containing a petroleum-based aromatic-containing oil that satisfies the REACH regulation and having excellent rolling resistance performance and wet grip performance.

Furthermore, the present invention has an object of providing a tire containing the petroleum-based aromatic-containing oil and a method for producing the tire.

[Solution to Problem]

[0008]

As a result of intensive studies in order to solve the above problems, the inventors of the present invention have found that it is possible to produce a rubber composition excellent in rolling resistance performance and wet grip performance by adding an oil containing saturated components and, among the aromatic components, especially bicyclic aromatic components, in the following specific amounts, and they were therefore able to complete the present invention.

That is, one aspect of the present invention is the following petroleum-based aromatic-containing oil, rubber composition, tire, and method for producing a tire.

[0009]

(1) A petroleum-based aromatic-containing oil, wherein a ratio of saturated components by a clay-gel method is 40% by mass or less,

a ratio of bicyclic aromatic components fractionated by HPLC is 10% by mass or more and 30% by mass or less with respect to 100% by mass of aromatic components by the clay-gel method,

a content of benzo(a)pyrene is 1 mass ppm or less, and

a total content of the following specific polycyclic aromatic hydrocarbons 1) to 8) is 10 mass ppm or less:

1) benzo(a)pyrene (BaP);

2) benzo(e)pyrene (BeP);

3) benzo(a)anthracene (BaA);

4) chrysene (CHR);

5) benzo(b)fluoranthene (BbFA);

6) benzo(j)fluoranthene (BjFA);

7) benzo(k)fluoranthene (BkFA); and

8) dibenzo(a,h)anthracene (DBAhA).

(2) The petroleum-based aromatic-containing oil according to (1) above, wherein the aforementioned ratio of saturated components by the clay-gel method is 20% by mass or more.

(3) The petroleum-based aromatic-containing oil according to (1) or (2) above, wherein the aforementioned ratio of bicyclic aromatic components fractionated by HPLC is 28% by mass or less with respect to 100% by mass of the aforementioned aromatic components by the clay-gel method.

(4) The petroleum-based aromatic-containing oil according to any one of (1) to (3) above, wherein the aforementioned ratio of saturated components by the clay-gel method is 35% by mass or less.

(5) The petroleum-based aromatic-containing oil according to any one of (1) to (4) above, wherein the aforementioned ratio of bicyclic aromatic components fractionated by HPLC is 20% by mass or more with respect to 100% by mass of the aforementioned aromatic components by the clay-gel method.

(6) The petroleum-based aromatic-containing oil according to any one of (1) to (5) above, wherein the aforementioned ratio of saturated components by the clay-gel method is 30% by mass or less.

(7) The petroleum-based aromatic-containing oil according to any one of (1) to (6) above, wherein the aforementioned ratio of bicyclic aromatic components fractionated by HPLC is 25% by mass or less with respect to 100% by mass of the aforementioned aromatic components by the clay-gel method.

(8) The petroleum-based aromatic-containing oil according to any one of (1) to (7) above, wherein the aforementioned ratio of bicyclic aromatic components fractionated by HPLC is 24.5% by mass or less with respect to 100% by mass of the aforementioned aromatic components by the clay-gel method.

(9) The petroleum-based aromatic-containing oil according to any one of (1) to (8) above, which is an extender oil or process oil used by mixing with a rubber.

(10) A rubber composition containing the petroleum-based aromatic-containing oil according to any one of (1) to (9) above and a rubber.

(11) A tire containing the petroleum-based aromatic-containing oil according to any one of (1) to (9) above.

(12) A method for producing the tire according to (11) above, which includes blending and vulcanizing a rubber and the petroleum-based aromatic-containing oil according to any one of (1) to (9) above.

[Advantageous Effects of Invention]

[0010]

According to the present invention, it is possible to provide a petroleum-based aromatic-containing oil that can produce a rubber composition excellent in rolling resistance performance and wet grip performance, and satisfies the REACH regulation.

Further, according to the present invention, it is possible to provide a rubber composition containing a petroleum-based aromatic-containing oil that satisfies the REACH regulation and having excellent rolling resistance performance and wet grip

containing oil according to the present invention and a compounding agent. The tire composition is a concept included in the rubber composition of the embodiment. The tire composition (rubber composition) may be vulcanized or unvulcanized.

