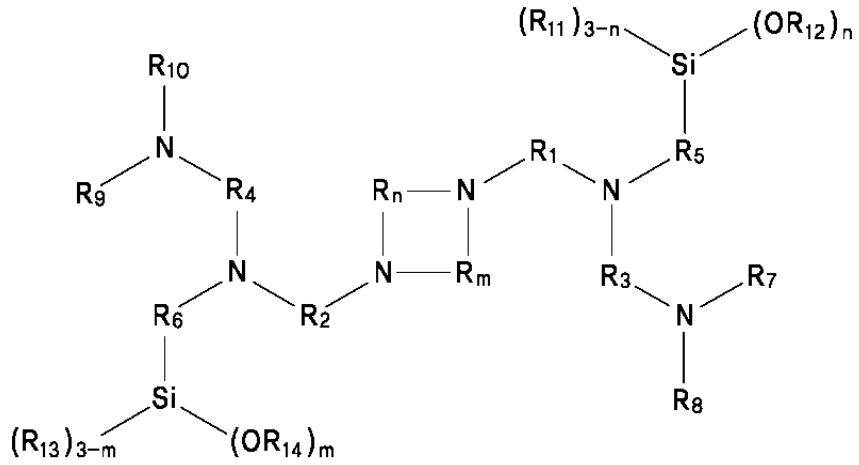
CLAIMS

1. A modified conjugated diene-based polymer comprising a repeating unit derived from a conjugated diene-based monomer, and a functional group derived from a modifier represented by the following Formula 1 in at least one terminal:

[Formula 1]



in Formula 1,

R_1 to R_6 are each independently an alkylene group of 1 to 20 carbon atoms, an alkenylene group of 2 to 20 carbon atoms, an alkynylene group of 2 to 20 carbon atoms, a cycloalkylene group of 5 to 30 carbon atoms, a cycloalkenylene group of 5 to 30 carbon atoms, a heteroalkylene group of 1 to 20 carbon atoms, an arylene group of 6 to 30 carbon atoms, or a heteroarylene group of 5 to 30 carbon atoms,

R_7 to R_{10} are each independently an alkyl group of 1 to 20 carbon atoms, an alkenyl group of 2 to 20 carbon atoms, an alkynyl group of 2 to 20 carbon atoms, a cycloalkyl group of 5 to 30 carbon atoms, a cycloalkenyl group of 5 to 30 carbon atoms, a heteroalkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a heteroaryl group of 5 to 30 carbon atoms, or $-R_{a1}-Si(OR_{a2})_a(R_{a3})_{3-a}$, where R_{a1} is an alkylene group of 1 to 10 carbon atoms, R_{a2} and R_{a3} are alkyl groups of 1 to 10 carbon atoms, and a is an integer selected from 0 to 3,

R_{11} to R_{14} are each independently an alkyl group of 1 to 20 carbon atoms, or an aryl group of 6 to 20 carbon atoms,

R_m and R_n are each independently an alkylene group of 1 to 3 carbon atoms, or an alkenylene group of 2 to 4 carbon atoms,

m and n are integers selected from 1 to 3, and

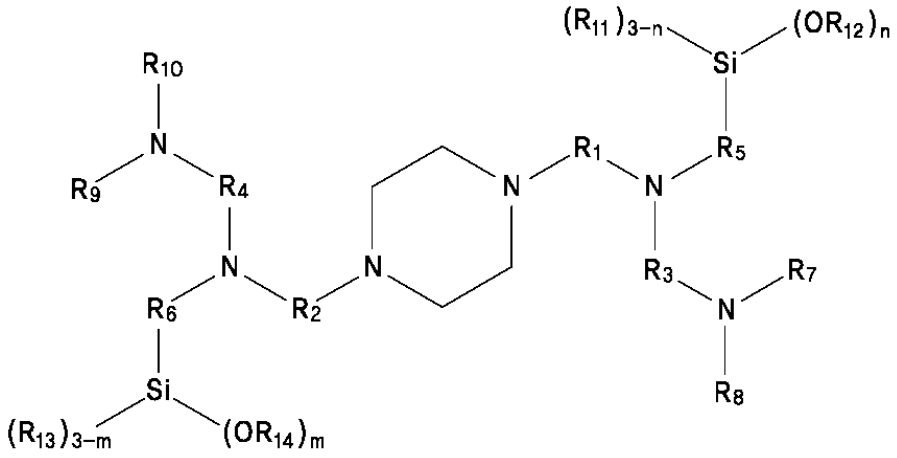
a hydrocarbon group or a hetero hydrocarbon group defined in R_1 to R_{14}, R_m and R_n is

