CLAIMS

1. An automotive crankcase lubricating oil composition, for an internal combustion engine, comprising or made by admixing:

   (i) in excess of 50 mass% of an oil of lubricating viscosity;

   (ii) 50 mass% or less of at least one overbased metal detergent, preferably an overbased metal hydroxybenzoate detergent;

   (iii) 50 mass% or less of an oil-soluble block or graft co-polymer of at least one block A which is derived from a hydroxycarboxylic acid and at least one polyalkylene block B which is a residue of a polyalkylene glycol, and

   (iv) optionally, at least one further additive selected from a dispersant, an antioxidant and/or a antiwear agent;

   wherein the lubricating oil composition includes less than 0.10 mass %, preferably less than 0.05 mass %, more preferably less than 0.01 mass %, of a friction modifier which is a monoester of a C_5 to C_{30} carboxylic acid and which is free of nitrogen; and wherein the lubricating oil composition has a sulfated ash content of up to 1.0 mass % and a sulfur content of up to 0.4 mass%.

2. The composition as claimed in claim 1, wherein the hydroxycarboxylic acid is a hydroxystearic acid, preferably 12-hydroxy stearic acid.

3. The composition as claimed in any one of the preceding claims, wherein the polyalkylene glycol in component (iii) is polyethylene glycol.

4. The composition as claimed in any one of the preceding claims, wherein the molecular weight of the polymeric block A in component (iii) is in the range 1000 to 2800, preferably 1,500 to 2,700, and most preferably 2,000 to 2,600 as measured by Gel Permeation Chromatography relative to linear polystyrene standards.

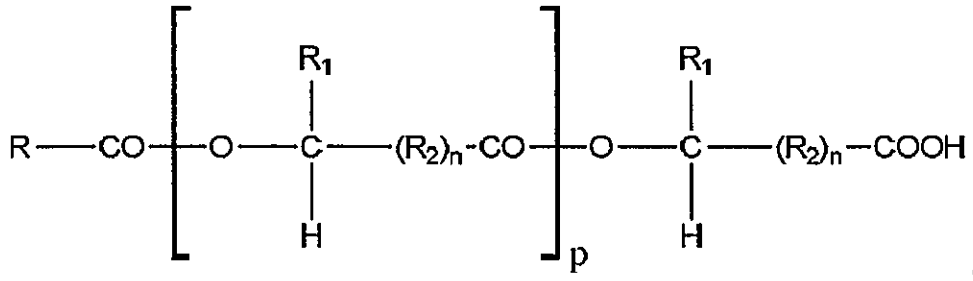
5. The composition as claimed in any one of the preceding claims, wherein the number average molecular weight of the polymeric block B in component (iii) is in the range 500 to 4600, preferably 1,000 to 4,400, more preferably 1,400 to 4,200, and most preferably 1,450 to 4,100, as measured by Gel Permeation Chromatography relative to linear polystyrene standards.

6. The composition as claimed in any one of the preceding claims, wherein the number average molecular weight of the block copolymer in component (iii) is in the range 3000 to 5000, as measured by Gel Permeation Chromatography relative to linear polystyrene standards.

7. The composition as claimed in any one of the preceding claims, wherein the block copolymer in component (iii) has the structure AB or ABA, preferably ABA, where the A blocks may be the same or different.

8. The composition as claimed in any one of the preceding claims, wherein the friction modifier is glycerol monoester, preferably glycerol monooleate.

9. The composition as claimed in any one of the preceding claims, wherein component (iii) is a block or graft copolymer having a general formula $(A—COO)_2—B$, wherein each polymeric component A has a molecular weight of at least 500 relative to linear polystyrene standards and is the residue of an oil-soluble complex monocarboxylic acid having the general structural formula



(I)

in which

R is hydrogen or a monovalent hydrocarbon or substituted hydrocarbon group;

