Claims:

1. A process for the preparation of an aqueous slurry comprising a plurality of copolymer particles suspended therein, the process comprising at least the steps of:

   a) providing a reaction medium comprising an organic diluent, and at least two monomers whereby at least one monomer is an isoolefin and at least one monomer is a multiolefin;

   b) polymerizing the monomers within the reaction medium in the presence of an initiator system to form a medium comprising the copolymer, the organic diluent and optionally residual monomers

   c) contacting the medium obtained in step b) with an aqueous medium comprising at least one LCST compound having a cloud point of 0 to 100℃, preferably 5 to 100℃, more preferably 15 to 80℃ and even more preferably 20 to 70℃ and removing at least partial ly the organic diluent and to the extent present in the medium removing at least partially the residual monomers to obtain the aqueous slurry comprising the copolymer particles.

2. The process according to claim 1, wherein LCST compounds are those having a cloud point of 0 to 100℃, preferably 5 to 100℃, more preferably 15 to 80℃ and even more preferably 20 to 80℃ determined by a t least one of the following methods:

   - DIN EN 1890 of September 2006, method A
   - DIN EN 1890 of September 2006, method C
   - DIN EN 1890 of September 2006, method E
   - DIN EN 1890 of September 2006, method A wherein the amount of compound tested is reduced from 1g per 100 ml of distilled water to 0.05 g per 100 ml of distilled water
   - DIN EN 1890 of September 2006, method A wherein the amount of compound tested is reduced from 1g per 100 ml of distilled water to 0.2 g per 100 ml of distilled water.

3. The process according to claim 1, wherein LCST compounds are those having a cloud point of 0 to 100℃, preferably 5 to 100℃, more preferably 15 to 80℃

and even more preferably 20 to 80°C determined by at least one of the following methods:

- DIN EN 1890 of September 2006, method A
- DIN EN 1890 of September 2006, method E
- DIN EN 1890 of September 2006, method A wherein the amount of compound tested is reduced from 1g per 100 ml of distilled water to 0.05 g per 100 ml of distilled water.

4. The process according to claim 1, wherein LCST compounds are those having a cloud point of 0 to 100°C, preferably 5 to 100°C, more preferably 15 to 80°C and even more preferably 20 to 80°C determined by at least one of the following methods:

- DIN EN 1890 of September 2006, method A
- DIN EN 1890 of September 2006, method C
- DIN EN 1890 of September 2006, method A wherein the amount of compound tested is reduced from 1g per 100 ml of distilled water to 0.05 g per 100 ml of distilled water.

5. The process according to one of claims 1 to 4, wherein the aqueous medium contains 20,000 ppm or less of non-LCST compounds

whereby the non-LCST compounds are

- selected from the group consisting of ionic or non-ionic surfactants, emulsifiers, and antiagglomerants

with respect to the amount of copolymer present in the medium obtained according to step b).

6. The process according to one of claims 1 to 5, wherein the aqueous medium comprises 500 ppm or less of non-LCST compounds

whereby the non-LCST compounds are

- selected from the group consisting of ionic or non-ionic surfactants, emulsifiers, and antiagglomerants

with respect to the amount of copolymer present in the medium obtained according to step b).

7. The process according to one of claims 1 to 6, wherein the aqueous medium comprises of from 0 to 5,000 ppm, preferably of from 0 to 2,000 ppm, more

preferably of from 10 to 1,000 ppm, even more preferably of from 50 to 800 ppm and yet even more preferably of from 100 to 600 ppm of salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b).

8. The process according to one of claims 1 to 7, wherein the aqueous medium contains salts of stearates, palmitates and oleates of mono- and multivalent metal ions whereby the weight ratio of salts of stearates, palmitates and oleates of mono- and multivalent metal ions to the LCST compounds is of from 1:2 to 1:100, preferably 1:2 to 1:10 and more preferably of from 1:5 to 1:10 in the aqueous medium.