unsubstituted or substituted with a substituent, wherein the substituent is an alkyl group of 1 to 10 carbon atoms, an alkenyl group of 2 to 10 carbon atoms, an alkynyl group of 2 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, a cycloalkenyl group of 5 to 20 carbon atoms, a heteroalkyl group of 1 to 10 carbon atoms, an aryl group of 6 to 20 carbon atoms, or a heteroaryl group of 5 to 20 carbon atoms.

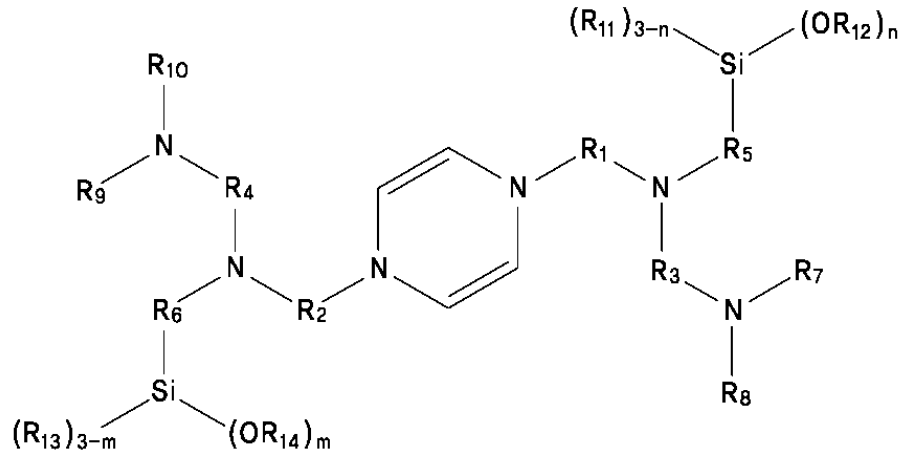
2. The modified conjugated diene-based polymer of claim 1, wherein
in Formula 1,
R_1 to R_6 are each independently an alkylene group of 1 to 10 carbon atoms, a cycloalkylene group of 5 to 20 carbon atoms, a heteroalkylene group of 1 to 10 carbon atoms, an arylene group of 6 to 20 carbon atoms, or a heteroarylene group of 5 to 20 carbon atoms.

3. The modified conjugated diene-based polymer of claim 1, wherein
in Formula 1,
R_7 to R_{10} are each independently is an alkyl group of 1 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, a heteroalkyl group of 1 to 10 carbon atoms, an aryl group of 6 to 20 carbon atoms, a heteroaryl group of 5 to 20 carbon atoms, or $-R_{a1}-Si(OR_{a2})_a(R_{a3})_{3-a}$, where R_{a1} is an alkylene group of 1 to 5 carbon atoms, R_{a2} and R_{a3} are alkyl groups of 1 to 5 carbon atoms, and a is an integer selected from 1 to 3.

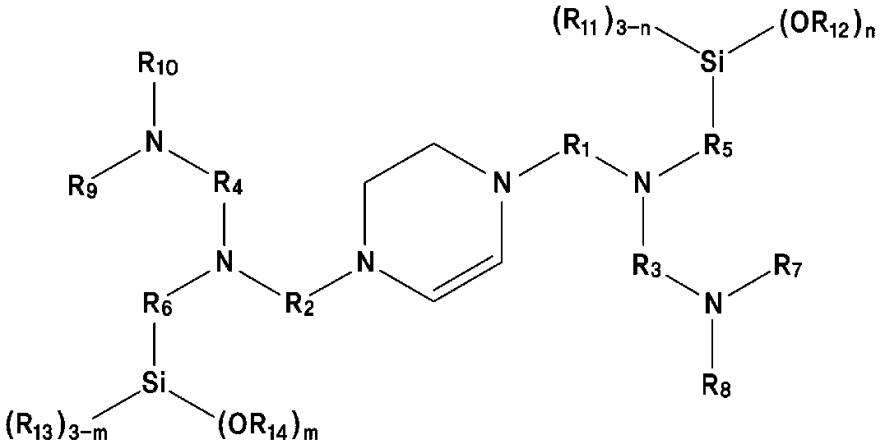
4. The modified conjugated diene-based polymer of claim 1, wherein the compound represented by Formula 1 is one or more selected from compounds represented by the following Formula 1a to Formula 1e:
[Formula 1a]



