C_{15}-C_{21} branched chain alkyl group derived from a propylene oligomer are useful as lubricating oil additives.

[0011] U.S. Patent No. 6,989,355 discloses an under-neutralized alkylxylene sulfonic acid composition for enhanced oil recovery processes. The patent also discloses a method for enhancing the recovery of oil from a subterranean reservoir which method employs the under-neutralized alkylxylene sulfonic acid compositions. The under-neutralized alkylxylene sulfonic acid compositions are employed in an aqueous media. The method optionally employs suitable co-surfactants, such as alcohols, alcohol ethers, polyalkylene glycols, poly(oxyalkylene)glycols and/or poly(oxyalkylene)glycol ethers.

[0012] It is desirable to provide an improved process for preparing a para-linear alkyl-substituted hydroxyaromatic compound.

SUMMARY OF THE INVENTION

[0012a] In one aspect, there is provided a process for preparing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound, the process:

either A.

comprising the steps of:

(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound; wherein a first alkyl substituent is a C_3 to C_8 alkyl moiety and a second alkyl substituent is a C_{4+n} to C_{8+n} linear alkyl moiety, wherein n is 0 to 42 and further wherein the second alkyl substituent is at least one carbon atom greater than the first alkyl substituent;

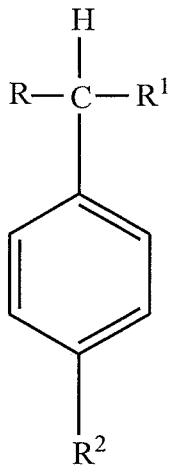
(b) subjecting the isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound to oxidation conditions in the presence of an oxygen-containing source, thereby converting the first alkyl substituent which is a C_3 to C_8 alkyl moiety to a hydroperoxide-containing substituted moiety to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound; and

(c) converting the hydroperoxide-containing substituted moiety to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound;

or B.

comprising the steps of:

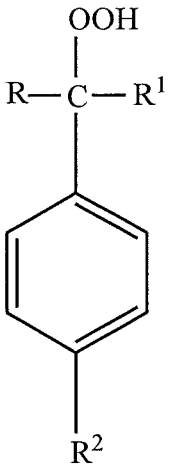
(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound of formula I:



(I)

wherein R and R^1 are the same or different alkyl group such that the combined number of carbon atoms is no more than 8 carbon atoms, and R^2 is a linear alkyl group of from 4 to 50 carbon atoms, wherein R^2 is at least one carbon atom greater than the combined number of carbon atoms of R and R^1;

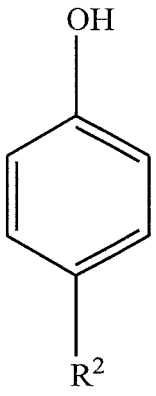
(b) subjecting the isomeric mixture comprising a major amount of the para-di(alkyl-substituted)aromatic compound of formula I to oxidation conditions in the presence of an oxygen-containing source to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound of formula II:



(II)

wherein R, R^1 and R^2 have the aforestated meanings; and

(c) converting the hydroperoxide-containing substituted moiety of the para-linear alkyl-substituted, hydroperoxide- containing substituted aromatic compound of formula II to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound of formula III:

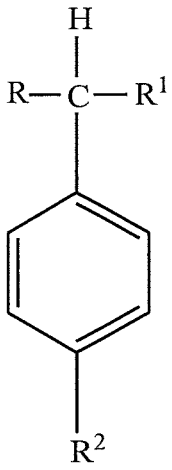


(III)

wherein R^2 has the aforestated meaning.

[0012b] In another aspect, there is provided a process described herein comprising the steps of:

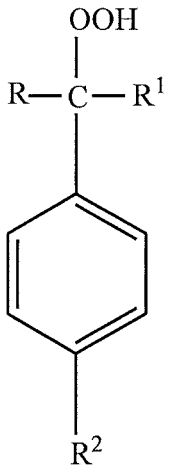
(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound of formula I:



(I)

wherein R and R^1 are the same or different alkyl group such that the combined number of carbon atoms is no more than 8 carbon atoms, and R^2 is a linear alkyl group of from 4 to 50 carbon atoms, wherein R^2 is at least one carbon atom greater than the combined number of carbon atoms of R and R^1;

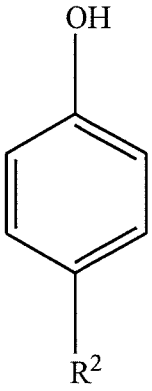
(b) subjecting the isomeric mixture comprising a major amount of the para-di(alkyl-substituted)aromatic compound of formula I to oxidation conditions in the presence of an oxygen-containing source to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound of formula II:



(II)

wherein R, R^1 and R^2 have the aforestated meanings; and

(c) converting the hydroperoxide-containing substituted moiety of the para-linear alkyl-substituted, hydroperoxide- containing substituted aromatic compound of formula II to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound of formula III:



(III)

wherein R^2 has the aforestated meaning.

