Claims

1. A polyalkyl(meth)acrylate for improvement of lubricant oil properties, comprising repeat units derived from (meth)acrylates having 6 to 22 carbon atoms in the alcohol radical, characterized in that the polyalkyl(meth)acrylate is a graft copolymer where the graft base comprises repeat units derived from (meth)acrylates having 6 to 22 carbon atoms in the alcohol radical, and the graft comprises repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer.

2. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the polar ethylenically unsaturated monomer from which the amine derivative is derived is maleic acid, maleic anhydride or a maleic acid derivative.

3. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the maleic acid derivative is maleic monoester or maleic diester.

4. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 3, characterized in that the polar ethylenically unsaturated monomer from which the amine derivative is derived is a (meth)acrylate having an epoxide group.

5. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 4, characterized in that the

amine derivative of a polar ethylenically unsaturated monomer is derived from a primary amine.

6. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 5, characterized in that the amine derivative of a polar ethylenically unsaturated monomer is derived from an amine which has at least two amino groups, one amino group being a primary amino group and at least one amino group being a secondary amino group.

7. The polyalkyl(meth)acrylate as claimed in claim 6, characterized in that the amine derivative of a polar ethylenically unsaturated monomer is derived from N-phenyl-1,4-phenylenediamine.

8. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 7, characterized in that the polyalkyl(meth)acrylate has a specific viscosity in the range from 5.5 to 25 ml/g at 100°C.

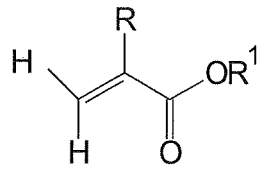
9. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 8, characterized in that the polyalkyl(meth)acrylate comprises repeat units derived from styrene monomers and/or heterocyclic monomers selected from the group consisting of 2-vinylpyridine, 3-vinylpyridine, 4-vinylpyridine, 2-methyl-5-vinylpyridine, 3-ethyl-4-vinylpyridine, 2,3-dimethyl-5-vinylpyridine, vinylpyrimidine, vinylpiperidine, 9-vinylcarbazole, 3-vinylcarbazole, 4-vinylcarbazole, 1-vinylimidazole, N-vinylimidazole, 2-methyl-1-vinylimidazole, N-vinylpyrrolidone, N-vinylpyrrolidine,

3-vinylpyrrolidine, N-vinylcaprolactam, N-vinylbutyrolactam, vinyloxolane, vinylfuran, vinylthiophene, vinylthiolane, vinylthiazoles, hydrogenated vinylthiazoles, vinyloxazoles and hydrogenated vinyloxazoles.

10. The polyalkyl(meth)acrylate as claimed in claim 9, characterized in that the polyalkyl(meth)acrylate comprises 0.1 to 20% by weight of repeat units derived from styrene monomers and/or heterocyclic monomers selected from the group consisting of 2-vinylpyridine, 3-vinylpyridine, 4-vinylpyridine, 2-methyl-5-vinylpyridine, 3-ethyl-4-vinylpyridine, 2,3-dimethyl-5-vinylpyridine, vinylpyrimidine, vinylpiperidine, 9-vinylcarbazole, 3-vinylcarbazole, 4-vinylcarbazole, 1-vinylimidazole, N-vinylimidazole, 2-methyl-1-vinylimidazole, N-vinylpyrrolidone, N-vinylpyrrolidine, 3-vinylpyrrolidine, N-vinylcaprolactam, N-vinylbutyrolactam, vinyloxolane, vinylfuran, vinylthiophene, vinylthiolane, vinylthiazoles, hydrogenated vinylthiazoles, vinyloxazoles and hydrogenated vinyloxazoles.

11. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 10, characterized in that the polyalkyl(meth)acrylate comprises

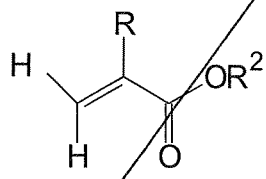
a) 0 to 40% by weight of repeat units derived from (meth)acrylates of the formula (I)



(I)

in which R is hydrogen or methyl and R^1 is an alkyl radical having 1 to 5 carbon atoms,

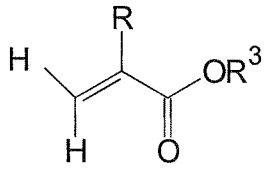
b) 20 to 99.9% by weight of repeat units derived from (meth)acrylates of the formula (II)



(II)

in which R is hydrogen or methyl and R^2 is an alkyl radical having 6 to 22 carbon atoms,

c) 0 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



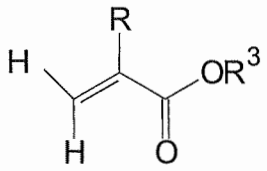
(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 4000 carbon atoms, and

d) 0.1 to 10% by weight of repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer.

