<<Aspect 9>>

The thermosetting resin composition according to any one of Aspects 1 to 8, including:

the (A) cyanate ester compound,

the (B) unsaturated imide compound, and

the (C) cyclic carbodiimide compound.

<<Aspect 10>>

The thermosetting resin composition according to Aspect 9, wherein the (C) cyclic carbodiimide compound is contained in a range of 1 to 30 parts by mass per 100 parts by mass of the total of the (A) cyanate ester compound and the (B) unsaturated imide compound.

<<Aspect 11>>

The thermosetting resin composition according to Aspect 9 or 10, wherein the (A) cyanate ester compound and the (B) unsaturated imide compound are contained at a mass ratio of 90:10 to 50:50.

<<Aspect 12>>

A molded article including a cured product of the thermosetting resin composition according to any one of Aspects 1 to 11.

<<Aspect 13>>

A prepreg including a reinforcing fiber substrate impregnated with the thermosetting resin composition according to any one of Aspects 1 to 11.

<<Aspect 14>>

A fiber-reinforced composite material obtained by curing the prepreg according to Aspect 13.

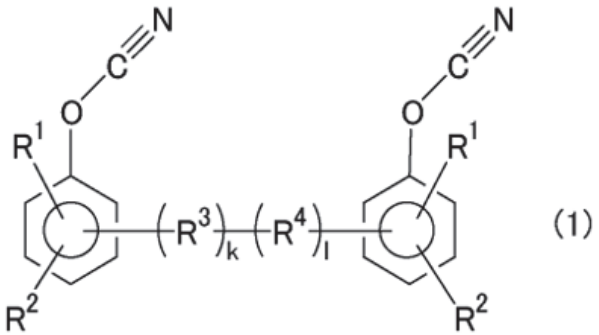
<<Aspect 15>>

A thermosetting resin composition comprising:

(A) a cyanate ester compound and/or (B) an unsaturated imide compound, and

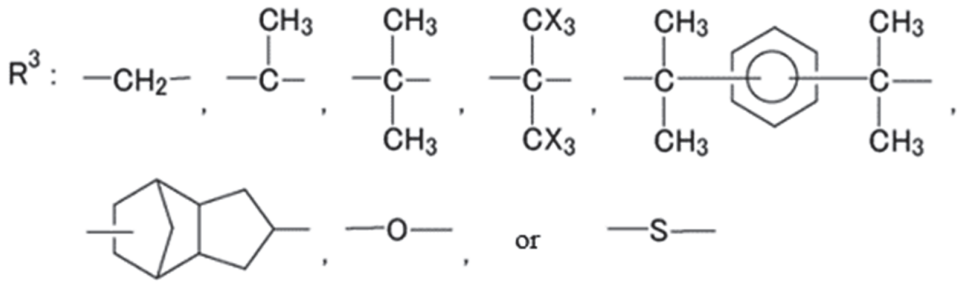
(C) a cyclic carbodiimide compound,

wherein the (A) cyanate ester compound is a compound represented by the following formula (1):

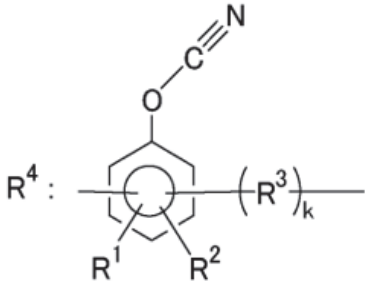


wherein R^1 and R^2 are the same or different and each represents hydrogen atom, an alkyl group or alkyl halide group having from 1 to 20 carbon atoms, or a halogen group;

R^3 are the same or different and each represents an organic group represented by the following chemical formula:



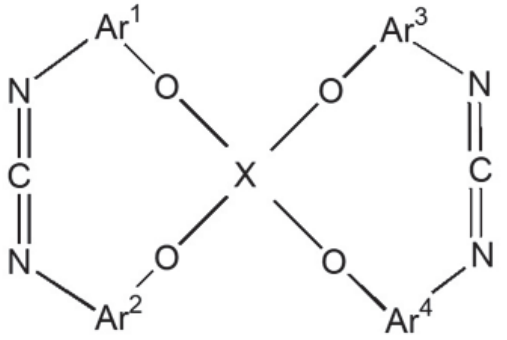
wherein R^4 are the same or different and each represents an organic group represented by the following chemical formula:



wherein k is 0 or 1; and l represents an integer of 0 to 10,

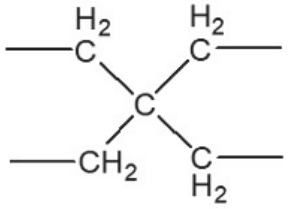
wherein the (B) unsaturated imide compound is a bismaleimide compound, and

wherein the (C) cyclic carbodiimide compound is a compound represented by the following formula (2-1):



(2-1)

wherein X is a tetravalent group represented by the following formula (i):



(i)

wherein each of Ar^1 to Ar^4 is independently a divalent monocyclic or fused polycyclic alicyclic group, aromatic group or heterocyclic group, which may have a substituent, wherein the substituent is selected from the group consisting of an alkyl group having from 1 to 20 carbon atoms, an aryl group having from 6 to 15 carbon atoms, a halogen atom, a nitro group, an amide group, a hydroxyl group, an ester group, an ether group and an aldehyde group and when each of Ar^1 to Ar^4 is a heterocyclic group, the heterocyclic group contains a heteroatom selected from the group consisting of O, N, S and P.

DESCRIPTION OF EMBODIMENTS

[0009]

The thermosetting resin composition of the present invention comprises (A) a cyanate ester compound and/or (B) an unsaturated imide compound, and (C) a cyclic carbodiimide compound.

[0010]

As described above, it is thought that (A) a cyanate ester group produces a triazine ring structure by cyclization and trimerization of a cyanate group (-OCN) and a cyanate ester-based resin thereby exhibits very high heat resistance. In addition, (B) an unsaturated imide compound is also known to give a cured resin having very high heat resistance due to polymerization of an unsaturated bond of a maleimide group.

[0011]

CLAIMS

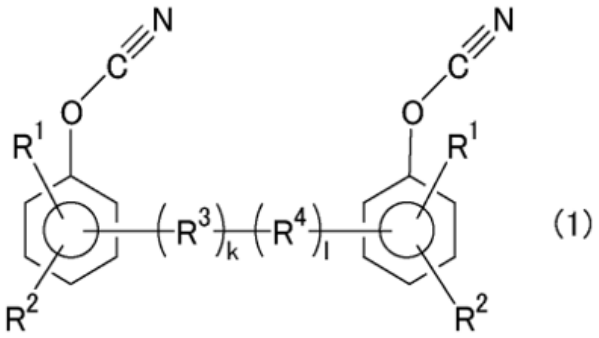
[Claim 1]

A thermosetting resin composition comprising:

(A) a cyanate ester compound and/or (B) an unsaturated imide compound, and

(C) a cyclic carbodiimide compound,

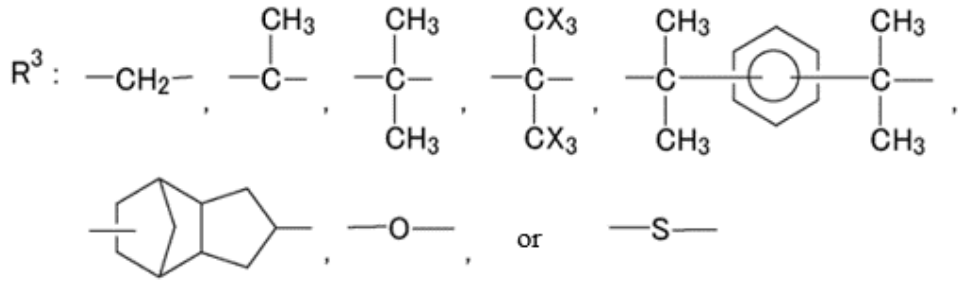
wherein the (A) cyanate ester compound is a compound represented by the following formula (1):



