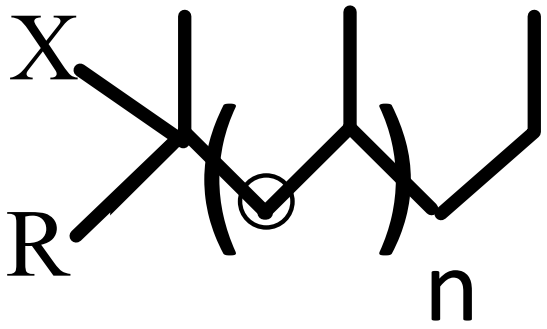
CLAIMS

1. A hydroxyaromatic product comprising:

a highly-structured alkyl hydroxyaromatic compound having a structure given by



wherein R is a hydroxyaromatic group, X is hydrogen or methyl group; wherein n is 1 or greater; and wherein at least 50 mol % of the alkyl group of the alkyl hydroxyaromatic compound have an alkyl group having a ratio of methyl carbon to methylene carbon of greater than about 0.85.

2. The hydroxyaromatic product of claim 1, wherein R is a phenol group, a hydroxybenzyl group, catechol group, resorcinol group, hydroquinone group, pyrogallol group, cresol group, naphthol group, hydroxybenzoic acid group or a salt thereof.

3. The hydroxyaromatic product of claim 1, wherein n is 20 or less.

4. The hydroxyaromatic product of claim 1, wherein n is between 2 and 6.

5. The hydroxyaromatic product of claim 1, wherein at least 50 mol % of alkyl hydroxyaromatic compound have an alkyl group having an NMR branching index of 45% or greater.

6. The hydroxyaromatic product of claim 1, wherein at least 50 mol % of the alkyl hydroxy aromatic compound have an alkyl group having a ratio of methyl carbon to methylene carbon and methine carbon of greater than about 0.29.

7. The hydroxyaromatic product of claim 1, wherein at least 50 mol % of the alkyl hydroxyaromatic compound have an alkyl group having a ratio of methyl-branch surrounded methylene carbon resonances in 44-49 PPM range as measured in chloroform to combined saturated aliphatic carbon resonances in 10-50 ppm resonances as measured in chloroform of more than 0.15.

8. A lubricating oil composition comprising:

a base oil; and

a hydroxyaromatic product of claim 1.

9. A highly-structured alkyl-substituted hydroxyaromatic compound wherein at least 50 mol % of the alkyl group of the alkyl-substituted hydroxyaromatic compound have an alkyl group having a ratio of methyl carbon to methylene carbon of greater than about 0.85, which is formed by a process comprising:

alkylating a hydroxyaromatic compound with an alkylating agent containing vinylidene-rich propylene oligomers comprising propylene oligomers that terminate with vinylidene double bond, wherein the propylene oligomers are prepared by oligomerizing a propylene-rich feedstock containing olefins wherein at least 50 mol % of the olefins in the feedstock are propylene and wherein at least 50 mol % of the propylene oligomers have the vinylidene double bond.

10. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein the hydroxyaromatic compound is phenol, catechol, resorcinol, hydroquinone, pyrogallol, cresol, naphthol, or hydroxybenzoic acid.

11. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein at least 80 mol % of the olefins in the feedstock are propylene.

12. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein the propylene-rich feedstock is prepared by fluid catalytic cracking and oligomerized without prior separation of propane and propylene.

13. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein at least 70 mol % of the propylene oligomers have the vinylidene double bond.

14. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein the propylene oligomers have an average carbon number ranging from about 9 to about 50.

15. The alkyl-substituted hydroxyaromatic composition of claim 9, wherein at least 50 mol % of the composition have an alkyl group with at least 5 carbons.

16. A lubricating oil composition comprising:

a base oil; and

a detergent derived from the highly-structured alkylhydroxyaromatic compound of claim 9; wherein the alkyl-substituted hydroxyaromatic compound is sulfurized.

17. The lubricating oil composition of claim 16, wherein at least 70 mol % of the olefins in the feedstock are propylene.

18. The lubricating oil composition of claim 16, wherein the propylene-rich feedstock has an olefin to alkane molar ratio ranging from 10/1 to 1/10.

19. The lubricating oil composition of claim 16, wherein the propylene-rich feedstock is isolated from a catalytic or thermal cracking process with a propylene to propane ratio within 5% as produced in the catalytic cracking process without separation of propane and propylene.

20. A method of alkylating a hydroxyaromatic compound to form highly-structured alkyl-substituted hydroxyaromatic compound wherein at least 50 mol % of the alkyl group of the alkyl hydroxyaromatic compound have an alkyl group having a ratio of methyl carbon to methylene carbon of greater than about 0.85, the method comprising:

oligomerizing propylene monomers in presence of single-site catalyst to form vinylidene-rich propylene oligomers comprising propylene oligomers that terminate with vinylidene double bond, wherein the propylene oligomers are prepared by oligomerizing a propylene-rich feedstock containing olefins wherein at least 50 mol % of the olefins in the feedstock are propylene and wherein at least 50 mol % of the propylene oligomers have the vinylidene double bond; and

alkylating the hydroxyaromatic compound with the vinylidene-rich propylene oligomers.

21. The method of claim 20, wherein the single-site catalyst is a metallocene.

22. The method of claim 20, wherein the metallocene has a general formula $(RCp)_2MX_2$ wherein Cp is a cyclopentadienyl group and RCp is a substituted cyclopentadienyl group wherein R is an alkyl group or hydrogen, M is Ti, Zr or Hf and X is Cl, Br, I, H, Me, or Et.

23. The method of claim 20, wherein the hydroxyaromatic compound is phenol, catechol, resorcinol, hydroquinone, pyrogallol, cresol, hydroxybenzoic acid or a salt thereof.