CLAIMS

1. Method for preparing a biodegradable polymer comprising:

a) preparing an acidic mixture of polyacrylic and/or polyaspartic acid, sodium ions, one or more oligosaccharides, or derivatives thereof, and water, wherein the resulting mixture has a pH equal to or lower than 5;

b) maintaining the temperature of said acidic mixture in a range of from 80°C to 130°C until an homogeneous suspension is obtained; and

c) adding polyvinyl alcohol (PVA) and one or more polycarboxylic acids, or derivatives thereof, to the mixture of step (b) while maintaining the temperature in a range of from 80°C to 130°C until the biodegradable polymer is formed.

2. Method for preparing a biodegradable polymer according to claim 1, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer:

- 5% to 60% polyacrylic acid and/or polyaspartic acid;
- 3%, or less, sodium ions; and
- 2% to 30% one or more oligosaccharides, or derivatives thereof.

3. Method for preparing a biodegradable polymer according to claim 1 or 2, wherein, in step (d), are added by weight percentage of the total weight of the biodegradable polymer:

- 0.1 to 20% polyvinyl alcohol; and
- 0.1 to 3% of polycarboxylic acid, or a derivative thereof.

4. Method for preparing a biodegradable polymer according to any one of claims 1 to 3, wherein the mixture of step (a) has a pH in the range of 1 to 4.5, more preferably 3.5 to 4.

5. Method for preparing a biodegradable polymer according to any one of claims 1 to 4, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer: 5% to 60% polyacrylic acid and/or polyaspartic acid, preferably 5 to 55%.

6. Method for preparing a biodegradable polymer according to any one of claims 1 to 5, wherein the sodium ions are provided by adding sodium hydroxide to the acidic mixture of step (a).

7. Method for preparing a biodegradable polymer according to any one of claims 1 to 6, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 0.05% to 2% sodium ions.

8. Method for preparing a biodegradable polymer according to any one of claims 1 to 7, wherein the acidic

mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 2% to 25%, preferably 2% to 20%, one or more oligosaccharides, or derivatives thereof.

9. Method for preparing a biodegradable polymer according to any one of claims 1 to 9, wherein the one or more oligosaccharides are di- and/or trisaccharides.

10. Method for preparing a biodegradable polymer according to any one of claims 1 to 9, wherein the one or more oligosaccharides, or derivatives thereof, are selected from the group consisting of sucrose, maltose, lactose, nigerotriose, maltrotriose, melezitose, sugar alcohols, mannitol, sorbitol, xylitol, maltitol and lactitol.

11. Method for preparing a biodegradable polymer according to any one of claims 1 to 10, wherein the polycarboxylic acid is a di- or tricarboxylic acid chosen from the group consisting of citric acid, isocitric acid, aconitic acid, tricarballylic acid, succinic acid, maleic acid, citrofol a1 and citrofol b1, preferably citric acid and/or citrofol b1.

12. Method for preparing a biodegradable polymer according to any one of claims 1 to 11, wherein, in step (d), are added by weight percentage of the total weight of the biodegradable polymer 0.1% to 2.5%, preferably 0.2% to 2%, more preferably 0.3% to 1%, most preferably 0.5% polycarboxylic acid, or a derivative thereof.

13. Method for preparing a biodegradable polymer according to any one of claims 1 to 13, wherein, in step

(d), are added by weight percentage of the total weight of the biodegradable polymer 0.1% to 20%, preferably 0.5% to 15%, more preferably 1% to 10%, most preferably 1% to 5% polyvinyl alcohol.

14. Method for preparing a biodegradable polymer according to any one of claims 1 to 13, wherein the temperature of step (b) is maintained in a range of 85°C to 120°C, more preferably 90°C to 115°C, most preferably 100°C to 110°C.

15. Method for preparing a biodegradable polymer according to any one of claims 1 to 14, wherein the temperature of step (c) is maintained in a range of 85°C to 120°C, more preferably 90°C to 115°C, most preferably 100°C to 110°C.

16. Method for preparing a biodegradable polymer according to any one of claims 1 to 15, wherein the mixture in step (a) further comprises one or more vegetable and/or animal oils and/or fats selected from the group consisting of rapeseed oil, olive oil, caraway oil, soy oil, walnut oil, hazelnut oil, peanut oil or peanut butter, coconut butter, lemon oil, sheep fat, beef fat, and fish oil.