9. The process according to one of claims 1 to 8, wherein the aqueous medium contains additionally 550 ppm or less, preferably 400 ppm or less, more preferably 300 ppm or less, even more preferably 250 ppm or less and yet even more preferably 150 ppm or less and in another yet even more preferred embodiment 100 ppm or less of salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b).

10. The process according to one of claims 1 to 9, wherein the aqueous medium contains 8,000 ppm or less, preferably 5,000 ppm or less, more preferably 2,000 ppm or less, yet even more preferably 1,000 ppm or less, in another embodiment prefeably 500 ppm or less, more preferably 100 ppm or less and even more preferably 15 ppm or less and yet even more preferably no or from 1 ppm to 10 ppm of non-ionic surfactants being non-LCST compounds with respect to the amount of copolymer present in the medium obtained according to step b).

11. The process according to one of claims 1 to 10, wherein the aqueous medium comprises 70 ppm or less, preferably 50 ppm or less, more preferably 30 ppm or less and even more preferably 20 ppm or less and yet even more preferably 10 ppm or less of salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b).

12. The process according to one of claims 1 to 11, wherein the aqueous medium comprises 25 ppm or less, preferably 10 ppm or less, more preferably 8 ppm or less and even more preferably 7 ppm or less and yet even more preferably 5

ppm or less of salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b).

13. The process according to one of claims 1 to 12, wherein the aqueous medium contains 550 ppm or less, preferably 400 ppm or less, more preferably 300 ppm or less, even more preferably 250 ppm or less and yet even more preferably 150 ppm or less and in another yet even more preferred embodiment 100 ppm or less of carboxylic acid salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b), whereby in a preferred embodiment the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms and are most preferably calcium stearate and/or zinc stearate and/or calcium palmitate and/or zinc palmitate.

14. The process according to one of claims 1 to 13, wherein the aqueous medium comprises 70 ppm or less, preferably 50 ppm or less, more preferably 30 ppm or less and even more preferably 20 ppm or less and yet even more preferably 10 ppm or less of carboxylic acid salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b), whereby the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms.

15. The process according to one of claims 1 to 14, wherein the aqueous medium comprises 25 ppm or less, preferably 10 ppm or less, more preferably 8 ppm or less and even more preferably 7 ppm or less and yet even more preferably 5 ppm or less of carboxylic acid salts of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b), whereby the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms.

16. The process according to one of claims 1 to 15, wherein the aqueous medium is free of carboxylic acid salts of multivalent metal ions whereby the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms.

17. The process according to one of claims 12 to 16, wherein the carboxylic acids are selected from monocarboxylic acids, preferably saturated monocarboxylic acids, more preferably palmitic, oleic or stearic acid.

18. The process according to one of claims 1 to 17, wherein the aqueous medium comprises 100 ppm or less, preferably 50 ppm or less, more preferably 20 ppm or less and even more preferably 15 ppm or less and yet even more preferably 10 ppm or less of salts of monovalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b).

19. The process according to one of claims 1 to 18, wherein the aqueous medium comprises 100 ppm or less, preferably 50 ppm or less, more preferably 30 ppm or less, even more preferably 20 ppm or less and yet even more preferably 10 ppm or less and in another yet even more preferred embodiment 5 ppm or less of carboxylic acid salts of monovalent metal ions, preferably those selected from the group consisting of sodium stearate, sodium palmitate, sodium oleate, potassium stearate, potassium palmitate and potassium oleate calculated on their metal content and with respect to the amount of copolymer present in the medium obtained according to step b), whereby the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms.

20. The process according to one of claims 1 to 19, wherein the aqueous medium is free of carboxylic acid salts of monovalent metal ions whereby the carboxylic acids are selected from those having 6 to 30 carbon atoms, preferably 8 to 24 carbon atoms, more preferably 12 to 18 carbon atoms, preferably monocarboxylic acids more preferably saturated monocarboxylic acids such as palmitic, oleic or stearic acid.

21. The process according to one of claims 1 to 20, wherein the aqueous medium contains of from 0 to 5,000 ppm, preferably of from 0 to 2,000 ppm, more preferably of from 10 to 1,000 ppm, even more preferably of from 50 to 800 ppm and yet even more preferably of from 100 to 600 ppm of

- carbonates of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the organic medium obtained according to step b).