Here, although the expressions are divided into extender oils and process oils, these are sometimes collectively referred to as process oils.

[0049]

Hereinafter, the compositions of the rubber composition and the tire composition will be described.

[0050]

As the raw rubber, an elastomeric polymer can be used, and examples thereof include diene-based rubbers such as natural rubbers, isoprene rubbers, butadiene rubbers, 1,2-butadiene rubbers, styrene-butadiene rubbers, isoprene-butadiene rubbers, styrene-isoprene-butadiene rubbers, ethylene-propylene-diene rubbers, halogenated butyl rubbers, halogenated isoprene rubbers, halogenated isobutylene copolymers, chloroprene rubbers, butyl rubbers and halogenated isobutylene-p-methylstyrene rubbers, nitrile rubbers and chloroprene rubbers; olefin-based rubbers such as butyl rubbers, ethylene-propylene-based rubbers (EPDM, EPM), ethylene-butene rubbers (EBM), chlorosulfonated polyethylenes, acrylic rubbers and fluororubbers; epichlorohydrin rubbers; polysulfide rubbers; silicone rubbers and urethane rubbers. Further, thermoplastic elastomers such as polystyrene-based elastomeric polymers (SBS, SIS, SEBS) which may be hydrogenated, polyolefin-based elastomeric polymers, polyvinyl chloride-based elastomeric polymers, polyurethane-based elastomeric polymers, polyester-based elastomeric polymers or polyamide-based elastomeric polymers may be used. These can be used alone or in any combination thereof.

From the viewpoint of compatibility with petroleum-based aromatic-containing

[CLAIMS]

[Claim 1]

A petroleum-based aromatic-containing oil,

wherein a ratio of saturated components by a clay-gel method is 40% by mass or less,

a ratio of bicyclic aromatic components fractionated by HPLC is 10% by mass or more and 30% by mass or less with respect to 100% by mass of aromatic components by the clay-gel method,

a content of benzo(a)pyrene is 1 mass ppm or less, and

a total content of the following specific polycyclic aromatic hydrocarbons 1) to 8) is 10 mass ppm or less:

1) benzo(a)pyrene;

2) benzo(e)pyrene;

3) benzo(a)anthracene;

4) chrysene;

5) benzo(b)fluoranthene;

6) benzo(j)fluoranthene;

7) benzo(k)fluoranthene; and

8) dibenzo(a,h)anthracene.

[Claim 2]

The petroleum-based aromatic-containing oil according to Claim 1, wherein said ratio of saturated components by the clay-gel method is 20% by mass or more.

[Claim 3]

The petroleum-based aromatic-containing oil according to Claim 1 or 2, wherein said ratio of bicyclic aromatic components fractionated by HPLC is 28% by mass or less with respect to 100% by mass of said aromatic components by the clay-gel method.

[Claim 4]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 3, wherein said ratio of saturated components by the clay-gel method is 35% by mass or less.

[Claim 5]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 4, wherein said ratio of bicyclic aromatic components fractionated by HPLC is 20% by mass or more with respect to 100% by mass of said aromatic components by the clay-gel method.

[Claim 6]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 5, wherein said ratio of saturated components by the clay-gel method is 30% by mass or less.

[Claim 7]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 6, wherein said ratio of bicyclic aromatic components fractionated by HPLC is 25% by mass or less with respect to 100% by mass of said aromatic components by the clay-gel method.

[Claim 8]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 7, wherein said ratio of bicyclic aromatic component fractionated by HPLC is 24.5% by mass or less with respect to 100% by mass of said aromatic components by the clay-gel method.

[Claim 9]

The petroleum-based aromatic-containing oil according to any one of Claims 1 to 8, which is an extender oil or process oil used by mixing with a rubber.

[Claim 10]

A rubber composition comprising the petroleum-based aromatic-containing oil according to any one of Claims 1 to 9 and a rubber.

[Claim 11]

A tire comprising the petroleum-based aromatic-containing oil according to any one of Claims 1 to 9.

[Claim 12]

A method for producing the tire according to Claim 11, which comprises blending and vulcanizing a rubber and the petroleum-based aromatic-containing oil according to any one of Claims 1 to 9.