CLAIMS

1. A modified conjugated diene-based polymer having a mooney large relaxation area (MLRA) measured at 100°C and represented by the following Mathematical Formula 1 of 1500 MU-s to 4000 MU-s:

[Mathematical Formula 1]

$$A = \frac{k}{(a+1)}\left[{t_f}^{(a+1)} - {t_o}^{(a+1)}\right]$$

in Mathematical Formula 1,

A is a mooney large relaxation area (MLRA),

k is a mooney intercept after 1 second from stopping operation of a rotor of a mooney viscometer,

a is a gradient value of mooney torque change,

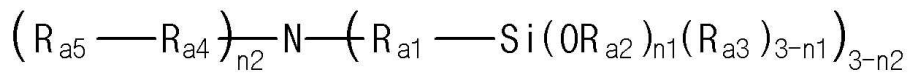
t_o is an initiation point of mooney relaxation, and

t_f is a finishing point of mooney relaxation,

The modified conjugated diene-based polymer comprising functional groups derived from an aminoalkoxysilane-based modifier and an eposy-based modifier in at least one terminal.

2. The modified conjugated diene-based polymer of claim 1, wherein the aminoalkoxysilane-based modifier is one or more compounds selected from the group consisting of compounds represented by the following Formula 1 to Formula 3:

[Formula 1]



in Formula 1,

R_{a1} and R_{a4} are each independently a single bond, or an alkylene group of 1 to 10 carbon atoms,

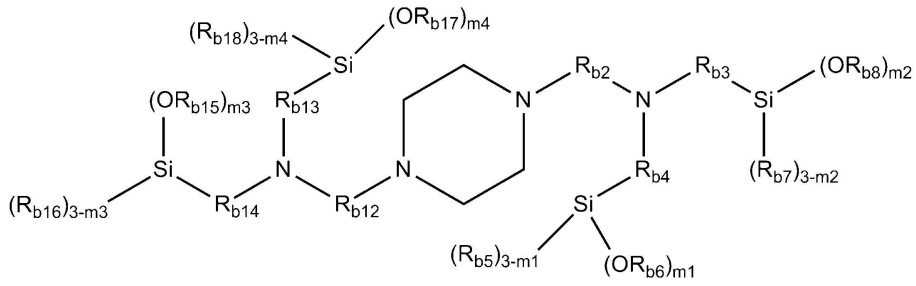
R_{a2} and R_{a3} are each independently an alkyl group of 1 to 10 carbon atoms,

R_{a5} is a hydrogen atom, an alkyl group of 1 to 10 carbon atoms, a monosubstituted, disubstituted or trisubstituted alkylsilyl group substituted with an alkyl group of 1 to 10 carbon atoms, or $-N[R_{a6}Si(OR_{a7})_{n3}(R_{a8})_{3-n3}]_2$, where R_{a6} is a single bond or an alkylene group of 1 to 10 carbon atoms, Ra_7 and R_{a8} are each independently an alkyl group of 1 to 10 carbon atoms, and n3 is an integer of 1 to 3,

n_1 is an integer of 1 to 3, and

n_2 is an integer of 0 to 2,

[Formula 2]



in Formula 2,

R_{b2} to R_{b4} are each independently an alkylene group of 1 to 10 carbon atoms,

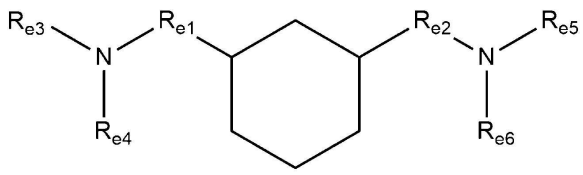
R_{b5} to R_{b8} are each independently an alkyl group of 1 to 10 carbon atoms,

R_{b12} to R_{b14} are each independently an alkylene group of 1 to 10 carbon atoms,

R_{b15} to R_{b18} are each independently an alkyl group of 1 to 10 carbon atoms, and

m_1, m_2, m_3 and m_4 are each independently an integer of 1 to 3,

[Formula 3]



in Formula 3,

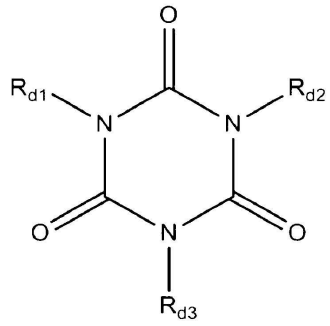
R_{e1} and R_{e2} are each independently an alkylene group of 1 to 10 carbon atoms,

R_{e3} to R_{e6} are each independently hydrogen, an alkyl group of 1 to 10 carbon atoms or $-R_{e7}SiR_{e8}R_{e9}R_{e10}$, where at least one of R_{e3} to R_{e6} is $-R_{e7}SiR_{e8}R_{e9}R_{e10}$, and R_{e7} is a single bond or an alkylene group of 1 to 10 carbon atoms, and

R_{e8} to R_{e10} are each independently an alkyl group of 1 to 10 carbon atoms or an alkoxy group of 1 to 10 carbon atoms, where at least one of R_{e8} to R_{e10} is an alkoxy group of 1 to 10 carbon atoms.

