

talc, aluminum hydroxide and calcium carbonate, and organic fillers such as cured epoxy resin, crosslinked benzoguanamine resin and crosslinked acrylic polymer.

[0253] The adhesion-aiding layer may also include one or more additives of various kinds as necessary, such as a colorant, a flame retardant, a tackifier, a silane coupling agent, an antioxidant, an ultraviolet absorbent, or the like.

[0254] When such a material as described above is added to the adhesion-aiding layer, an addition amount of each material is in the range of preferably 0 to 200% by mass and more preferably 0 to 80% by mass, with respect to the amount of the resin as a main component. When the adhesion-aiding layer and the substrate that are adjacent to each other have the same or similar physical properties with respect to heat or electricity, these additives may not be added. When the above amount of the additive is more than 200% by mass, properties that are inherent to the resin, such as strength, may deteriorate.

[0255] The adhesion-aiding layer preferably includes, as mentioned above, a resin composition and a compound that generates radicals upon exposure with light.

[0256] In the invention, known photopolymerization initiators or light-sensitive resins can be used as the compound that generates radicals upon exposure with light.

[0257] Examples of the photopolymerization initiator include acetophenones such as p-tert-butyl trichloroacetophenone, 2,2'-diethoxyacetophenone, and 2-hydroxy-2-methyl-1-phenylpropan-1-one; ketones such as benzophenone, 4,4'-bisdimethylaminobenzophenone, 2-chlorothioxanthone, 2-methylthioxanthone, 2-ethylthioxanthone, and 2-isopropylthioxanthone; benzoin ethers such as benzoin methyl ether, benzoin isopropyl ether, and benzoin isobutyl ether; benzyl ketals such as benzyl dimethyl ketal and hydroxycyclohexyl phenyl ketone; sulfonium salts such as triphenyl sulfonium chloride, triphenyl sulfonium pentafluoro phosphate; and iodonium salts such as diphenyl iodonium chloride and diphenyl iodonium sulfate.

[0258] The photopolymerization initiator (compound that generates radicals upon exposure with light) is incorporated in the adhesion-aiding layer preferably at an amount of from 0.1 to 50% by mass, and more preferably from 1.0 to 30% by mass, in terms of solid content.

[0259] The thickness of the adhesion-aiding layer according to the invention is generally from 0.1 to 10 μm , and preferably from 0.5 to 7 μm . When the adhesion-aiding layer has a thickness within this range, a sufficient level of adhesion to the adjacent substrate or the layer to be plated can be achieved. Further, a level of adhesion equivalent to that of a layer formed from a commonly used adhesive can be achieved, in spite of a thinner layer than the layer formed from the adhesive.

[0260] The surface of the adhesion-aiding layer according to the invention preferably has a surface roughness R_z of 3 μm or less, more preferably 1 μm or less, as measured in accordance with a ten-point average height method as stipulated by JIS B 0601 (1994), from the viewpoint of improving the properties of the plated metal film to be formed on the adhesion-aiding layer.

[0261] When a surface roughness of the adhesion-aiding layer is within the above range, namely the adhesion-aiding layer has a smooth surface, the adhesion-aiding layer can be favorably used in the production of a printing circuit board having an extremely fine circuit (for example, a circuit pattern having a line/space value of 25/25 μm or less).

[0262] The adhesion-aiding layer can be formed on the substrate by a known method such as a coating method, a transfer method or a printing method.

[0263] If desired, the adhesion-aiding layer may be patterned by a printing method (such as gravure printing, screen printing, flexographic printing, inkjet printing and imprint method), a development method (such as wet etching, dry etching, ablation, curing/plasticizing (negative/positive) with light), or the like.

[0264] The adhesion-aiding layer having been formed on the substrate may be subjected to a curing process by applying energy of some kind. Examples of the energy to be applied include light, heat, pressure and electron beams, and heat or light is generally used in this embodiment. When energy is applied by heat, heating is preferably conducted at the temperature of from 100 to 300° C. for a period of from 5 to 120 minutes. The conditions for curing by heating may differ depending on the type of material for the substrate, the type of resin composition that forms the adhesion-aiding layer, or the curing temperatures of these materials, but are preferably selected from the temperature range of from 120 to 220° C. and the time range of from 20 to 120 minutes.

[0265] The curing treatment may be performed immediately after the formation of the adhesion-aiding layer. Alternatively, by conducting a pre-curing treatment for about 5 to about 10 minutes after the formation of the adhesion-aiding layer, the curing treatment can be performed after completion of all processes subsequent to the formation of the adhesion-aiding layer.

[0266] After formation of the adhesion-aiding layer, the surface of the same may be roughened by a dry or wet method in order to improve its adhesiveness with respect to the layer to be plated, which is to be formed on the adhesion-aiding layer. Examples of the dry roughening method include mechanical polishing such as buffing or sand blasting, and plasma etching. Examples of the wet roughening method include a chemical treatment using an oxidant such as permanganate, bichromate, ozone, hydrogen peroxide/sulfuric acid, or nitric acid; a strong base; or a resin-swelling solvent.

[0267] Step (2)

[0268] In step (2) of the method of producing a metal pattern material according to the invention, the uncured portion of the composition on the substrate is removed by developing with an aqueous solution to form a patterned layer to be plated.

[0269] Development with Aqueous Solution

[0270] Examples of the aqueous solution used in this step include an acidic aqueous solution, a neutral aqueous solution, and an alkali aqueous solution.

[0271] Examples of the acidic aqueous solution include an aqueous solution of hydrochloric acid, sulfuric acid or nitric acid.

[0272] Examples of the neutral aqueous solution include a surfactant that is dissolved in water. Anionic, nonionic or cationic surfactant may be used.

[0273] Of the aqueous solution, an alkali aqueous solution is preferable, and specific examples thereof include an aqueous solution of sodium hydroxide, potassium hydroxide, magnesium hydroxide, calcium hydroxide, sodium carbonate, potassium carbonate, magnesium carbonate, calcium carbonate, sodium hydrogen carbonate, potassium hydrogen carbonate, magnesium hydrogen carbonate and calcium hydrogen carbonate.