17. Method for preparing a biodegradable polymer according to claim 16, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 0.1% to 5%, preferably 0.1% to 4% of one or more vegetable oils and/or fats.

18. Method for preparing a biodegradable polymer according to any one of claims 1 to 17, wherein, in step

(d), are further added by weight percentage of the total weight of the biodegradable polymer 0.5% to 20% mono- and/or disaccharides.

19. Method for preparing a biodegradable polymer according to any one of claims 1 to 18, wherein, in step (d), are further added by weight percentage of the total weight of the biodegradable polymer 0.01% to 5%, preferably 0.02% to 3%, more preferably 0.05% to 1% of one or more hydrophobic silica and/or silicate.

20. Method for preparing a biodegradable polymer according to claim 19, wherein the one or more hydrophobic silica is aerosil R972.

21. Method for preparing a biodegradable polymer according to claim 19, wherein one or more hydrophobic silicates are sodium silicates.

22. Method for preparing a biodegradable polymer according to any one of claims 1 to 21, wherein step (a) and/or step (d) further comprises, by weight percentage of the total weight of the biodegradable polymer, adding 0.05% to 5%, preferably 0.1% to 4%, more preferably 0.2% to 3% of one or more additives, preferably selected form the group consisting of glycerol, gluconic acid, di-acetal, sodium sulphate and biocide.

23. Method for preparing a biodegradable polymer according to any one of claims 1 to 22, further comprising step (d) comprising shaping the biodegradable polymer obtained in step (c) by a process chosen from the group consisting of extrusion, thermoforming, injection molding,

blow molding, coating, spinning, rolling, compression molding, and transfer molding.

24. Method for preparing a biodegradable polymer according to claim 23, wherein the biodegradable polymer, before step (d), is mixed with another polymer, preferably a biodegradable polymer.

25. Biodegradable polymer obtainable by a method according to any of the claims 1 to 24.

26. Use of a biodegradable polymer according to claim 25 wherein the use is selected from the group consisting of for coating surfaces, as a protective layer, for thermal insulation, for anti-oxidation insulation, for the manufacture of packaging materials, the manufacture of food containers, and the manufacture of food protective films.

CLAIMS

1. Method for preparing a biodegradable polymer comprising:

a) preparing an acidic mixture of polyacrylic and/or polyaspartic acid, sodium ions, one or more oligosaccharides, or derivatives thereof, and water, wherein the resulting mixture has a pH equal to or lower than 5;

b) maintaining the temperature of said acidic mixture in a range of from 80°C to 130°C until an homogeneous suspension is obtained; and

c) adding polyvinyl alcohol (PVA) and one or more polycarboxylic acids, or derivatives thereof, to the mixture of step (b) while maintaining the temperature in a range of from 80°C to 130°C until the biodegradable polymer is formed.

2. Method for preparing a biodegradable polymer according to claim 1, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer:

- 5% to 60% polyacrylic acid and/or polyaspartic acid;
- 3%, or less, sodium ions; and
- 2% to 30% one or more oligosaccharides, or derivatives thereof.

3. Method for preparing a biodegradable polymer according to claim 1 or 2, wherein, in step (d), are added by weight percentage of the total weight of the biodegradable polymer:

- 0.1 to 20% polyvinyl alcohol; and
- 0.1 to 3% of polycarboxylic acid, or a derivative thereof.

4. Method for preparing a biodegradable polymer according to any one of claims 1 to 3, wherein the mixture of step (a) has a pH in the range of 1 to 4.5, more preferably 3.5 to 4.

5. Method for preparing a biodegradable polymer according to any one of claims 1 to 4, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer: 5% to 60% polyacrylic acid and/or polyaspartic acid, preferably 5 to 55%.

6. Method for preparing a biodegradable polymer according to any one of claims 1 to 5, wherein the sodium ions are provided by adding sodium hydroxide to the acidic mixture of step (a).

7. Method for preparing a biodegradable polymer according to any one of claims 1 to 6, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 0.05% to 2% sodium ions.

8. Method for preparing a biodegradable polymer according to any one of claims 1 to 7, wherein the acidic

mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 2% to 25%, preferably 2% to 20%, one or more oligosaccharides, or derivatives thereof.

9. Method for preparing a biodegradable polymer according to any one of claims 1 to 9, wherein the one or more oligosaccharides are di- and/or trisaccharides.

