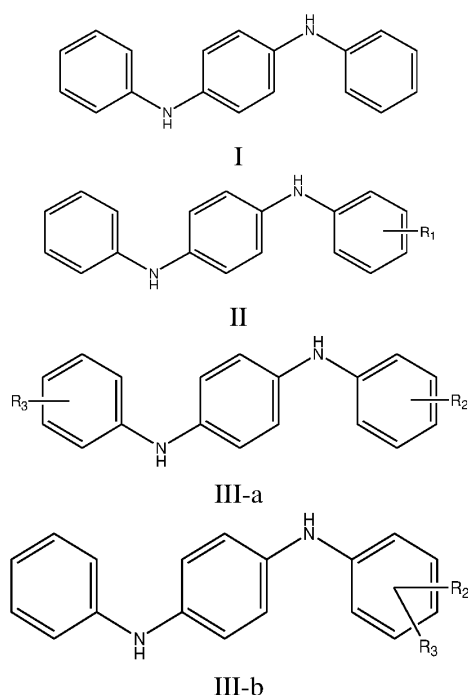


WE CLAIM:

1. An anti-degradant, comprising
at least two compounds, each of the compounds being selected from a compound of
Formula I, a compound of Formula II, a compound of Formula III-a, or a compound of Formula
III-b:



wherein the selected compounds are compounds of different formulae and are not
compounds of Formulae III-a and III-b at the same time when the anti-degradant has only two
compounds,

R_1 is a C1-C12 alkyl or C3-C8 cycloalkyl; and

R_2 and R_3 are identical or different, each is independently selected from the group
consisting of C1-C12 alkyl and C3-C8 cycloalkyl;

with the proviso that the anti-degradant is not an anti-degradant consisting of a compound
of Formula I, a compound of Formula II and a compound of Formula III-a wherein R_1 is a
methyl in an ortho-position, and R_2 and R_3 are each a methyl in an ortho-position.

2. The anti-degradant of claim 1, wherein

R₁ is a C1-C12 alkyl in the ortho-position, a C1-C12 alkyl in a para-position or a C3-C8 cycloalkyl in a para-position; and/or

R₂ and R₃ each independently are C1-C6 alkyl; preferably, in the compound of Formula III-a, R₂ is a C1-C4 alkyl in an ortho-position, and R₃ is a C1-C4 alkyl in a meta-position; preferably, in the compound of Formula III-b, R₂ is a C1-C4 alkyl in an ortho-position, and R₃ is a C1-C6 alkyl in a meta- or para-position.

3. The anti-degradant of claim 1, wherein

R₁ is a methyl in an ortho-position or a para-position, a butyl in an ortho-position, a cyclohexyl in a para-position or a 2,4,6-trimethyloctyl in a para-position; and/or

in the compound of Formula III-a, R₂ is a methyl in an ortho-position, and R₃ is a methyl or ethyl in a meta-position; and/or

in the compound of Formula III-b, R₂ is a methyl in an ortho-position, and R₃ is an isobutyl in a para-position or 1,3-dimethylbutyl in a meta-position; or R₂ is an ethyl in an ortho-position, and R₃ is an ethyl in a para-position.

4. The anti-degradant of claim 1, wherein

the anti-degradant comprises the compound of Formula I and the compound of Formula II, and a mass ratio of the compound of Formula I to the compound of Formula II is preferably in a range of 1:3 to 3:1, preferably 1:2 to 2:1; or

the anti-degradant comprises the compound of Formula II and one or both of the compounds of Formulae III-a and III-b, and a mass ratio of the compound of Formula II to a total of one or both of compounds of Formulae III-a and III-b is preferably in a range of 3:1 to 1:3, preferably 1:2 to 2:1; or

the anti-degradant comprises the compound of Formula I, the compound of Formula II, and one or both of the compounds of Formulae III-a and III-b, preferably the anti-degradant comprises the compound of Formula I, the compound of Formula II, and the compound of Formulae III-b; preferably, a mass percentage of the compound of Formula I is in a range of 5-

20%, preferably 8-18%, a mass percentage of the compound of Formula II is in a range of 45-85%, preferably 48-82%, more preferably 50-80%, and a mass percentage of the one or both of the compounds of Formulae III-a and III-b is in a range of 5-45%, preferably 8-42%, more preferably 10-40%, based on a total mass of all compounds; or

the anti-degradant comprises the compound of Formula I and the compound of Formula III-a, and preferably a mass ratio of the compound of Formula I to the compound of Formula III-a is in a range of 3:1 to 1:3, preferably 2:1 to 1:2.