[0013] In accordance with a first embodiment of the present invention, there is provided a process for preparing an isomeric mixture containing a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound, the process comprising the steps of:

[0014] (a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound, wherein a first alkyl substituent is a C_3 to C_8 alkyl moiety and a second alkyl substituent is a C_{4+n} to C_{8+n} linear alkyl moiety, wherein n is 0 to 42 and further wherein the second alkyl substituent is at least one carbon atom greater than the first alkyl substituent;

[0015] (b) subjecting the isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound to oxidation conditions in the presence of an oxygen-containing source, thereby converting the first alkyl substituent which is a C_3 to C_8 alkyl moiety to a hydroperoxide-containing substituted moiety to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound; and

[0016] (c) converting the hydroperoxide-containing substituted moiety to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound.

[0017] In accordance with a second embodiment of the present invention, there is provided a process comprising the steps of:

WHAT IS CLAIMED IS:

1. A process for preparing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound, the process:

either A.

comprising the steps of:

(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound; wherein a first alkyl substituent is a C_3 to C_8 alkyl moiety and a second alkyl substituent is a C_{4+n} to C_{8+n} linear alkyl moiety, wherein n is 0 to 42 and further wherein the second alkyl substituent is at least one carbon atom greater than the first alkyl substituent;

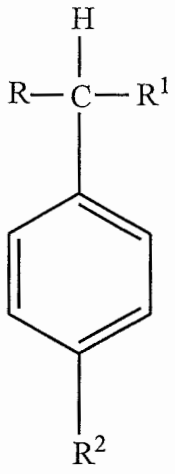
(b) subjecting the isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound to oxidation conditions in the presence of an oxygen-containing source, thereby converting the first alkyl substituent which is a C_3 to C_8 alkyl moiety to a hydroperoxide-containing substituted moiety to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound; and

(c) converting the hydroperoxide-containing substituted moiety to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound;

or B.

comprising the steps of:

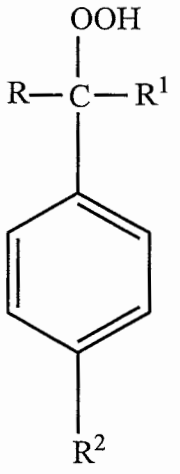
(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound of formula I:



(I)

wherein R and R^1 are the same or different alkyl group such that the combined number of carbon atoms is no more than 8 carbon atoms, and R^2 is a linear alkyl group of from 4 to 50 carbon atoms, wherein R^2 is at least one carbon atom greater than the combined number of carbon atoms of R and R^1;

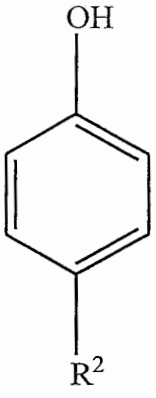
(b) subjecting the isomeric mixture comprising a major amount of the para-di(alkyl-substituted)aromatic compound of formula I to oxidation conditions in the presence of an oxygen-containing source to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound of formula II:



(II)

wherein R, R^1 and R^2 have the aforestated meanings; and

(c) converting the hydroperoxide-containing substituted moiety of the para-linear alkyl-substituted, hydroperoxide- containing substituted aromatic compound of formula II to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound of formula III:



(III)

wherein R^2 has the aforestated meaning.

2. The process of Claim 1, comprising the steps of:

(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound; wherein a first alkyl substituent is a C_3 to C_8 alkyl moiety and a second alkyl substituent is a C_{4+n} to C_{8+n} linear alkyl moiety, wherein n is 0 to 42 and further wherein the second alkyl substituent is at least one carbon atom greater than the first alkyl substituent;

(b) subjecting the isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound to oxidation conditions in the presence of an oxygen-containing source, thereby converting the first alkyl substituent which is a C_3 to C_8 alkyl moiety to a hydroperoxide-containing substituted moiety to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound; and

(c) converting the hydroperoxide-containing substituted moiety to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound.

3. The process of Claim 2, wherein the second alkyl substituent is derived from a C_4 to C_{50} linear normal alpha olefin.