22. The process according to one of claims 1 to 21, wherein the aqueous medium comprises 70 ppm or less, preferably 50 ppm or less, more preferably 30 ppm or less and even more preferably 20 ppm or less and yet even more preferably 10 ppm or less of

- carbonates of multivalent metal ions calculated on their metal content and with respect to the amount of copolymer present in the organic medium obtained according to step b).

23. The process according to one of claims 1 to 22, wherein the aqueous medium comprises 500 ppm or less, preferably 200 ppm or less, more preferably 100 ppm or less, even more preferably 50 ppm or less and yet even more preferably 20 ppm or less and in another yet even more preferred embodiment no layered minerals such as talcum calculated with respect to the amount of copolymer present in the medium obtained according to step b).

24. The process according to one of claims 1 to 23, wherein the aqueous medium comprises 500 ppm or less, preferably 200 ppm or less, more preferably 100 ppm or less, even more preferably 20 ppm or less and yet even more preferably 10 ppm or less and in another yet even more preferred embodiment 5 ppm or less and yet even more preferably no dispersants, emulsifiers or anti-agglomerants other than the LCST compounds defined for step c).

25. The process according to one of claims 1 to 24, wherein the aqueous slurry comprises at least 10 discrete copolymer particles per liter suspended therein, preferably at least 20 discrete particles per liter, more preferably at least 50 discrete particles per liter and even more preferably at least 100 discrete particles per liter.

26. The process according to one of claims 1 to 25, wherein copolymer particles are discrete particles of any form and consistency, which in a preferred embodiment have a particle size of between 0.05 mm and 25 mm, more preferably between 0.1 and 20 mm.

27. The process according to one of claims 1 to 26, wherein copolymer particles have a weight average particle size of from 0.3 to 10.0 mm.

28. The process according to one of claims 1 to 27, wherein the aqueous medium comprises of from 1 to 2,000 ppm of antioxidants, preferably of from 50 to

1,000 ppm more preferably of from 80 to 500 ppm calculated with respect to the amount of copolymer present in the medium obtained according to step b).

29. The process according to one of claims 1 to 28, wherein the at least one isoolefin is selected from the the group consisting of isoolefin monomers having from 4 to 16 carbon atoms, preferably 4 to 7 carbon atoms, more preferably isobutene, 2-methyl-1-butene, 3-methyl-1-butene, 2-methyl-2-butene.

30. The process according to one of claims 1 to 29, wherein the isoolefin is isobutene.

31. The process according to one of claims 1 to 30, wherein the at least one multiolefin is selected from the the group consisting of isoprene, butadiene, 2-methylbutadiene, 2,4-dimethylbutadiene, piperyline, 3-methyl-1,3-pentadiene, 2,4-hexadiene, 2-neopentylbutadiene, 2-methyl-1,5-hexadiene, 2,5-dimethyl-2,4-hexadiene, 2-methyl-1,4-pentadiene, 4-butyl-1,3-pentadiene, 2,3-dimethyl-1,3-pentadiene, 2,3-dibutyl-1,3-pentadiene, 2-ethyl-1,3-pentadiene, 2-ethyl-1,3-butadiene, 2-methyl-1,6-heptadiene, cyclopentadiene, methylcyclopentadiene, cyclohexadiene and 1-vinyl-cyclohexadiene.

32. The process according to one of claims 1 to 31, wherein the multiolefin is isoprene.

33. The process according to one of claims 1 to 31, wherein the monomers are isobutylene and isoprene.

34. The process according to one of claims 1 to 32, wherein at least one further monomers is selected from the group consisting of β-pinene, styrene, divinylbenzene, diisopropenylbenzene o-, m- and p-alkylstyrenes such as o-, m- and p-methyl-styrene.