10. Method for preparing a biodegradable polymer according to any one of claims 1 to 9, wherein the one or more oligosaccharides, or derivatives thereof, are selected from the group consisting of sucrose, maltose, lactose, nigerotriose, maltrotriose, melezitose, sugar alcohols, mannitol, sorbitol, xylitol, maltitol and lactitol.

11. Method for preparing a biodegradable polymer according to any one of claims 1 to 10, wherein the polycarboxylic acid is a di- or tricarboxylic acid chosen from the group consisting of citric acid, isocitric acid, aconitic acid, tricarballylic acid, succinic acid, maleic acid, citrofol a1 and citrofol b1, preferably citric acid and/or citrofol b1.

12. Method for preparing a biodegradable polymer according to any one of claims 1 to 11, wherein, in step (d), are added by weight percentage of the total weight of the biodegradable polymer 0.1% to 2.5%, preferably 0.2% to 2%, more preferably 0.3% to 1%, most preferably 0.5% polycarboxylic acid, or a derivative thereof.

13. Method for preparing a biodegradable polymer according to any one of claims 1 to 13, wherein, in step

(d), are added by weight percentage of the total weight of the biodegradable polymer 0.1% to 20%, preferably 0.5% to 15%, more preferably 1% to 10%, most preferably 1% to 5% polyvinyl alcohol.

14. Method for preparing a biodegradable polymer according to any one of claims 1 to 13, wherein the temperature of step (b) is maintained in a range of 85°C to 120°C, more preferably 90°C to 115°C, most preferably 100°C to 110°C.

15. Method for preparing a biodegradable polymer according to any one of claims 1 to 14, wherein the temperature of step (c) is maintained in a range of 85°C to 120°C, more preferably 90°C to 115°C, most preferably 100°C to 110°C.

16. Method for preparing a biodegradable polymer according to any one of claims 1 to 15, wherein the mixture in step (a) further comprises one or more vegetable and/or animal oils and/or fats selected from the group consisting of rapeseed oil, olive oil, caraway oil, soy oil, walnut oil, hazelnut oil, peanut oil or peanut butter, coconut butter, lemon oil, sheep fat, beef fat, and fish oil.

17. Method for preparing a biodegradable polymer according to claim 16, wherein the acidic mixture of step (a) comprises by weight percentage of the total weight of the biodegradable polymer 0.1% to 5%, preferably 0.1% to 4% of one or more vegetable oils and/or fats.

18. Method for preparing a biodegradable polymer according to any one of claims 1 to 17, wherein, in step

(d), are further added by weight percentage of the total weight of the biodegradable polymer 0.5% to 20% mono- and/or disaccharides.

19. Method for preparing a biodegradable polymer according to any one of claims 1 to 18, wherein, in step (d), are further added by weight percentage of the total weight of the biodegradable polymer 0.01% to 5%, preferably 0.02% to 3%, more preferably 0.05% to 1% of one or more hydrophobic silica and/or silicate.

20. Method for preparing a biodegradable polymer according to claim 19, wherein one or more hydrophobic silicates are sodium silicates.

21. Method for preparing a biodegradable polymer according to any one of claims 1 to 20, wherein step (a) and/or step (d) further comprises, by weight percentage of the total weight of the biodegradable polymer, adding 0.05% to 5%, preferably 0.1% to 4%, more preferably 0.2% to 3% of one or more additives, preferably selected form the group consisting of glycerol, gluconic acid, di-acetal, sodium sulphate, and biocide.

22. Method for preparing a biodegradable polymer according to any one of claims 1 to 21, further comprising step (d) comprising shaping the biodegradable polymer obtained in step (c) by a process chosen from the group consisting of extrusion, thermoforming, injection molding, blow molding, coating, spinning, rolling, compression molding, and transfer molding.

23. Method for preparing a biodegradable polymer according to claim 22, wherein the biodegradable polymer, before step (d), is mixed with another polymer, preferably a biodegradable polymer.

24. Biodegradable polymer obtainable by a method according to any of the claims 1 to 23.

25. Use of a biodegradable polymer according to claim 24 wherein the use is selected from the group consisting of for coating surfaces, as a protective layer, for thermal insulation, for anti-oxidation insulation, for the manufacture of packaging materials, the manufacture of food containers, and the manufacture of food protective films.