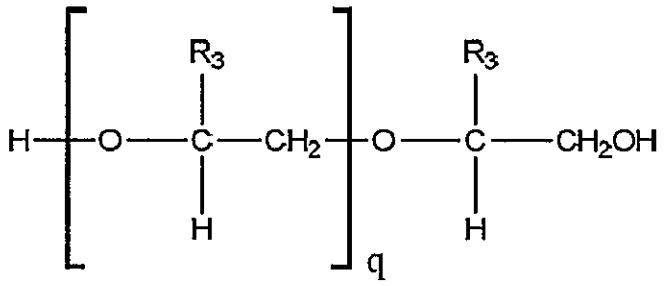
R_1 is hydrogen or a monovalent C_2 to C_{24} hydrocarbon group;

R_2 is a divalent C_1 to C_{24} hydrocarbon group;

n is zero or 1;

p is zero or an integer up to 200;

and wherein each polymeric component B has a number average molecular weight of at least 500 relative to linear polystyrene standards and is the divalent residue of a water-soluble polyalkylene glycol having the general formula



(II)

in which

R_3 is hydrogen or a C_2 to C_3 alkyl group;

q is an integer from 10 up to 500.

10. The composition as claimed in claim 9, wherein R is an alkyl group containing up to 25 carbon atoms, R_1 is a straight-chain alkyl group containing 1 to 24 carbon atoms and R_2 is a straight-chain alkylene group containing 1 to 24 carbon atoms.

11. The composition as claimed in any one of claims 9 or 10, wherein R_3 is hydrogen or a $C_1 - C_3$ alkyl group.

12. The composition as claimed in any one of claims 9 to 11, wherein each of the polymeric components A has a molecular weight of at least 1000 as measured by Gel Permeation Chromatography relative to linear polystyrene standards.

13. The composition as claimed in any one of claims 9 to 12, wherein the polymeric component B has a number average molecular weight of at least 1000 as measured by Gel Permeation Chromatography relative to linear polystyrene standards.

14. The composition as claimed in any one of claims 9 to 13, the polymeric components A are derived from poly(12-hydroxystearic acid) chain-terminated with stearic acid and the polymeric component B is derived from polyethylene glycol.

15. The composition as claimed in claim 14, which is water-soluble and in which the component B constitutes at least 65% by weight of the total copolymer component (iii).

16. The composition as claimed in claim 15, which is soluble in aliphatic hydrocarbons and in which the component B constitutes not more than 40% by weight of the total copolymer component (iii).

17. The composition as claimed in claim 16, in which each polymeric component A is of molecular weight approximately 1750 as measured by Gel Permeation Chromatography relative to linear polystyrene standards and the B component is of molecular weight 1500 as measured by Gel Permeation Chromatography relative to linear polystyrene standards, the B component constituting approximately 30% by weight of the total copolymer.

18. The composition as claimed in any preceding claim, having not greater than 1600, preferably not greater than 1200, more preferably not greater than 800,

and most preferably not greater than 500, ppm by mass of phosphorus, expressed as phosphorus atoms.

19. The composition as claimed in any one of the preceding claims, further containing other additive components, different from (iii), selected from one or more ashless dispersants, corrosion inhibitors, antioxidants, zinc dihydrocarbyl dithiophosphates, pour point depressants, antiwear agents, friction modifiers other than a monoester of a C_5 to C_{30} carboxylic acid which is nitrogen-free, demulsifiers and anti-foam agents.

20. The composition as claimed in any one of the preceding claims, wherein the overbased metal detergent is a metal hydroxybenzoate detergent, preferably an alkaline earth alkylsalicylate, more preferably a calcium salicylate detergent having a TBN as defined in ASTM D2896 of 50 to 450, preferably 150 to 350, more preferably 200 to 300, mg KOH/g.

21. The composition as claimed in any one of the preceding claims, wherein the block copolymer (iii) has a hydrophilic/lipophilic balance (HLB) of at least 6.5, preferably in the range 7 to 9.

22. The use of component (iii), as defined in any of claims 1 to 21, in an amount of 50 mass% or less as an additive in an automotive crankcase lubricating oil composition for an internal combustion engine to improve the friction reducing properties and/or storage stability of the composition, wherein the automotive crankcase lubricating oil composition includes at least one overbased metal detergent in an amount of 50 mass% or less.

23. The use as claimed in claim 22, wherein component (iii) is used as a replacement for a friction modifier which is a glycerol monooleate.