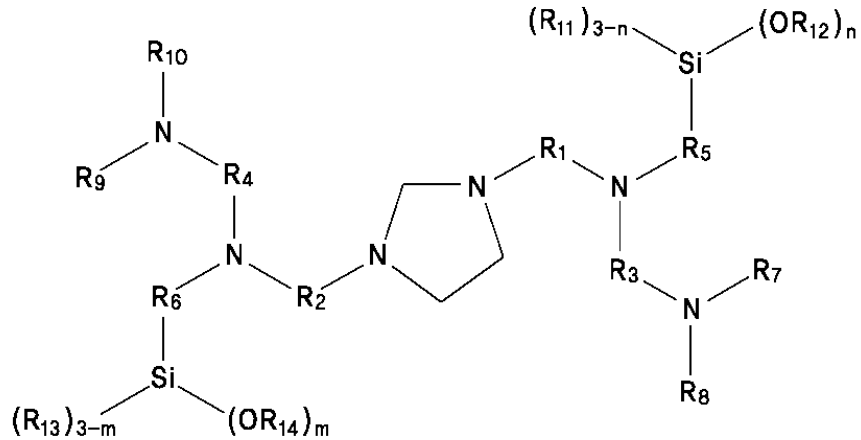
[Formula 1b]



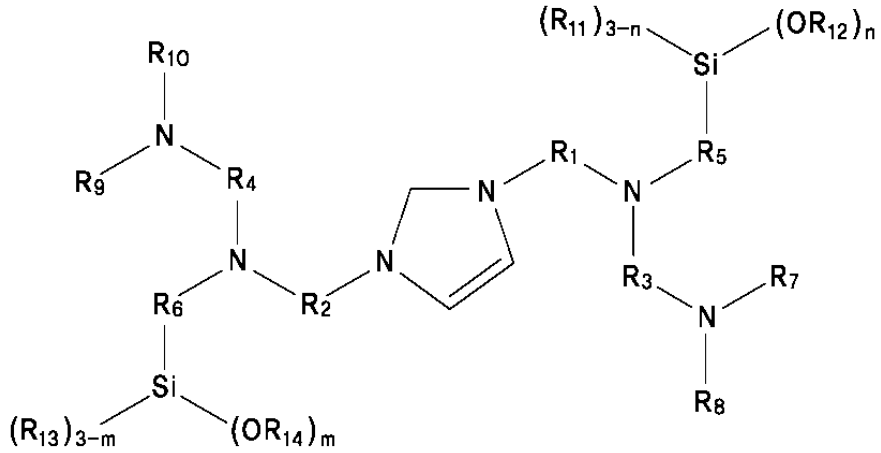
[Formula 1c]



[Formula 1d]



[Formula 1e]



in Formula 1a to Formula 1e above,

the definition of R_1 to R_{14}, m and n is the same as defined in Formula 1.

5. The modified conjugated diene-based polymer of claim 1, wherein

in Formula 1,

R_1 to R_6 are each independently an alkylene group of 1 to 10 carbon atoms, a cycloalkylene group of 5 to 20 carbon atoms, or an arylene group of 6 to 20 carbon atoms,

R_7 to R_{10} are each independently an alkyl group of 1 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, or an aryl group of 6 to 30 carbon atoms,

R_{11} to R_{14} are each independently an alkyl group of 1 to 10 carbon atoms,

R_m and R_n are each independently a methylene group, an ethylene group, or an ethenylene group, and

m and n are integers selected from 1 to 3.

6. The modified conjugated diene-based polymer of claim 1, further comprising a repeating unit derived from an aromatic vinyl monomer.

