Claims

[Claim 1]

A conjugated diene-based polymer, having:

a branch number measured by viscosity detector-equipped GPC-light scattering measurement of 7 or more,

an amount of bound aromatic vinyl of 1% by mass or more and 32% by mass or less, and

a content of vinyl bond in bound conjugated diene of 11% by mol or more and 35% by mol or less,

wherein a value (expressed in % by mass) of the amount of bound aromatic vinyl is larger than a value (expressed in % by mol) of the content of vinyl bond in bound conjugated diene.

[Claim 2]

The conjugated diene-based polymer according to claim 1,

wherein the amount of bound aromatic vinyl is 1% by mass or more and 30% by mass or less, and

the content of vinyl bond in bound conjugated diene is 11% by mol or more and 30% by mol or less.

[Claim 3]

The conjugated diene-based polymer according to claim 1 or 2, having a nitrogen atom.

[Claim 4]

The conjugated diene-based polymer according to any one of claims 1 to 3, having a silicon atom.

[Claim 5]

The conjugated diene-based polymer according to any one of claims 1 to 4, having a modifying group.

[Claim 6]

The conjugated diene-based polymer according to claim 5,

wherein the modifying group has a nitrogen atom, and

a modification ratio of the conjugated diene-based polymer is 70% by mass or more.

[Claim 7]

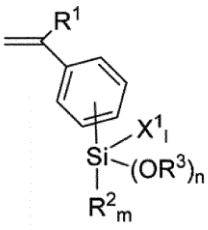
The conjugated diene-based polymer according to any one of claims 1 to 6, having a star polymer structure having 3 or more branches,

wherein at least one branched chain of the star polymer structure has at least one portion derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group, and is further branched in the portion.

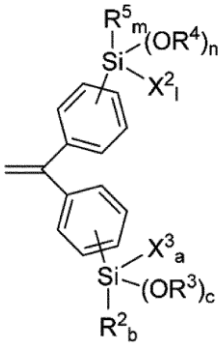
[Claim 8]

The conjugated diene-based polymer according to claim 7,

wherein at least one of the portions each derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group is a portion derived from a compound represented by the following formula (1) or (2):



(1)



(2)

wherein in the formula (1), R^1 represents a hydrogen atom, an alkyl group having 1 to 20 carbon atoms, or an aryl group having 6 to 20 carbon atoms, and may have a branch structure in a part thereof;

R^2 and R^3 each independently represent an alkyl group having 1 to 20 carbon atoms, or an aryl group having 6 to 20 carbon atoms, and may have a branch structure in a part thereof;

X^1 each independently represents a halogen atom;

m represents an integer of 0 to 2, n represents an integer of 0 to 3, l represents an integer of 0 to 3; and

a sum of m, n, and l is 3; and

in the formula (2), R^2, R^3, R^4 and R^5 each independently represent an alkyl group having 1 to 20 carbon atoms, or an aryl group having 6 to 20 carbon atoms, and may have a branch structure in a part thereof;

X^2 and X^3 each independently represent a halogen atom;

m represents an integer of 0 to 2, n represents an integer of 0 to 3, l represents an integer of 0 to 3;

a sum of m, n, and l is 3;

a represents an integer of 0 to 3, b represents an integer of 0 to 2, c represents an integer of 0 to 3; and

a sum of a, b, and c is 3.

[Claim 9]

The conjugated diene-based polymer according to claim 8, wherein at least one of the portions each derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group is a portion derived from a compound represented by the formula (1) wherein R^1 is a hydrogen atom, and m is 0.

[Claim 10]

The conjugated diene-based polymer according to claim 8, wherein at least one of the portions each derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group is a portion derived from a compound represented by the formula (2) wherein m is 0, and b is 0.

[Claim 11]

The conjugated diene-based polymer according to claim 8, wherein at least one of the portions each derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group is a portion

derived from a compound represented by the formula (1) wherein R^1 is a hydrogen atom, m is 0, l is 0, and n is 3.

[Claim 12]

The conjugated diene-based polymer according to claim 8, wherein at least one of the portions each derived from a vinyl-based monomer containing an alkoxysilyl group or a halosilyl group is a portion derived from a compound represented by the formula (2) wherein m is 0, l is 0, n is 3, a is 0, b is 0, and c is 3.

[Claim 13]

A method for producing the conjugated diene-based polymer according to any one of claims 1 to 12, comprising:

a step of obtaining a conjugated diene-based polymer having a branch structure by adding a branching agent during polymerization of at least a conjugated diene compound and an aromatic vinyl compound with an organic lithium compound used as a polymerization initiator.

[Claim 14]

The method for producing the conjugated diene-based polymer according to claim 13, further comprising a step of obtaining a modified conjugated diene-based polymer by reacting a coupling modifier with the conjugated diene-based polymer having a branch structure.

[Claim 15]

A conjugated diene-based polymer composition, comprising 100 parts by mass of the conjugated diene-based polymer according to any one of claims 1 to 12, and 1.0 part by mass or more and 60 parts by mass or less of a rubber softener.

[Claim 16]

A rubber composition, comprising a rubber component, and 5.0 parts by mass or more and 150 parts by mass or less of a filler with respect to 100 parts by mass of the rubber component,

wherein the rubber component comprises 10 parts by mass or more of the conjugated diene-based polymer according to any one of claims 1 to 12 or the conjugated diene-based polymer composition according to claim 15 with respect to 100 parts by mass of a total amount of the rubber component.