35. The process according to one of claims 1 to 34, wherein the monomers employed in step a) comprise in the range of from 80 wt.-% to 99.5 wt.-%, preferably of from 85 wt.-% to 98.0 wt.-%, more preferably of from 85 wt.-% to 96.5 wt.-%, even more preferably of from 85 wt.-% to 95.0 wt.-%, by weight of at least one isoolefin monomer and in the range of from 0.5 wt.-% to 20 wt.-%, preferably of from 2.0 wt.-% to 15 wt.-%, more preferably of from 3.5 wt.-% to 15 wt.-%, and yet even more preferably of from 5.0 wt.-% to 15 wt.-% by weight of at least one multiolefin monomer based on the weight sum of all monomers employed.

36. The process according to one of claims 1 to 35, wherein the monomers comprise in the range of from 90 wt.-% to 95 wt.-% of at least one isoolefin monomer and in the range of from 5 wt.-% to 10 wt.-% by weight of a multiolefin monomer based on the weight sum of all monomers employed.

37. The process according to one of claims 1 to 36, wherein the monomers comprise in the range of from 92 wt.-% to 94 wt.-% of at least one isoolefin monomer and in the range of from 6 wt.-% to 8 wt.-% by weight of at least one multiolefin monomer based on the weight sum of all monomers employed.

38. The process according to one of claims 1 to 37, wherein the monomers are present in the reaction medium in an amount of from 0.01 wt.-% to 80 wt.-%, preferably of from 0.1 wt.-% to 65 wt.-%, more preferably of from 10.0 wt.-% to 65.0 wt.-% and even more preferably of from 25.0 wt.-% to 65.0 wt.-%.

39. The process according to one of claims 1 to 38, wherein the organic diluents are hydrochlorocarbon(s) or hydrofluorocarbons represented by the formula: $C_xH_yF_z$ wherein x is an integer from 1 to 40, alternatively from 1 to 30, alternatively from 1 to 20, alternatively from 1 to 10, alternatively from 1 to 6, alternatively from 2 to 20 alternatively from 3 to 10, alternatively from 3 to 6, most preferably from 1 to 3, wherein y and z are integers and at least one or hydrocarbons, preferably alkanes which in a further preferred embodiment are those selected from the group consisting of propane, isobutane, pentane, methycyclopentane, isohexane, 2-methylpentane, 3-methylpentane, 2-methylbutane, 2,2-dimethylbutane, 2,3-dimethylbutane, 2-methylhexane, 3-methylhexane, 3-ethylpentane, 2,2-dimethylpentane, 2,3-dimethylpentane, 2,4-dimethylpentane, 3,3-dimethyl pentane, 2-methylheptane, 3-ethylhexane, 2,5-dimethylhexane, 2,2,4,-trimethylpentane, octane, heptane, butane, ethane, methane, nonane, decane, dodecane, undecane, hexane, methyl cyclohexane, cyclopropane, cyclobutane, cyclopentane, methylcyclopentane, 1,1-dimethylcycopentane, cis-1,2-dimethylcyclopentane, trans-1,2-dimethylcyclopentane, trans-1,3-dimethyl-cyclopentane, ethylcyclopentane, cyclohexane, methylcyclohexane mixtures of the aforementioned diluents.

40. The process according to one of claims 1 to 39, wherein the polymerization according to step b) is carried out either as slurry polymerization or solution polymerization.

41. The process according to one of claims 1 to 40, wherein step b) or step c) are independently are carried out batchwise or continuously, preferably continuously and in a preferred emdiment both steps b) and step c) are carried continuously.

42. The process according to one of claims 1 to 41, wherein the initiator comprises aluminium trichloride, preferably in a wt.-ratio of isobutylene to aluminum trichloride of 500 to 20000, preferably 1500 to 10000.

43. The process according to claim 42, wherein water and/or alcohols, preferably water is used as proton source, preferably in an amount of from 0.05 to 2.0 moles of water per mole of aluminum in the aluminum trichloride, preferably in the range of 0.1 to 1.2 moles of water per mole of aluminum in the aluminum trichloride.

44. The process according to one of claims 1 to 43, wherein the temperature in step c) is from 10 to 100℃, preferably from 50 to 100℃, more preferably from 60 to 95℃ and even more preferably from 75 to 95℃ .