7. The modified conjugated diene-based polymer according to claim 1, wherein a weight average molecular weight (Mw) is from 10,000 g/mol to 2,000,000 g/mol.

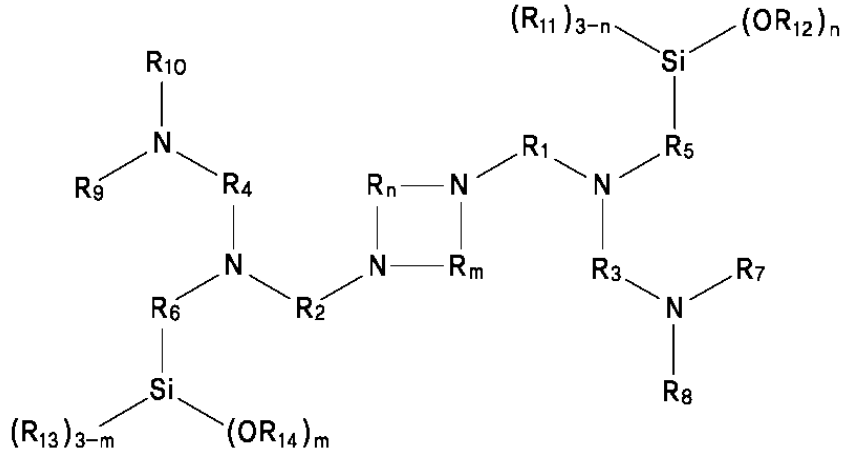
8. The modified conjugated diene-based polymer of claim 1, wherein molecular weight distribution (Mw/Mn) is from 1.0 to 8.0.

9. A method for preparing the modified conjugated diene-based polymer described in claim 1, the method comprising:

polymerizing a conjugated diene-based monomer, or an aromatic vinyl-based monomer and a conjugated diene-based monomer in a hydrocarbon solvent comprising an organometallic compound to prepare an active polymer coupled with an organometal (S1); and

reacting the active polymer with a modifier represented by the following Formula 1 (S2):

[Formula 1]



in Formula 1,

R_1 to R_6 are each independently an alkylene group of 1 to 20 carbon atoms, an alkenylene group of 2 to 20 carbon atoms, an alkynylene group of 2 to 20 carbon atoms, a cycloalkylene group of 5 to 30 carbon atoms, a cycloalkenylene group of 5 to 30 carbon atoms, a heteroalkylene group of 1 to 20 carbon atoms, an arylene group of 6 to 30 carbon atoms, or a heteroarylene group of 5 to 30 carbon atoms,

R_7 to R_{10} are each independently is an alkyl group of 1 to 20 carbon atoms, an alkenyl group of 2 to 20 carbon atoms, an alkynyl group of 2 to 20 carbon atoms, a cycloalkyl group of 5 to 30 carbon atoms, a cycloalkenyl group of 5 to 30 carbon atoms, a heteroalkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a heteroaryl group of 5 to 30 carbon atoms, or $-R_{a1}\text{-}Si(OR_{a2})_a(R_{a3})_{3-a}$, where R_{a1} is an alkylene group of 1 to 10 carbon atoms, R_{a2} and R_{a3} are alkyl groups of 1 to 10 carbon atoms, and a is an integer selected from 0 to 3,

R_{11} to R_{14} are each independently an alkyl group of 1 to 20 carbon atoms, or an aryl group of 6 to 20 carbon atoms,

R_m and R_n are each independently an alkylene group of 1 to 3 carbon atoms, or an alkenylene group of 2 to 4 carbon atoms,

m and n are integers selected from 1 to 3, and

a hydrocarbon group or a hetero hydrocarbon group defined in R_1 to R_{14}, R_m and R_n is

