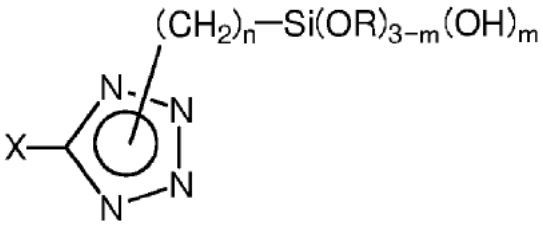
CLAIMS

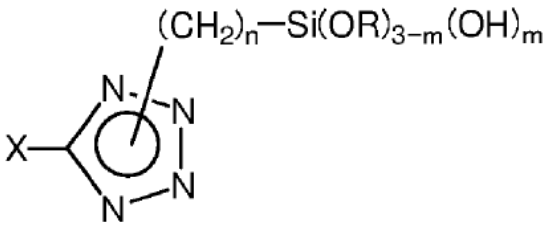
1. A silane coupling agent comprising a tetrazole silane compound represented by the following chemical formula (IV) as a component:



(IV)

wherein in formula (IV), X represents a hydrogen atom, a linear or branched alkyl group having a carbon number of 1 to 12, an aryl group, an aralkyl group, an alkylthio group having a carbon number of 1 to 6, or an amino group which may have a substituent; n represents an integer of 1 to 12; R represents a methyl group or an ethyl group; and m represents an integer of 1 to 3.

2. A surface treatment solution comprising a tetrazole silane compound represented by the following chemical formula (IV):



(IV)

wherein in formula (IV), X represents a hydrogen atom, a linear or branched alkyl group having a carbon number of 1 to 12, an aryl group, an aralkyl group, an alkylthio group having a carbon number of 1 to 6, or an amino group which may have a substituent; n represents an integer of 1 to 12; R represents a methyl group or an ethyl group; and m represents an integer of 1 to 3.

3. The surface treatment solution according to Claim 2, which is used for treating a surface of at least one material selected from the group consisting of a metal, an inorganic material and a resin material.

4. The surface treatment solution according to Claim 2, which is used for bonding two materials selected from the group consisting of a metal, an inorganic material and a resin material.

5. The surface treatment solution according to Claim 3, wherein the metal is at least one selected from the group consisting of copper, aluminum, titanium, nickel, tin, iron, silver, gold, and alloys thereof.

6. The surface treatment solution according to Claim 3, wherein the metal is copper or a copper alloy.

7. The surface treatment solution according to Claim 3, wherein the inorganic material is at least one selected from the group consisting of silicon, a ceramic, a glass and an inorganic salt.

8. The surface treatment solution according to Claim 7, wherein the ceramic is at least one selected from the group consisting of alumina, silicon carbide, aluminum nitride, silicon nitride, and barium titanate.

9. The surface treatment solution according to Claim 3, wherein the resin material is at least one selected from the group consisting of an acrylate resin, an epoxy resin, an olefin resin, a polybenzoxazole resin, a silicone resin, and a polyimide resin.

10. A surface treatment method of metal, comprising bringing the surface treatment solution described in Claim 2 into contact with a surface of a metal.

11. The surface treatment method of metal according to Claim 10, wherein the metal is at least one selected from the group consisting of copper, aluminum, titanium, nickel, tin, iron, silver, gold, and alloys thereof.

12. The surface treatment method of metal according to Claim 10, wherein the metal is copper or a copper alloy.

13. The surface treatment method of metal according to Claim 12, comprising, before bringing the surface treatment solution into contact with a surface of copper or a copper alloy, bringing an aqueous solution containing a copper ion into contact with the surface of the copper or the copper alloy.

14. The surface treatment method of metal according to Claim 12, comprising, after bringing the surface treatment solution into contact with a surface of copper or a copper alloy, bringing an aqueous acidic solution or an aqueous alkaline solution into contact with the surface of the copper or the copper alloy.

15. A surface treatment method of an inorganic material, comprising bringing the surface treatment solution described in Claim 2 into contact with a surface of an inorganic material.

16. The surface treatment method of an inorganic material according to Claim 15, wherein the inorganic material is at least one selected from the group consisting of silicon, a ceramic, a glass and an inorganic salt.

17. The surface treatment method of an inorganic material according to Claim 16, wherein the ceramic is at least one selected from the group consisting of alumina, silicon carbide, aluminum nitride, silicon nitride, and barium titanate.

18. A surface treatment method of a resin material, comprising bringing the surface treatment solution described in Claim 2 into contact with a surface of a resin material.

19. The surface treatment method of a resin material according to Claim 18, wherein the resin material is at least one selected from the group consisting of an acrylate resin, an epoxy resin, an olefin resin, a polybenzoxazole resin, a silicone resin, and a polyimide resin.

20. A bonding method between a metal and a resin material, comprising bringing the surface treatment solution described in Claim 2 into contact with at least one of a metal and a resin

material to form a chemical film, and bonding the metal and the resin material to each other through the chemical film.

21. A bonding method between an inorganic material and a resin material, comprising bringing the surface treatment solution described in Claim 2 into contact with at least one of an inorganic material and a resin material to form a chemical film, and bonding the inorganic material and the resin material to each other through the chemical film.

22. A bonding method between a metal and an inorganic material, comprising bringing the surface treatment solution described in Claim 2 into contact with at least one of a metal and an inorganic material to form a chemical film, and bonding the metal and the inorganic material to each other through the chemical film.

23. A printed wiring board comprising two materials selected from the group consisting of a metal, an inorganic material and a resin material, bonded through a chemical film formed from the surface treatment solution described in Claim 2.

24. A semiconductor wafer comprising two materials selected from the group consisting of a metal, an inorganic material and a resin material, bonded through a chemical film formed from the surface treatment solution described in Claim 2.

25. An electronic device comprising two materials selected from the group consisting of a metal, an inorganic material and a resin material, bonded through a chemical film formed from the surface treatment solution described in Claim 2.

26. An insulating composition comprising the silane coupling agent described in Claim 1 and a resin material or an inorganic material.

27. The insulating composition according to Claim 26, wherein the resin material is at least one selected from the group consisting of an acrylate resin, an epoxy resin, an olefin resin, a polybenzoxazole resin, a silicone resin, and a polyimide resin.

28. The insulating composition according to Claim 26, wherein the inorganic material is at least one selected from the group consisting of silicon, a ceramic, a glass and an inorganic salt.

29. An insulating material comprising the insulating composition described in Claim 26.

30. A printed wiring board comprising an insulating layer obtained from the insulating composition described in Claim 26.

31. A semiconductor wafer comprising an insulating layer obtained from the insulating composition described in Claim 26.

32. An electronic device comprising an insulating layer obtained from the insulating composition described in Claim 26.