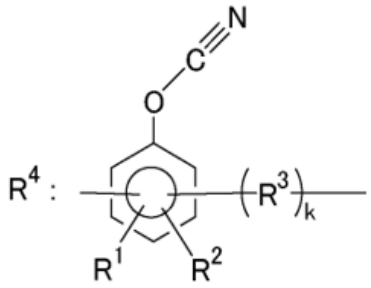
(1)

wherein R^1 and R^2 are the same or different and each represents hydrogen atom, an alkyl group or alkyl halide group having from 1 to 20 carbon atoms, or a halogen group;

R^3 are the same or different and each represents an organic group represented by the following chemical formula:



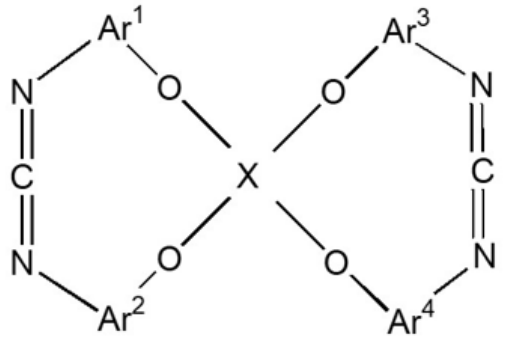
wherein R^4 are the same or different and each represents an organic group represented by the following chemical formula:



wherein k is 0 or 1; and l represents an integer of 0 to 10,

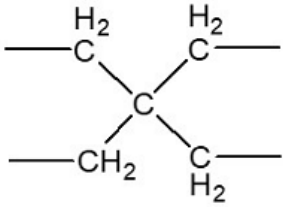
wherein the (B) unsaturated imide compound is a bismaleimide compound, and

wherein the (C) cyclic carbodiimide compound is a compound represented by the following formula (2-1):



(2-1)

wherein X is a tetravalent group represented by the following formula (i):



(i)

wherein each of Ar^1 to Ar^4 is independently a divalent monocyclic or fused polycyclic alicyclic group, aromatic group or heterocyclic group, which may have a substituent, wherein the substituent is selected from the group consisting of an alkyl group having from 1 to 20 carbon atoms, an aryl group having from 6 to 15 carbon atoms, a halogen atom, a nitro group, an amide group, a hydroxyl group, an ester group, an ether group and an aldehyde group and when each of Ar^1 to Ar^4 is a heterocyclic group, the heterocyclic group contains a heteroatom selected from the group consisting of O, N, S and P.

[Claim 2]

The thermosetting resin composition according to claim 1, comprising the (A) cyanate ester compound.

[Claim 3]

The thermosetting resin composition according to claim 1, comprising the (B) unsaturated imide compound.

[Claim 4]

The thermosetting resin composition according to any one of claims 1 to 3, comprising:

the (A) cyanate ester compound,

the (B) unsaturated imide compound, and

the (C) cyclic carbodiimide compound.

[Claim 5]

The thermosetting resin composition according to claim 4, wherein the (C) cyclic carbodiimide compound is contained in a range of 1 to 30 parts by mass per 100 parts by mass of the total of the (A) cyanate ester compound and the (B) unsaturated imide compound.

[Claim 6]

The thermosetting resin composition according to claim 4 or 5, wherein the (A) cyanate ester compound and the (B) unsaturated imide compound are contained at a mass ratio of 90:10 to 50:50.

[Claim 7]

A molded article comprising a cured product of the thermosetting resin composition according to any one of claims 1 to 6.

[Claim 8]

A prepreg comprising a reinforcing fiber substrate impregnated with the thermosetting resin composition according to any one of claims 1 to 6.

[Claim 9]

A fiber-reinforced composite material obtained by curing the prepreg according to claim 8.