Claims

1. A varnish, comprising:

an olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer;

(a) a curing agent;

as an optional component, one or more selected from the group consisting of the following (b) to (c):

(b) one or a plurality of resins selected from the group consisting of a hydrocarbon-based elastomer, a polyphenylene ether-based resin, an olefin-aromatic vinyl compound-aromatic polyene copolymer, and an aromatic polyene-based resin, and

(c) a polar monomer; and

(d) a solvent, and

wherein the olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer satisfies all of the following conditions (1) to (4):

(1) a number average molecular weight of the copolymerized oligomer is 500 or more and less than 12000;

(2) the aromatic vinyl compound monomer is an aromatic vinyl compound having 8 or more and 20 or less carbon atoms, and a content of a unit of the aromatic vinyl compound monomer is 0 mass% or more and 90 mass% or less;

(3) the aromatic polyene is one or more selected from the group consisting of polyenes having 5 or more and 20 or less carbon atoms, and a content of the vinyl groups and/or the vinylene groups derived from a unit of the aromatic polyene is 1.5 pieces or more and less than 10 pieces per number average molecular weight; and

(4) the olefin is one or more selected from olefins having 2 or more and 20 or less carbon atoms, and a total of units of the olefin monomer, the aromatic vinyl compound, and the aromatic polyene monomer is 100 mass%.

2. The varnish according to claim 1, wherein the varnish has at least a resin concentration of 33 mass% or more and a viscosity measured at 25°C and 1 sec^{-1} of 2000 mPa·s or less.

3. A cured product of the varnish according to claim 1 or 2.

4. A cured product, comprising:

an olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer satisfying all of the following conditions (1) to (4):

(1) a number average molecular weight of the copolymerized oligomer is 500 or more and less than 12000;

(2) the aromatic vinyl compound monomer is an aromatic vinyl compound having 8 or more and 20 or less carbon atoms, and a content of a unit of the aromatic vinyl compound monomer is 0 mass% or more and 90 mass% or less;

(3) the aromatic polyene is one or more selected from polyenes having 5 or more and 20 or less carbon atoms and having a plurality of vinyl groups and/or vinylene groups in the molecule, and a content of the vinyl groups and/or the vinylene groups derived from a unit of the aromatic polyene is 1.5 pieces or more and less than 10 pieces per number average molecular weight; and

(4) the olefin is one or more selected from olefins having 2 or more and 20 or less carbon atoms, and a total of units of the olefin monomer, the aromatic vinyl compound, and the aromatic polyene monomer is 100 mass%; and

(a) a curing agent.

5. The cured product according to claim 4, further comprising one or more selected from the group consisting of the following (b) to (c):

(b) one or a plurality of resins selected from the group consisting of a hydrocarbon-based elastomer, a polyphenylene ether-based resin, an olefin-aromatic vinyl compound-aromatic polyene copolymer, and an aromatic polyene-based resin; and

(c) a polar monomer.

6. The cured product according to any one of claims 3 to 5, further comprising one or more selected from the group consisting of the following (e) to (g):

(e) a filler;

(f) a flame retardant; and

(g) a surface modifier.

7. The cured product according to any one of claims 3 to 6, being an electrically insulating material.

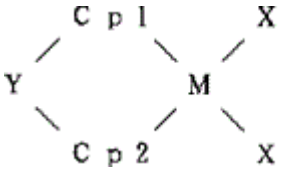
8. An electrically insulating material, comprising the cured product according to claim 7.

9. A CCL circuit board, an FCCL circuit board, an interlayer insulating layer or an interlayer adhesive layer, comprising the cured product according to claim 7.

10. A method for preparing a cured product, the method comprising the steps of:

providing a single-site-coordinated polymerization catalyst composed of a transition metal compound represented by the following general formula (1) and a co-catalyst:

Chemical Formula 1



(I)

wherein M is zirconium or hafnium;

Cp1 and Cp2 are cyclopentadienyl groups having no substituent, or cyclopentadienyl groups having one or two alkyl substituents having no cyclic structure; the Cp1 and Cp2 are the same or different from each other; one of the Cp1 and Cp2 groups is optionally an indenyl group having no substituent, or an indenyl group having one or two alkyl substituents having no cyclic structure;

Y is carbon, silicon, germanium or boron having a bond with Cp1 and Cp2 and having a hydrogen atom or a substituent; the substituents are different from each other or the same, and optionally have a cyclic structure;

X is selected from the group consisting of hydrogen, halogens, alkyl groups and aryl groups, or two X are bonded to each other to form a diene group;

reacting an olefin monomer, an aromatic vinyl compound monomer, and an aromatic polyene monomer by using the single-site-coordinated

polymerization catalyst to produce an olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer; and

curing the olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer with a curing agent to obtain a cured product, and

wherein the olefin-aromatic vinyl compound-aromatic polyene copolymerized oligomer satisfies all of the following conditions (1) to (4):

(1) a number average molecular weight of the copolymerized oligomer is 500 or more and less than 12000;

(2) the aromatic vinyl compound monomer is an aromatic vinyl compound having 8 or more and 20 or less carbon atoms, and a content of a unit of the aromatic vinyl compound monomer is 0 mass% or more and 90 mass% or less;

(3) the aromatic polyene is one or more selected from polyenes having 5 or more and 20 or less carbon atoms and having a plurality of vinyl groups and/or vinylene groups in the molecule, and a content of the vinyl groups and/or the vinylene groups derived from a unit of the aromatic polyene is 1.5 pieces or more and less than 10 pieces per number average molecular weight; and

(4) the olefin is one or more selected from olefins having 2 or more and 20 or less carbon atoms, and a total of units of the olefin monomer, the aromatic vinyl compound, and the aromatic polyene monomer is 100 mass%.