CLAIMS

WHAT IS CLAIMED IS

1. A process for preparing a sulfurized alkyl phenate product to achieve a high sulfurization ratio of sulfurized alkyl phenate to unsulfurized alkyl phenate, the process comprising:

sulfurizing an alkyl phenol with a source of sulfur to provide a sulfurized alkyl phenol, wherein the alkyl phenol is derived from an alkylation of a phenol and wherein a mol ratio of the sulfur source to the alkyl phenol is about 0.66 to about 3.5;

neutralizing and optionally overbasing the sulfurized alkyl phenol in the presence of a solvent to provide a sulfurized alkyl phenate composition, wherein the neutralizing and the optional overbasing is at a temperature not exceeding about 140°C to achieve a sulfurization ratio of about 500:1 or greater; and

post processing the sulfurized alkyl phenate composition to obtain the sulfurized alkyl phenate product, wherein the post processing is at temperatures not to exceed about 140°C to maintain the sulfurization ratio of about 500:1 or greater.

2. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the source of sulfur includes elemental sulfur, sulfur monochloride, sulfur dichloride, hydrogen sulfide, sulfur dioxide, sulfide hydrates, or combinations thereof.

3. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the solvent is one more solvents having a boiling point of about 100°C or less at about 1000 to about 40 mbars.

4. The process for preparing a sulfurized alkyl phenate of claim 3, wherein the solvent is about 85 to about 95 weight percent heptane and about 5 to about 15 weight percent methanol.

5. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the neutralizing and/or the optional overbasing includes contacting the sulfurized alkyl phenol with an alkali or alkaline earth metal salt at a temperature not to exceed about 140°C and wherein the

alkali or alkaline earth metal salt is lithium hydroxide, potassium hydroxide, sodium hydroxide, magnesium hydroxide, calcium hydroxide, barium hydroxide, aluminum hydroxide, lithium oxide, magnesium oxide, calcium oxide, barium oxide, or combinations thereof.

6. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the process does not remove residual unsulfurized alkyl phenate between the sulfurizing, the neutralizing, and/or the optional overbasing.

7. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the sulfurized alkyl phenate product has a total base number of about 100 to about 400 mg KOH/g as measured by the method of ASTM D-2896.

8. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the sulfurizing occurs in the absence of a base; and/or wherein the sulfurized alkyl phenol is neutralized and overbased.

9. The process for preparing a sulfurized alkyl phenate of claim 1, wherein the sulfurized alkyl phenate product has less than about 0.2 weight percent of unsulfurized alkyl phenate and/or unsulfurized alkyl phenol.

10. A sulfurized alkyl phenate product prepared by the methods of claim 1.

11. A metal phenate detergent having a high sulfurization ratio of sulfurized alkyl phenate to unsulfurized alkyl phenate or unsulfurized alkyl phenol, the metal phenate detergent comprising:

a sulfurized alkyl phenate obtained from a source of sulfur and an alkyl phenol and having a total base number of about 50 to about 400 mg KOH/g as measured by the method of ASTM D-2896, wherein a mol ratio of a sulfur source to the alkyl phenol is about 0.66 to about 3.5;

up to about 100,000 ppm of alkali or alkaline metal and up to about 65,000 ppm of sulfur; and

a sulfurization ratio of about 500:1 to about 5500:1 with no more than about 900 ppm of unsulfurized alkyl phenate and/or unsulfurized alkyl phenol.

12. The metal phenate detergent of claim 11, wherein the alkyl phenate is derived from an alkylation of a phenol with one or more C6 to C36 alkylene groups; and/or wherein the alkylene groups are oligomers; and/or wherein the oligomers are derived from ethylene, propylene, butylene, isobutylene, pentene, or combinations thereof.

13. The metal phenate detergent of claim 11, wherein the sulfurized alkyl phenate detergent has a total base number of about 90 to about 250 mg KOH/g as measured by the method of ASTM D-2896.

14. The metal phenate detergent of claim 11, wherein the sulfurized alkyl phenate has less than about 50 percent of alkyl substitution at the ortho position.

15. A lubricating oil composition comprising the metal phenate detergent of claim 11 and one or more base oils of lubricating viscosity.