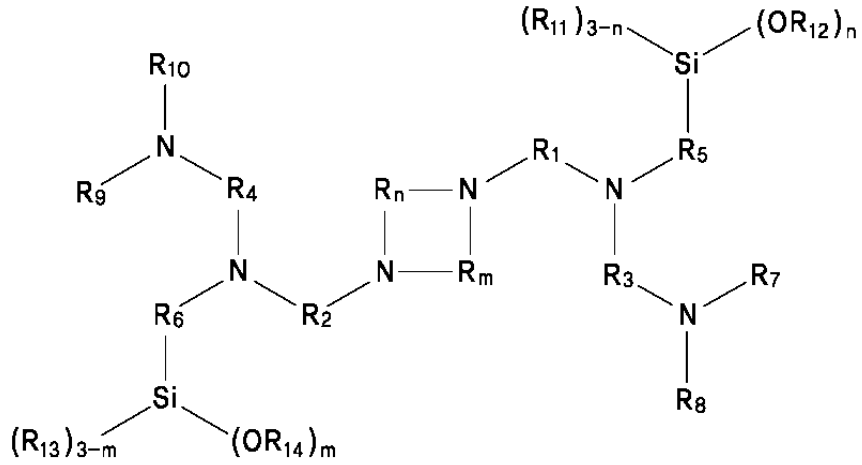
unsubstituted or substituted with a substituent, wherein the substituent is an alkyl group of 1 to 10 carbon atoms, an alkenyl group of 2 to 10 carbon atoms, an alkynyl group of 2 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, a cycloalkenyl group of 5 to 20 carbon atoms, a heteroalkyl group of 1 to 10 carbon atoms, an aryl group of 6 to 20 carbon atoms, or a heteroaryl group of 5 to 20 carbon atoms.

10. The method for preparing the modified conjugated diene-based polymer of claim 9, wherein the organometallic compound is used in 0.01 mmol to 10 mmol based on total 100 g of the monomer.

11. The method for preparing the modified conjugated diene-based polymer of claim 9, wherein the organometallic compound is one or more selected from the group consisting of methyllithium, ethyllithium, propyllithium, n-butyllithium, s-butyllithium, t-butyllithium, hexyllithium, n-decyllithium, t-octyllithium, phenyllithium, 1-naphthyl lithium, n-eicosyl lithium, 4-butylphenyl lithium, 4-tolyl lithium, cyclohexyl lithium, 3,5-di-n-heptylcyclohexyl lithium, 4-cyclopentyl lithium, naphthyl sodium, naphthyl potassium, lithium alkoxide, sodium alkoxide, potassium alkoxide, lithium sulfonate, sodium sulfonate, potassium sulfonate, lithium amide, sodium amide, potassium amide, and lithium isopropylamide.

12. The method for preparing the modified conjugated diene-based polymer of claim 9, wherein the modifier and the organometallic compound are used in a molar ratio of 1:0.1 to 1:10.

13. A modifier represented by the following Formula 1:
[Formula 1]



in Formula 1,

R_1 to R_6 are each independently an alkylene group of 1 to 20 carbon atoms, an alkenylene group of 2 to 20 carbon atoms, an alkynylene group of 2 to 20 carbon atoms, a cycloalkylene group of 5 to 30 carbon atoms, a cycloalkenylene group of 5 to 30 carbon atoms, a heteroalkylene group of 1 to 20 carbon atoms, an arylene group of 6 to 30 carbon atoms, or a heteroarylene group of 5 to 30 carbon atoms,

R_7 to R_{10} are each independently an alkyl group of 1 to 20 carbon atoms, an alkenyl group of 2 to 20 carbon atoms, an alkynyl group of 2 to 20 carbon atoms, a cycloalkyl group of 5 to 30 carbon atoms, a cycloalkenyl group of 5 to 30 carbon atoms, a heteroalkyl group of 1 to 20 carbon atoms, an aryl group of 6 to 30 carbon atoms, a heteroaryl group of 5 to 30 carbon atoms, or $-R_{a1}\text{-}Si(OR_{a2})_a(R_{a3})_{3-a}$, where R_{a1} is an alkylene group of 1 to 10 carbon atoms, R_{a2} and R_{a3} are alkyl groups of 1 to 10 carbon atoms, and a is an integer selected from 0 to 3,

R_{11} to R_{14} are each independently an alkyl group of 1 to 20 carbon atoms, or an aryl group of 6 to 20 carbon atoms,

