CLAIMS

1. A method of making a sulphurised calcium phenate detergent comprising the steps of:

   (i) reacting one or more alkyl phenol materials comprising hydrogenated distilled cashew nut shell liquid with first defined amounts of a calcium salt (such as calcium oxide or calcium hydroxide) and of an alcohol, with sulphur, preferably elemental sulphur, in the presence of a solvent; and

   (ii) reacting the product of step (i) with second defined amounts of the calcium salt and of the alcohol and carbonating the product;

   the total amount of calcium salt and of alcohol being such as to provide a sulphurised calcium phenate of desired TBN; and wherein the first amount of each of the calcium salt and of the alcohol in step (i), relative to its total amount in the method, being less than 50, preferably less than 30, more preferably 20 or less, expressed as a molar percentage.

2. The method of claim 1, wherein step (ii) is carried out in the absence of sulphur.

3. The method of claims 1 or 2, wherein the alcohol is a mono-, di- or poly-hydric alcohol, preferably a 1,2-vicinal diol.

4. The method of any one of the preceding claims wherein the molar percentage of the first amount of each of the calcium salt and of the alcohol is not less than 5 such as not less than 10.

5. The method of any one of the preceding claims wherein the calcium salt is calcium oxide or calcium hydroxide.

6. The method of any one of the preceding claims wherein the alkyl phenol material comprises 3-pentadecylphenol.

7. The method of any one of the preceding claims carried out in the presence of a carboxylic acid or anhydride.

8. The method of claim 7, wherein the carboxylic acid or anhydride is stearic acid or a polyisobutene succinic anhydride.

9. A sulphurised calcium phenate detergent obtainable by the method of any one of claims 1-8, the sulphurised calcium phenate detergent having a kinematic viscosity at 100°C of greater than 750 and less than 1200 cSt, preferably greater than 800 and less than 1150 cSt, as measured by ASTM D445.

10. Use of the detergent of claim 9 in a marine crankcase lubricant.

11. Use of the detergent of claim 9 in a marine crankcase lubricant to improve the oxidative stability of the lubricant as measured using Differential Scanning Calorimetry (pDSC) (European method no. CECEL-85-T-99) in comparison with that of a lubricant containing a detergent made by a single-stage calcium salt addition process.

12. A lubricating oil composition comprising, in a major amount, an oil of lubricating viscosity and, in a minor amount, a detergent of claim 9.

13. The lubricating oil composition of claim 12, wherein the oil of lubricating viscosity contains 50 mass % or more of a basestock containing greater than or equal to 90 % saturates and less than or equal to 0.03 % sulphur or a mixture thereof.

14. The lubricating oil composition of claim 12 or claim 13 in the form of a marine diesel cylinder lubricant.

15. The lubricating oil composition of claim 12 or claim 13 in the form of a marine diesel trunk piston engine oil.

16. A method of operating an internal combustion diesel engine comprising fuelling the engine, and lubricating the engine with a lubricating oil composition of any of claims 12-15.

CLAIMS

1. A method of making a sulphurised calcium phenate detergent comprising the steps of:

   (i) reacting one or more alkyl phenol materials comprising hydrogenated distilled cashew nut shell liquid with first defined amounts of a calcium salt (such as calcium oxide or calcium hydroxide) and of an alcohol, with sulphur, preferably elemental sulphur, in the presence of a solvent; and

   (ii) reacting the product of step (i) with second defined amounts of the calcium salt and of the alcohol and carbonating the product;

   the total amount of calcium salt and of alcohol being such as to provide a sulphurised calcium phenate of desired TBN; and wherein the first amount of each of the calcium salt and of the alcohol in step (i), relative to its total amount in the method, being less than 50, preferably less than 30, more preferably 20 or less, expressed as a molar percentage;
   wherein the method is carried out in the presence of stearic acid or a polyisobutene succinic anhydride.

2. The method of claim 1, wherein step (ii) is carried out in the absence of sulphur.

3. The method of claims 1 or 2, wherein the alcohol is a mono-, di- or poly-hydric alcohol, preferably a 1,2-vicinal diol.

4. The method of any one of the preceding claims wherein the molar percentage of the first amount of each of the calcium salt and of the alcohol is not less than 5 such as not less than 10.

5. The method of any one of the preceding claims wherein the calcium salt is calcium oxide or calcium hydroxide.

6. The method of any one of the preceding claims wherein the alkyl phenol material comprises 3-pentadecylphenol.

7. A sulphurised calcium phenate detergent obtainable by the method of any one of claims 1-6, the sulphurised calcium phenate detergent having a kinematic viscosity at 100°C of greater than 750 and less than 1200 cSt, preferably greater than 800 and less than 1150 cSt, as measured by ASTM D445.

8. Use of the detergent of claim 7 in a marine crankcase lubricant.

9. Use of the detergent of claim 7 in a marine crankcase lubricant to improve the oxidative stability of the lubricant as measured using Differential Scanning Calorimetry (pDSC) (European method no. CECEL-85-T-99) in comparison with that of a lubricant containing a detergent made by a single-stage calcium salt addition process.

10. A lubricating oil composition comprising, in a major amount, an oil of lubricating viscosity and, in a minor amount, a detergent of claim 7.

11. The lubricating oil composition of claim 10, wherein the oil of lubricating viscosity contains 50 mass % or more of a basestock containing greater than or equal to 90 % saturates and less than or equal to 0.03 % sulphur or a mixture thereof.

12. The lubricating oil composition of claim 10 or claim 11 in the form of a marine diesel cylinder lubricant.

13. The lubricating oil composition of claim 10 or claim 11 in the form of a marine diesel trunk piston engine oil.

14. A method of operating an internal combustion diesel engine comprising fuelling the engine, and lubricating the engine with a lubricating oil composition of any of claims 10-13.