5. The anti-degradant of claim 1, wherein the anti-degradant comprises the compound of Formula I, the compound of Formula II, and the compound of Formula III-b;

wherein R₁ is methyl in an ortho-position; R₂ is methyl in an ortho-position and R₃ is isobutyl in a para-position; and a mass percentage of the compound of formula I is in a range of 8-12%, a mass percentage of the compound of formula II is in a range of 78-82%, and a mass percentage of the compound of formula III-b is in a range of 8-12%, based on a total mass of all compounds; or

wherein R₁ is methyl in a para-position; R₂ is methyl in an ortho-position and R₃ is 1,3-dimethylbutyl in a meta-position; and a mass percentage of the compound of Formula I is in a range of 15-18%, a mass percentage of the compound of Formula II is in a range of 64-68%, and a mass percentage of the compound of Formula III-b is in a range of 15-18%, based on a total mass of all compounds; or

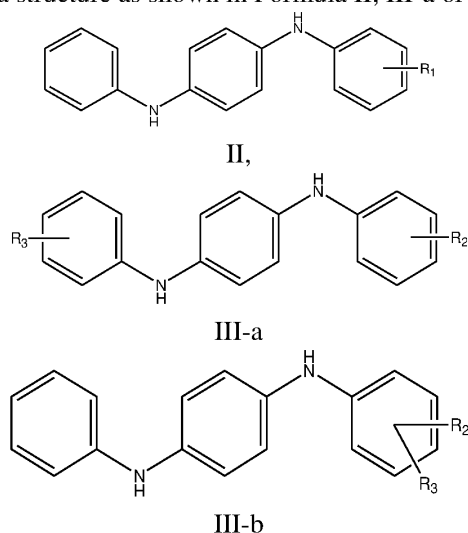
wherein R₁ is butyl in an ortho-position; R₂ is ethyl in an ortho-position and R₃ is ethyl in a para-position; and a mass percentage of the compound of Formula I is in a range of 8-12%, a mass percentage of the compound of Formula II is in a range of 48-52%, and a mass percentage of the compound of Formula III-b is in a range of 38-42%.

6. A rubber composition, comprising the anti-degradant of any of claims 1-5;

preferably, content of the anti-degradant is in a range of 0.1-5 parts by mass, preferably 0.1-2.0 parts by mass or 0.5-5.0 parts by mass, per 100 parts by mass of a diene elastomer contained in the rubber composition.

7. A rubber article prepared using the rubber composition of claim 6 as a rubber ingredient; preferably, the rubber article is a tire, or a belt ply or sidewall of the tire.

8. A compound having a structure as shown in Formula II, III-a or III-b:



wherein R_1 is a C3-C8 cycloalkyl or a C1-C12 alkyl.

R_2 and R_3 are identical or different, each being independently selected from a C1-C12 alkyl or a C3-C8 cycloalkyl;

with the provision R_1 is not a methyl in an ortho-position, and R_2 and R_3 are not a methyl in an ortho-position at the same time in Formula III-a.

9. The compound of claim 8, wherein

R_1 is a C2-C4 alkyl in the ortho-position, a C1-C12 alkyl in a para-position or a C3-C8 cycloalkyl in a para-position;

in the compound of Formula III-a, R_2 is a C1-C4 alkyl in an ortho-position, and R_3 is a C1-C4 alkyl in a meta-position;

in the compound of Formula III-b, R_2 is a C1-C4 alkyl in an ortho-position, and R_3 is a C1-C6 alkyl in a meta- or para-position.

10. Use of the compound of any of claims 8-9 or the anti-degradant of any of claims 1-5 in promoting resistance of a rubber to thermo-oxidative aging and ozone aging.

11. Use of the rubber composition of claim 6 for manufacturing or retreading tires.