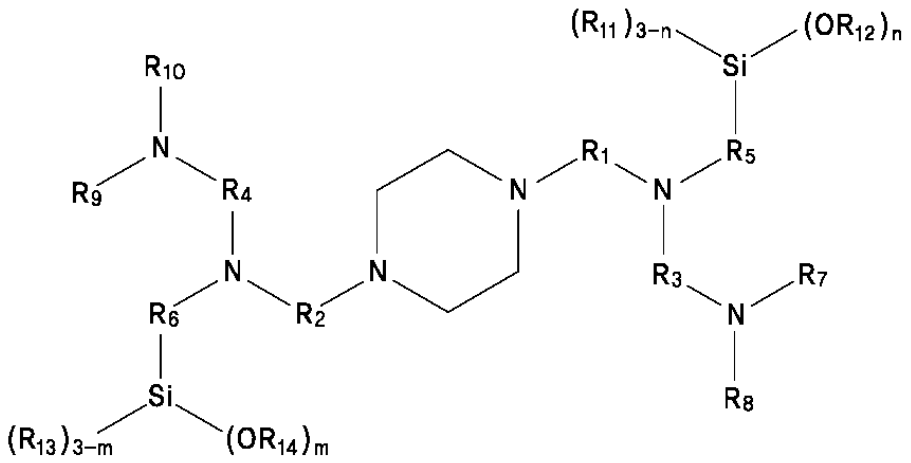
R_m and R_n are each independently an alkylene group of 1 to 3 carbon atoms, or an alkenylene group of 2 to 4 carbon atoms,

m and n are integers selected from 1 to 3, and

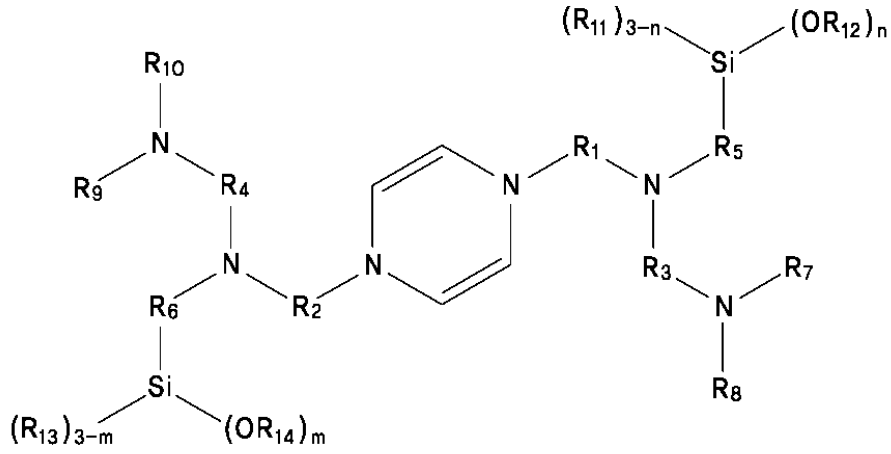
a hydrocarbon group or a hetero hydrocarbon group defined in R_1 to R_{14}, R_m and R_n is unsubstituted or substituted with a substituent, wherein the substituent is an alkyl group of 1 to 10 carbon atoms, an alkenyl group of 2 to 10 carbon atoms, an alkynyl group of 2 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, a cycloalkenyl group of 5 to 20 carbon atoms, a heteroalkyl group of 1 to 10 carbon atoms, an aryl group of 6 to 20 carbon atoms, or a heteroaryl group of 5 to 20 carbon atoms.

14. The modifier of claim 13, wherein the compound represented by Formula 1 is one or more selected from compounds represented by the following Formula 1a to Formula 1e:

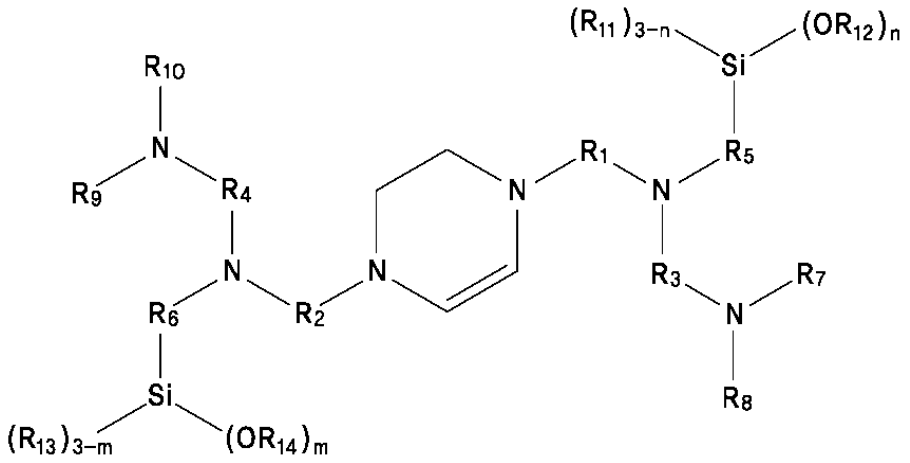
[Formula 1a]



