Claims

1. Method for preparing polyalkyl (meth)acrylates, comprising the steps of:
   (i) preparing a reaction mixture comprising:
      (A) at least two different alkyl (meth)acrylates, comprising:
         (a) 0.2 wt.% to 50 wt.% of C1-6 alkyl (meth)acrylates;
         (b) 50 wt.% to 99.8 wt.% of C7-20 alkyl (meth)acrylates; and
         (c) 0 wt.% to 10 wt.% of one or more further comonomers,
         based on the total amount of the alkyl (meth)acrylates;
      (B) optionally, a chain transfer agent; and
      (C) optionally, a base oil,
   (ii) charging the reaction mixture prepared under step (i) to a reaction vessel;
   (iii) heating the reaction mixture to the desired reaction temperature;
   (iv) adding 0.1 wt.% to 4 wt.%, based on the total amount of monomers used, of a free radical initiator **1**, either continuously or stepwise;
   (v) adding, after a monomer conversion of at least 95% was achieved, 0.05 wt.% to 0.2 wt.%, based on the total amount of monomers used, of an initiator **2** and less than 1 wt.%, based on the total amount of monomers used, of an additional monomer selected from the group consisting of C4-14 alkyl acrylates, C4-14 alkyl methacrylates, C4-14 alkyl maleates, C4-14 alkyl fumarates and styrene, preferably C4-14 alkyl acrylates and styrene to the reaction mixture; and
   (vi) optionally, further processing of the reaction mixture to receive the targeted polyalkyl (meth)acrylates,
   wherein the conversion is determined by measuring the residual monomer content by HPLC method and
   wherein the polyalkyl (meth)acrylates have a total residual monomer content of below 0.7 % by weight, the residual monomer content being determined by HPLC method.

2. The method according to claim 1, wherein the C1-6 alkyl (meth)acrylate is methyl methacrylate and the residual methyl methacrylate content is less than 0.1% by weight, preferably below 0.07% by weight.

3. The method according to claim 1 or 2, wherein the C7-20 alkyl (meth)acrylate is a C10-15 alkyl methacrylate.

4. The method according to claim 1 or 2, wherein the C7-20 alkyl (meth)acrylate is selected from linear or branched C10-15 alkyl methacrylates and mixtures of linear and branched C10-15 alkyl methacrylates.

5. The method according to claim 1 or 2, wherein the C7-20 alkyl (meth)acrylate is lauryl methacrylate.

6. The method according to claim 1, wherein the chain transfer agent is selected from the group consisting of n-dodecyl mercaptane, tert-dodecyl mercaptane, 2-mercaptoethanol and 2-ethylhexyl-thioglycolate, preferably selected from n-dodecyl mercaptane, tert-dodecyl mercaptane and 2-mercaptoethanol.

7. The method according to claim 1, wherein initiator **1** and initiator **2** are independently selected from the group consisting of azo initiators and peroxy compounds; preferably selected from the group consisting of 2,2'-azobis(2-methylbutyronitrile), tert-butylperoxy-2-ethylhexanoate, tert-amylperoxy-2-ethylhexanoate, 1,1-di-tert-butylperoxy-3,3,5-trimethylcyclohexan, tert-butyl-peroxybenzoate, tert-butylperoxy-3,5,5-trimethylhexanoat and 2,2-di(tert-butylperoxy)butane; more preferably more preferably tert-butylperoxy-2-ethylhexanoate and tert-amylperoxy-2-ethylhexanoate.

8. The method according to claim 1, wherein the additional monomer is selected from the group consisting of 2-ethylhexyl acrylate, lauryl methacrylate and styrene, preferably 2-ethylhexyl acrylate and styrene.

9. The method according to claim 1, comprising the steps of:

(i) preparing a reaction mixture comprising:

(A) at least two different alkyl (meth)acrylates, comprising:

(a) 0.2 wt.% to 25 wt.% of C1-6 alkyl (meth)acrylates, preferably methyl methacrylate; and

(b) 75 wt.% to 99.8 wt.% of C7-20 alkyl (meth)acrylates, preferably C10-15 alkyl methacrylates;

(B) optionally, a chain transfer agent; and

(C) optionally, a base oil;

(ii) charging the reaction mixture prepared under step (i) to a reaction vessel;

(iii) heating the reaction mixture to the desired reaction temperature;

(iv) adding 0.1 wt.% to 4 wt.%, based on the total amount of monomers used, of a free radical initiator **1**, either continuously or stepwise;

(v) adding, after a monomer conversion of at least 95% was achieved, 0.05 wt.% to 0.2 wt.%, based on the total amount of monomers used, of an initiator **2** and less than 1 wt.%, based on the total amount of monomers used, of an additional monomer selected from the group consisting of C4-14 alkyl acrylates, C4-14 alkyl

methacrylates, C4-14 alkyl maleates, C4-14 alkyl fumarates and styrene, preferably C4-14 alkyl acrylates and styrene to the reaction mixture; and

(vi) optionally, further processing of the reaction mixture to receive the targeted polyalkyl (meth)acrylates,

wherein the conversion is determined by measuring the residual monomer content by HPLC method.

10. The method according to any one of claims 1 to 9, wherein the base oil (C) is selected from the group consisting of API Group I, II, III, IV, V oils and mixtures thereof.

11. The method according to any one of claims 1 to 10, wherein the reaction temperature mentioned under step (iii) is generally in the range of 20°C to 200°C, preferably 90°C to 120°C.

12. An industrial fluid, comprising:

(A) 0.5 wt.% to 50 wt.% of a polyalkyl (meth)acrylate prepared according to any one of claims 1 to 11;

(B) 50 wt.% to 99.5 wt.% of a base oil selected from the group consisting of API Group I, II, III, IV and V oils and mixtures thereof, preferably API Group II, III, IV oils and mixtures thereof; and

(C) 0 wt.% to 5 wt.% of one or more further additives.

13. An industrial fluid, comprising:

(A) 0.5 wt.% to 25 wt.% of a polyalkyl (meth)acrylate prepared according to any one of claims 1 to 11;

(B) 75 wt.% to 99.5 wt.% of a base oil selected from the group consisting of hydrocarbon-based API Group I, II, III, IV and V oils and mixtures thereof; and

(C) 0 wt.% to 5 wt.% of one or more further additives.

14. The industrial fluid according to any one of claims 12 or 13, wherein component (C) is selected from the group consisting of conventional VI improvers, dispersants, defoamers, detergents, antioxidants, pour point depressants, antiwear additives, extreme pressure additives, friction modifiers, anticorrosion additives, dyes and mixtures thereof.