3. The modified conjugated diene-based polymer of claim 1, wherein the epoxy-based modifier is one or more compounds selected from the group consisting of compounds represented by the following Formula 4 to Formula 7:

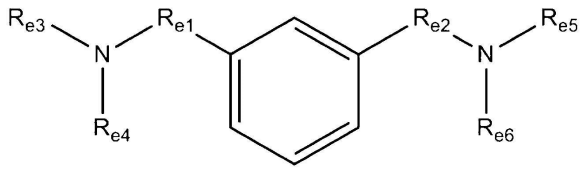
[Formula 4]



in Formula 4,

R_{d1} to R_{d3} are each independently hydrogen, an alkyl group of 1 to 10 carbon atoms or $-R_{d4}R_{d5}$, where at least one of R_{d1} to R_{d3} is $-R_{d4}R_{d5}$, R_{d4} is an alkylene group of 1 to 10 carbon atoms, which includes or excludes a heteroatom, and R_{d5} is an epoxy group,

[Formula 5]

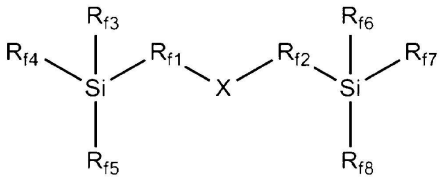


in Formula 5,

R_{e1} and R_{e2} are each independently an alkylene group of 1 to 10 carbon atoms, and

R_{e3} to R_{e6} are each independently hydrogen, an alkyl group of 1 to 10 carbon atoms or $-R_{e7}R_{e8}$, where at least one of R_{e3} to R_{e6} is $-R_{e7}R_{e8}$, R_{e7} is an alkylene group of 1 to 10 carbon atoms, which includes or excludes one or more heteroatoms selected from N, S and O, and R_{e8} is an epoxy group,

[Formula 6]



in Formula 6,

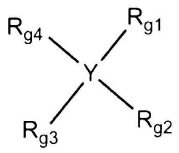
X is O or S,

R_{f1} and R_{f2} are each independently a single bond, or an alkylene group of 1 to 10 carbon atoms, and

R_{f3} to R_{f8} are each independently hydrogen, an alkyl group of 1 to 15 carbon atoms,

an alkoxy group of 1 to 10 carbon atoms, an aryl group of 6 to 10 carbon atoms, a cycloalkyl group of 5 to 10 carbon atoms, an aralkyl group of 7 to 14 carbon atoms or -$R_{f9}R_{f10}$, where at least one of R_{f3} to R_{f8} is -$R_{f9}R_{f10}$, R_{f9} is an alkylene group of 1 to 12 carbon atoms, which includes or excludes a heteroatom, and R_{f10} is an epoxy group,

[Formula 7]



in Formula 7,

R_{g1} to R_{g4} are each independently hydrogen, an alkyl group of 1 to 10 carbon atoms, an alkoxy group of 1 to 10 carbon atoms, an aryl group of 6 to 12 carbon atoms or -$R_{g5}OR_{g6}$, where at least one of R_{g1} to R_{g4} is -$R_{g5}OR_{g6}$, R_{g5} is a single bond or an alkylene group of 1 to 10 carbon atoms, and R_{g6} is an epoxyalkyl group of 3 to 10 carbon atoms, and Y is C or N, where if Y is N, R_{g4} is not present.

4. The modified conjugated diene-based polymer of claim 1, wherein the modified conjugated diene-based polymer has a number average molecular weight (Mn) of 100,000 g/mol to 2,000,000 g/mol, a weight average molecular weight (Mw) of 100,000 g/mol to 3,000,000 g/mol, and molecular weight distribution (PDI) of 1.5 or more.

5. The modified conjugated diene-based polymer of claim 1, wherein the conjugated diene-based polymer is a homopolymer of a conjugated diene-based monomer; or a copolymer of a conjugated diene-based monomer and an aromatic vinyl-based monomer.

6. 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 the presence of a polymerization initiator in a hydrocarbon solvent to prepare an active polymer (S1); and

reacting or coupling the active polymer prepared in step (S1) with a first modifier and a second modifier simultaneously (S2),

wherein the first modifier is an aminoalkoxysilane-based modifier, and the second modifier is an epoxy-based modifier,

wherein the first modifier and the second modifier are used in a molar ratio of 2:1 to 1:1.

7. The method for preparing the modified conjugated diene-based polymer of claim 6, wherein the polymerization initiator is used in 0.01 mmol to 10 mmol based on 100 g of the monomer.

8. The method for preparing the modified conjugated diene-based polymer of claim 6, wherein a total amount used of the modifiers is 0.01 mmol to 10 mmol based on total 100 g of the monomer, and

the total amount used of the modifiers is a total amount of the first modifier and the second modifier.

9. A rubber composition comprising the modified conjugated diene-based polymer described in claim 1, and a filler.

10. The rubber composition of claim 9, wherein the rubber composition comprises 0.1

parts by weight to 200 parts by weight of the filler based on 100 parts by weight of the modified conjugated diene-based polymer.