12. The polyalkyl(meth)acrylate as claimed in claim 11, characterized in that the polyalkyl(meth)acrylate comprises

0 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)

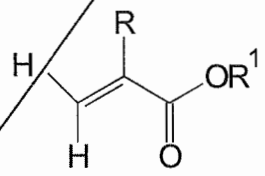


(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 400 carbon atoms.

13. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 12, characterized in that the polyalkyl(meth)acrylate comprises

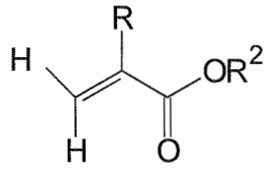
a) 0 to 40% by weight of repeat units derived from (meth)acrylates of the formula (I)



(I)

in which R is hydrogen or methyl and R^1 is an alkyl radical having 1 to 5 carbon atoms,

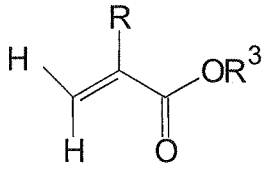
b) 50 to 99.9% by weight of repeat units derived from (meth)acrylates of the formula (II)



(II)

in which R is hydrogen or methyl and R^2 is an alkyl radical having 6 to 22 carbon atoms,

c) 0.5 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



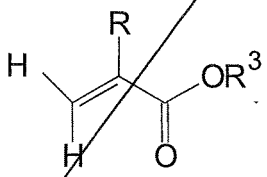
(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 4000 carbon atoms, and

d) 0.1 to 10% by weight of repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer.

14. The polyalkyl(meth)acrylate as claimed in claim 13, characterized in that the polyalkyl(meth)acrylate comprises

0.5 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 400 carbon atoms.

15. A process for preparing a polyalkyl(meth)acrylate as claimed in any one of claims 1 to 14,

characterized in that a graft base is first prepared by polymerizing (meth)acrylates having 6 to 22 carbon atoms, onto which polar ethylenically unsaturated monomers are subsequently grafted.

16. A lubricant composition comprising at least one polyalkyl(meth)acrylate as claimed in any one of claims 1 to 14.

17. The lubricant composition as claimed in claim 16, characterized in that the lubricant composition comprises 0.01 to 30% by weight of polyalkyl(meth)acrylate as claimed in any one of claims 1 to 14.

18. The use of a polyalkyl(meth)acrylate as claimed in any one of claims 1 to 14 for reducing friction.

Claims

1. A polyalkyl(meth)acrylate for improvement of lubricant oil properties, comprising repeat units derived from (meth)acrylates having 6 to 22 carbon atoms in the alcohol radical, characterized in that the polyalkyl(meth)acrylate is a graft copolymer where the graft base comprises repeat units derived from (meth)acrylates having 6 to 22 carbon atoms in the alcohol radical, and the graft comprises repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer,
wherein the polar ethylenically unsaturated monomer is maleic acid or a maleic acid derivative and the amine derivative corresponds to the formula

$$R^5\text{-}NH\text{-}R^6\text{-}NH_2$$

in which R^5 is a radical having 1 to 18 carbon atoms and R^6 is a radical having 2 to 18 carbon atoms.

2. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the maleic acid derivative is selected from the group consisting of maleic monoester,maleic diester, maleic anhydride and methyl maleic anhydride.

3. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the maleic acid derivative is maleic anhydride.

4. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the amine derivative of a polar ethylenically unsaturated monomer is derived from N-phenyl-1,4-phenylenediamine or N,N-dimethylaminopropylamine.

5. The polyalkyl(meth)acrylate as claimed in claim 1, characterized in that the amine derivative of a polar ethylenically unsaturated monomer is derived from N-phenyl-1,4-phenylenediamine.

6. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 5, characterized in that the polyalkyl(meth)acrylate has a specific viscosity in the range from 5.5 to 25 ml/g at 100°C.

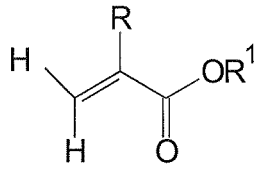
7. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 6, characterized in that the polyalkyl(meth)acrylate comprises repeat units derived from styrene monomers and/or heterocyclic monomers selected from the group consisting of 2-vinylpyridine, 3-vinylpyridine, 4-vinylpyridine, 2-methyl-5-vinylpyridine, 3-ethyl-4-vinylpyridine, 2,3-dimethyl-5-vinylpyridine, vinylpyrimidine, vinylpiperidine, 9-vinylcarbazole, 3-vinylcarbazole, 4-vinylcarbazole, 1-vinylimidazole, N-vinylimidazole, 2-methyl-1-vinylimidazole, N-vinylpyrrolidone, N-vinylpyrrolidine, 3-vinylpyrrolidine, N-vinylcaprolactam, N-vinylbutyrolactam, vinyloxolane, vinylfuran, vinylthiophene, vinylthiolane, vinylthiazoles, hydrogenated vinylthiazoles, vinyloxazoles and hydrogenated vinyloxazoles.

