~~and "kd" each represent 1 or 2;~~ "kc", "kd", and "ke" each represent ~~an integer of 0 to 2~~ 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, comprising a phenolic hydroxyl group represented by the following general formula (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; R^2, R^3, and R^4 are as defined above; and a dashed line represents a bonding arm.~~

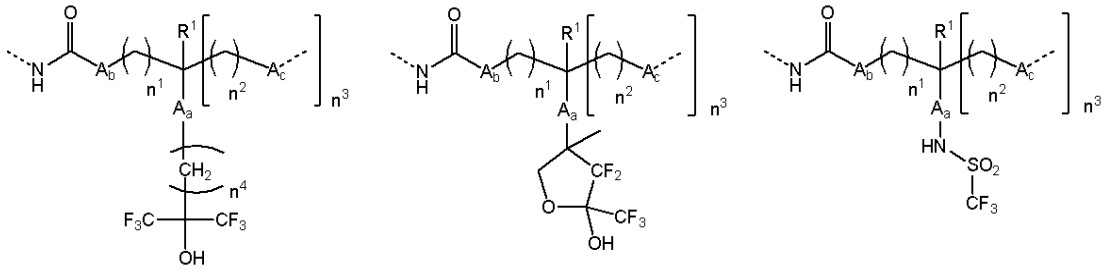
~~3.~~ 2. The polyurethane according to claim 1~~ or 2~~, further comprising one or more weakly acidic functional group represented by the following general formulae (1a) to (1c),



(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.

~~4.~~ 3. The polyurethane according to~~ any one of~~ claim~~s~~ 1 ~~to 3~~ or 2, further comprising one or more structures represented by the following general formulae (2a) to (2c),

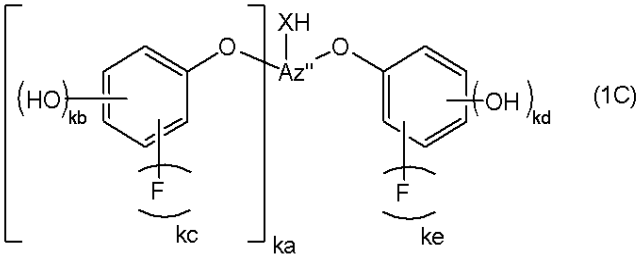


(2a) (2b) (2c)

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.

~~5.~~ 4. A method for producing the polyurethane according to claim ~~2~~ 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,

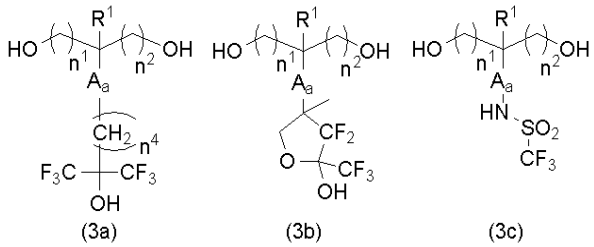


(1C)

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.

~~6.~~ 5. The method for producing the polyurethane according to claim ~~5~~ 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,

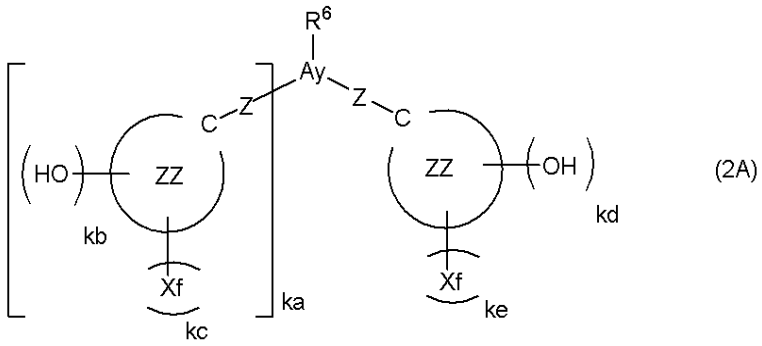


wherein R^1 is a hydrogen atom or a monovalent hydrocarbon group having 1 to 3 carbon atoms; A_a is a single bond, or a linear, branched, or cyclic divalent hydrocarbon group having 1 to 20 carbon atoms, and $-CH_2-$ constituting A_a is optionally substituted with -O-, -C(=O)-, -C(=O)O-, or $-C_6H_4-$, 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.

~~7.~~ 6. A conductive paste composition comprising (A) a conductive filler, (B) the polyurethane according to any one of claims 1 to ~~4~~ 3, and (C) a solvent.

~~8.~~ 7. The conductive paste composition according to claim ~~7~~ 6, further comprising (D) a phenol compound.

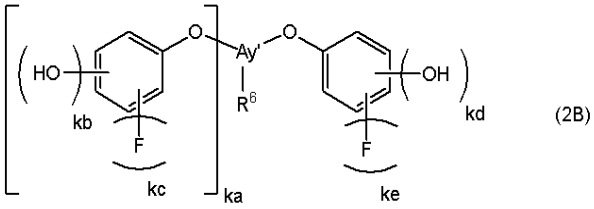
~~9.~~ 8. The conductive paste composition according to claim ~~8~~ 7, wherein the phenol compound as the component (D) comprises a structure represented by the following general formula (2A),



(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; ~~and~~ $Z_{\prime}$ represents a single bond or an oxygen atom; each $Xf_{\prime}$ 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 $ZZ_{\prime}$ 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.

~~10.~~ 9. The conductive paste composition according to claim ~~9~~ 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.

~~11.~~ 10. The conductive paste composition according to any one of claims ~~7 to 10~~ 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).

~~12.~~ 11. The conductive paste composition according to any one of claims ~~7 to 11~~ 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.

~~13.~~ 12. The conductive paste composition according to claim ~~12~~ 11, wherein the conductive filler as the component (A) is a silver powder.

~~14.~~ 13. The conductive paste composition according to any one of claims ~~7 to 13~~ 6 to 12, wherein the conductive filler as the component (A) has an average particle size of 5 nm to 10 μm.

~~15.~~ 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 ~~7 to 14~~ 6 to 13.

~~16.~~ 15. The conductive wire according to claim ~~15~~ 14, wherein the substrate is stretchable.

~~17.~~ 16. The conductive wire according to claim ~~16~~ 15, wherein the substrate is a thermoplastic polyurethane.

~~18.~~ 17. The conductive wire according to claim ~~16 or 17~~ 15 or 16, wherein electric resistance upon 20% elongation is 500% or less of electric resistance before the elongation.

~~19.~~ 18. The conductive wire according to any one of claims ~~16 to 18~~ 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.

~~20.~~ 19. A method for producing a conductive wire by using the conductive paste composition according to any one of claims ~~7 to 14~~ 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.

~~21.~~ 20. A method for producing a conductive wire, comprising printing the conductive paste composition according to any one of claims ~~7 to 14~~ 6 to 13 to form a conductive wire on a substrate.