4. The process of Claim 2, wherein the isomeric mixture of step (a) is obtained from the reaction of a monoalkylaromatic compound and one or more linear alkylating agents in the presence of an acidic catalyst.

5. The process of Claim 4, wherein the one or more linear alkylating agents is a C_4 to C_{50} linear normal alpha olefin.

6. The process of Claim 4, wherein the acidic catalyst is an acidic zeolite catalyst.

7. The process of Claim 4, the molar ratio of the monoalkylaromatic compound to the one or more linear alkylating agents is in the range of about 0.5:2 to about 2:0.5.

8. The process of Claim 2, wherein the oxygen-containing source is air.

9. The process of Claim 2, wherein step (b) is carried out in the presence of a free radical initiator, optionally wherein the free radical initiator is a peroxy compound or azo compound.

10. The process of Claim 2, wherein the oxidation conditions for step (b) comprise a temperature ranging from about 70°C to about 200°C.

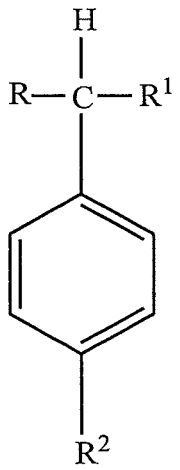
11. The process of Claim 2, wherein step (c) is carried out in the presence of a catalyst, optionally wherein the catalyst is selected from the group consisting of sulfuric acid, perchloric acid, phosphoric acid, hydrochloric acid, p-toluenesulfonic acid, ferric chloride, boron trifluoride, sulfur dioxide and sulfur trioxide .

12. The process of Claim 2, wherein the isomeric mixture contains about 60 mole % or greater of the para-linear mono-alkyl-substituted hydroxyaromatic compound with the remaining isomeric mixture comprising ortho isomers of the mono-alkyl-substituted hydroxyaromatic compound.

13. The process of Claim 2, wherein the isomeric mixture contains about 80 mole % or greater of the para-linear mono-alkyl-substituted hydroxyaromatic compound with the remaining isomeric mixture comprising ortho isomers of the mono-alkyl-substituted hydroxyaromatic compound; or wherein the isomeric mixture contains about 90 mole % or greater of the para-linear mono-alkyl-substituted hydroxyaromatic compound with the remaining isomeric mixture comprising ortho isomers of the mono-alkyl-substituted hydroxyaromatic compound; or wherein the isomeric mixture contains about 95 mole % or greater of the para-linear mono-alkyl-substituted hydroxyaromatic compound with the remaining isomeric mixture comprising ortho isomers of the mono-alkyl-substituted hydroxyaromatic compound; or wherein the isomeric mixture contains about 99 mole % or greater of the para-linear mono-alkyl-substituted hydroxyaromatic compound with the remaining isomeric mixture comprising ortho isomers of the mono-alkyl-substituted hydroxyaromatic compound.

14. A process according to Claim 1 comprising the steps of:

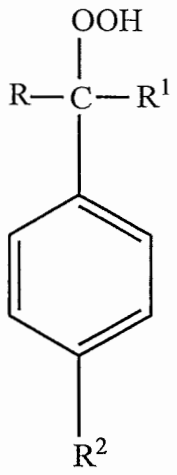
(a) providing an isomeric mixture comprising a major amount of a para-di(alkyl-substituted)aromatic compound of formula I:



(I)

wherein R and R^1 are the same or different alkyl group such that the combined number of carbon atoms is no more than 8 carbon atoms, and R^2 is a linear alkyl group of from 4 to 50 carbon atoms, wherein R^2 is at least one carbon atom greater than the combined number of carbon atoms of R and R^1;

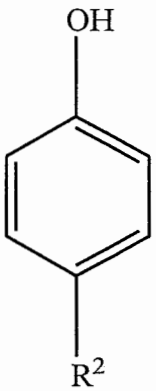
(b) subjecting the isomeric mixture comprising a major amount of the para-di(alkyl-substituted)aromatic compound of formula I to oxidation conditions in the presence of an oxygen-containing source to produce an isomeric mixture comprising a major amount of a para-linear alkyl-substituted, hydroperoxide-containing substituted aromatic compound of formula II:



(II)

wherein R, R^1 and R^2 have the aforestated meanings; and

(c) converting the hydroperoxide-containing substituted moiety of the para-linear alkyl-substituted, hydroperoxide- containing substituted aromatic compound of formula II to a hydroxyl moiety thereby providing an isomeric mixture comprising a major amount of a para-linear mono-alkyl-substituted hydroxyaromatic compound of formula III:



(III)

wherein R^2 has the aforestated meaning.