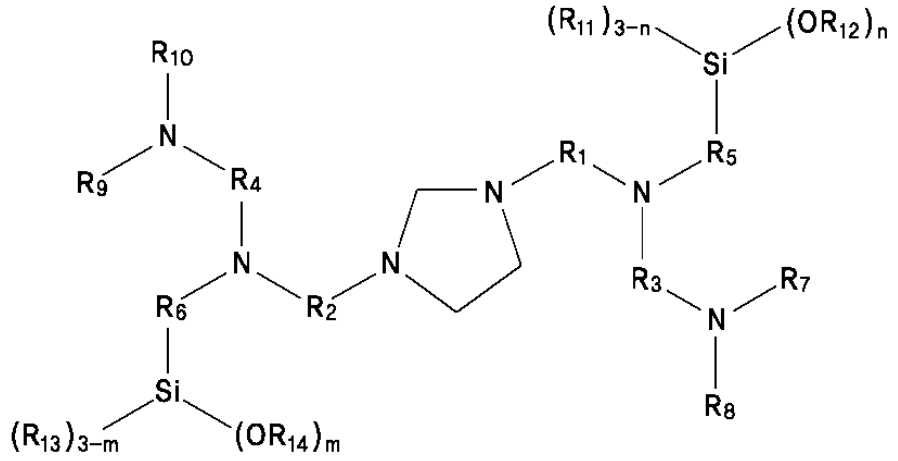
[Formula 1b]



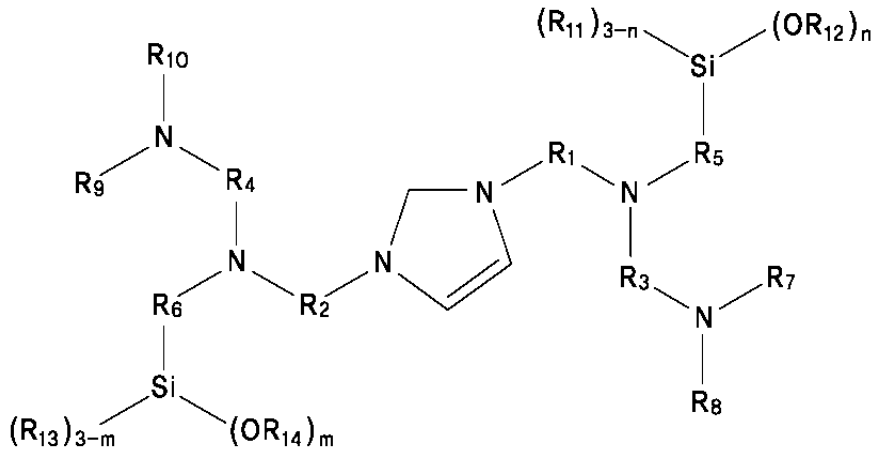
[Formula 1c]



[Formula 1d]



[Formula 1e]



in Formula 1a to Formula 1e,
the definition of R_1 to R_{14}, m and n is the same as defined in Formula 1.

15. The modifier of claim 13, wherein
in Formula 1,
R_1 to R_6 are each independently an alkylene group of 1 to 10 carbon atoms, a cycloalkylene group of 5 to 20 carbon atoms, or an arylene group of 6 to 20 carbon atoms,
R_7 to R_{10} are each independently an alkyl group of 1 to 10 carbon atoms, a cycloalkyl group of 5 to 20 carbon atoms, or an aryl group of 6 to 30 carbon atoms,
R_{11} to R_{14} are each independently an alkyl group of 1 to 10 carbon atoms,
R_m and R_n are each independently a methylene group, an ethylene group, or an ethenylene group, and
m and n are integers selected from 1 to 3.