8. The polyalkyl(meth)acrylate as claimed in claim 7, characterized in that the polyalkyl(meth)acrylate comprises 0.1 to 20% by weight of repeat units derived from styrene monomers and/or heterocyclic monomers selected from the group consisting of 2-vinylpyridine, 3-vinylpyridine, 4-vinylpyridine, 2-methyl-5-vinylpyridine, 3-ethyl-4-vinylpyridine, 2,3-dimethyl-5-vinylpyridine, vinylpyrimidine, vinylpiperidine, 9-vinylcarbazole, 3-vinylcarbazole, 4-vinylcarbazole, 1-vinylimidazole, N-vinylimidazole, 2-methyl-1-vinylimidazole, N-vinylpyrrolidone, N-vinylpyrrolidine, 3-vinylpyrrolidine, N-vinylcaprolactam, N-vinylbutyrolactam, vinyloxolane, vinylfuran,

vinylthiophene, vinylthiolane, vinylthiazoles, hydrogenated vinylthiazoles, vinyloxazoles and hydrogenated vinyloxazoles.

9. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 8, characterized in that the polyalkyl(meth)acrylate comprises

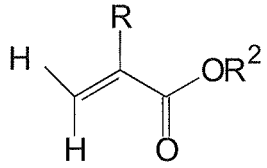
a) 0 to 40% by weight of repeat units derived from (meth)acrylates of the formula (I)



(I)

in which R is hydrogen or methyl and R^1 is an alkyl radical having 1 to 5 carbon atoms,

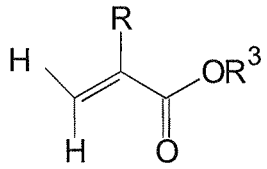
b) 20 to 99.9% by weight of repeat units derived from (meth)acrylates of the formula (II)



(II)

in which R is hydrogen or methyl and R^2 is an alkyl radical having 6 to 22 carbon atoms,

c) 0 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



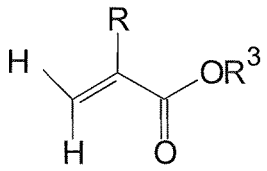
(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 4000 carbon atoms, and

d) 0.1 to 10% by weight of repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer.

10. The polyalkyl(meth)acrylate as claimed in claim 9, characterized in that the polyalkyl(meth)acrylate comprises

0 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)

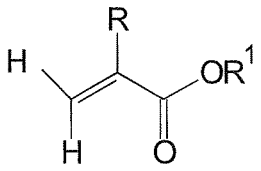


(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 400 carbon atoms.

11. The polyalkyl(meth)acrylate as claimed in any one of claims 1 to 10, characterized in that the polyalkyl(meth)acrylate comprises

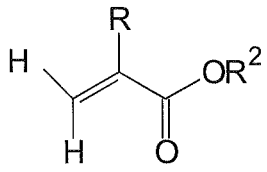
a) 0 to 40% by weight of repeat units derived from (meth)acrylates of the formula (I)



(I)

in which R is hydrogen or methyl and R^1 is an alkyl radical having 1 to 5 carbon atoms,

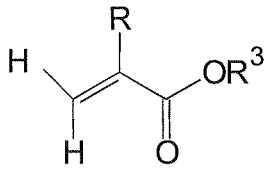
b) 50 to 99.9% by weight of repeat units derived from (meth)acrylates of the formula (II)



(II)

in which R is hydrogen or methyl and R^2 is an alkyl radical having 6 to 22 carbon atoms,

c) 0.5 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



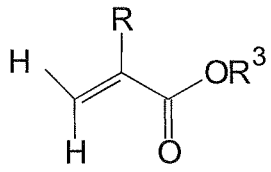
(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 4000 carbon atoms, and

d) 0.1 to 10% by weight of repeat units derived from amine derivatives of a polar ethylenically unsaturated monomer.

12. The polyalkyl(meth)acrylate as claimed in claim 11, characterized in that the polyalkyl(meth)acrylate comprises

0.5 to 20% by weight of repeat units derived from (meth)acrylates of the formula (III)



(III)

in which R is hydrogen or methyl and R^3 is an alkyl radical having 23 to 400 carbon atoms.

13. A process for preparing a polyalkyl(meth)acrylate as claimed in any one of claims 1 to 12, characterized in that a graft base is first prepared by polymerizing (meth)acrylates having 6 to 22 carbon atoms, onto which polar ethylenically unsaturated monomers are subsequently grafted.

14. A lubricant composition comprising at least one polyalkyl(meth)acrylate as claimed in any one of claims 1 to 12.

15. The lubricant composition as claimed in claim 14, characterized in that the lubricant composition

comprises 0.01 to 30% by weight of polyalkyl(meth)acrylate as claimed in any one of claims 1 to 12.

16. The use of a polyalkyl(meth)acrylate as claimed in any one of claims 1 to 12 for reducing friction.