45. The process according to one of claims 1 to 44, wherein the at least one LCST compound is selected from the group consisting of:
poly(N-isopropylacrylamide), poly(N-isopropylacrylamide-co-N,N-dimethylacrylamide, poly(N-isopropylacrylamide)-alt-2-hydroxyethylmethacrylate, poly(N-vinylcaprolactam), poly(N,N-diethylacrylamide), poly[2-(dimethylamino)ethyl methacrylate], poly(2-oxazoline) glycopolymers, Poly(3-ethyl-N-vinyl-2-pyrrolidone), hydroxylbutyl chitosan, polyoxyethylene (20) sorbitan monostearate, polyoxyethylene (20) sorbitan monolaurate, polyoxyethylene (20) sorbitan monooleate, methyl cellulose, hydroxypropyl cellulose, hydroxyethyl cellulose, hydroxyethyl methylcellulose, hydroxypropyl methylcellulose, poly(ethylene glycol) methacrylates with 2 to 6 ethylene glycol units, polyethyleneglycol-co-polypropylene glycols, preferably those with 2 to 6 ethylene glycol units and 2 to 6 polypropylene units, compounds of formula (I)

(I) $HO-[-CH_2-CH_2-O]_x-[-CH(CH_3)-CH_2-O]_y-[-CH_2-CH_2-O]_z-H$

with y = 3 to 10 and x and z = 1 to 8, whereby y+x+z is from 5 to 18,
polyethyleneglycol-co-polypropylene glycol, preferably those with 2 to 8 ethylene glycol units and 2 to 8 polypropylene units, ethoxylated iso-$C_{13}H_{27}$-alcohols, preferably with an ethoxylation degree of 4 to 8, polyethylene glycol

with 4 to 50, preferably 4 to 20 ethyleneglycol units, polypropylene glycol with 4 to 30, preferably 4 to 15 propyleneglycol units, polyethylene glycol monomethyl, dimethyl, monoethyl and diethyl ether with 4 to 50, preferably 4 to 20 ethyleneglycol units, polypropylene glycol monomethyl, dimethyl, monoethyl and diethyl ether with 4 to 50, preferably 4 to 20 propyleneglycol units, whereby methyl cellulose, hydroxypropyl cellulose, hydroxyethyl cellulose, hydroxyethyl methylcellulose and hydroxypropyl methylcellulose are preferred.

46. The process according to one of claims 1 to 45, wherein the amount of LCST compound(s) present in the aquous medium employed in step c) is of from 1 to 20,000 ppm, preferably 3 to 10,000 ppm, more preferably 5 to 5,000 ppm and even more preferably 10 to 5,000 ppm with respect to the amount of copolymer present in the medium obtained according to step b).

47. The process according to one of claims 1 to 46, wherein the amount of LCST compound(s) present in the aquous medium employed in step c) is of from 1 to 5,000 ppm, preferably 3 to 1,000 ppm, more preferably 5 to 500 ppm and even more preferably 5 to 100 ppm with respect to the amount of copolymer present in the medium obtained according to step b).

48. The process according to one of claims 1 to 47, wherein the LCST compounds exhibit a molecular weight of at least 1,500 g/mol, preferably at least 2,500 g/mol and more preferably at least 4,000 g/mol.

49. The process according to one of claims 1 to 48, comprising a further step d) wherein the copolymer particles contained in the aqueous slurry obtained according to step c) are separated to obtain isolated copolymer particles.

50. The process according to one of claims 1 to 49, comprising further step d) wherein the copolymer particles contained in the aqueous slurry obtained according to step c) are separated to obtain isolated copolymer particles and further step e) wherein the (isolated) copolymer particles are dried, preferably to a residual content of volatiles of 7,000 or less, preferably 5,000 or less, even more preferably 4,000 or less and in onother embodiment 2,000 ppm or less, preferably 1,000 ppm or less.

51. The process according to one of claims 1 to 50, comprising as a further step shaping of the copolymer particles to obtain reshaped copolymer particles such as pellets or shaped articles such as bales.