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(54) **Titre : LIANTS ET PRODUITS ASSOCIES**
(54) **Title: BINDERS AND ASSOCIATED PRODUCTS**

(57) **Abrégé/Abstract:**
The present invention relates to a water-soluble pre-reacted binder composition, a method of its manufacture, a use of said pre-reacted binder composition, a method of manufacturing a collection of matter bound by a polymeric binder, a binder solution or dispersion comprising said pre-reacted binder composition, as well as products comprising the pre-reacted binder composition in a cured state.

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(54) **Title**: BINDERS AND ASSOCIATED PRODUCTS

(57) **Abstract**: The present invention relates to a water-soluble pre-reacted binder composition, a method of its manufacture, a use of said pre-reacted binder composition, a method of manufacturing a collection of matter bound by a polymeric binder, a binder solution or dispersion comprising said pre-reacted binder composition, as well as products comprising the pre-reacted binder composition in a cured state.

Claims

1. A method of manufacturing a collection of matter bound by a polymeric binder comprising the steps:

(i) providing a collection of matter,

(ii) providing a water-soluble pre-reacted binder composition comprising the reaction product(s) of

(a) at least one carbohydrate component, and

(b) at least one nitrogen-containing component selected from the group consisting of an organic amine comprising at least one primary amine group, salts of an organic amine comprising at least one primary amine group, a polyamine, a primary polyamine, and a polymeric polyamine,

wherein the pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 1 to 500 kDa in an amount of 2 wt.-% or more, based on the total weight of the pre-reacted binder composition,

(iii) applying the water-soluble pre-reacted binder composition in the form of an aqueous solution or dispersion containing no more than 80 wt.-% of said pre-reacted binder composition obtained in step (ii) to the collection of matter, and

(iv) applying energy to the collection of matter containing said solution or dispersion to cure the binder composition.

2. The method according to claim 1, wherein step (ii) comprises adding a crosslinker to the pre-reacted binder composition.

3. The method according to claim 2, wherein the crosslinker comprises hexamethylenediamine.

4. The method according to any one of claims 1 to 3, wherein said at least one pre-polymer having a molecular weight in the range of 1 to 500 kDa is contained in an amount of 5 wt.-% or more, based on the total weight of the binder composition.

5. The method according to claim 4 wherein said at least one pre-polymer having a

molecular weight in the range of 1 to 500 kDa is contained in an amount of 10 wt.-% or more based on the total weight of the binder composition.

6. The method according to claim 4 wherein said at least one pre-polymer having a molecular weight in the range of 1 to 500 kDa is contained in an amount of 20 wt.-% or more based on the total weight of the binder composition.

7. The method according to claim 4 wherein said at least one pre-polymer having a molecular weight in the range of 1 to 500 kDa is contained in an amount of 35 wt.-% or more based on the total weight of the binder composition.

8. The method according to claim 4 wherein said at least one pre-polymer having a molecular weight in the range of 1 to 500 kDa is contained in an amount of 50 wt.-% or more based on the total weight of the binder composition.

9. The method according to any one of claims 1 to 8, wherein the pre-reacted binder is in the form of an aqueous solution or dispersion containing at least 30% wt.-of said pre-reacted binder composition.

10. The method according to claim 9 wherein the pre-reacted binder is in the form of an aqueous solution or dispersion containing at least 40 wt.-% of said pre-reacted binder composition.

11. The method according to claim 9 wherein the pre-reacted binder is in the form of an aqueous solution or dispersion containing at least 50 wt.-% of said pre-reacted binder composition.

12. The method according to claim 9 wherein the pre-reacted binder is in the form of an aqueous solution or dispersion containing at least 55 wt.-% of said pre-reacted binder composition.

13. The method according to any one of claims 1 to 12, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight

in the range of 80 to 500 kDa in an amount of 0.2 wt.-% or more based on the total weight of the pre-reacted binder composition.

14. The method according to claim 13, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 80 to 500 kDa in an amount of 0.5 wt-% or more based on the total weight of the pre-reacted binder composition.

15. The method according to claim 13, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 80 to 500 kDa in an amount of 0.75 wt-% or more based on the total weight of the pre-reacted binder composition.

16. The method according to any one of claims 1 to 15, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 10 to 80 kDa in an amount of 1 wt.-% or more based on the total weight of the pre-reacted binder composition.

17. The method according to claim 16, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 10 to 80 kDa in an amount of 5 wt.-% or more based on the total weight of the pre-reacted binder composition.

18. The method according to claim 16, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 10 to 80 kDa in an amount of 10 wt.-% or more based on the total weight of the pre-reacted binder composition.

19. The method according to claim 16, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 10 to 80 kDa in an amount of 30 wt.-% or more based on the total weight of the pre-reacted binder composition.

20. The method according to claim 16, wherein said pre-reacted binder composition comprises at least one pre-polymer having a molecular weight in the range of 10 to 80 kDa in an amount of 50 wt.-% or more, based on the total weight of the pre-reacted binder composition.

21. The method according to any one of claims 1 to 20, wherein said pre-reacted binder composition comprises one or more low molecular-weight compounds having a molecular weight of 10 kDa or less , and which are different from (a) the at least one carbohydrate component and (b) the at least one nitrogen-containing component.

22. The method according to claim 21, in which the low molecular-weight compounds comprise one or more of a glycolaldehyde, glyceraldehyde, 2-oxopropanal, acetol, dihydroxyacetone, acetoin, butanedione, ethanal, glucosone, 1-desoxyhexosulose, 3-desoxyhexosulose, 3-desoxy-pentosulose, 1,4-didesoxyhexosulose, glyoxal, methylglyoxal, diacetyl and 5-(hydroxymethyl)furfural.

23. The method according to any one of claims 1 to 22, wherein the at least one carbohydrate component of the pre-reacted binder composition is selected from the group consisting of monosaccharides, disaccharides and polysaccharides or a mixture thereof.

24. The method according to claim 23, wherein the at least one carbohydrate component of the pre-reacted binder composition is selected from the group consisting of reducing sugars, ribose, arabinose, xylose, lyxose, glucose, dextrose, mannose, galactose, allose, altrose, talose, gulose, idose, fructose, psicose, sorbose, dihydroxyacetone, sucrose and tagatose, or a mixture thereof.

25. The method according to any one of claims 1 to 24, wherein the at least one nitrogen-containing component of the pre-reacted binder composition is hexamethylenediamine.

26. The method according to any one of claims 1 to 25, wherein the collection of matter comprises matter selected from the group consisting of mineral fibers, slag wool fibers, stone wool fibers, glass fibers, aramid fibers, ceramic fibers, metal fibers, carbon fibers, polyimide fibers, polyester fibers, rayon fibers, cellulosic fibers, coal, sand, wood shavings, sawdust, wood pulp, ground wood, wood chips, wood strands, wood layers, jute, flax, hemp, straw, wood veneers, facings, wood facings, particles, and woven or non-woven materials.

27. The method according to any one of claims 1 to 26, in which an aqueous solution containing 70 wt.-% of said pre-reacted binder composition has a viscosity at 20°C of at most 2000 cP.

28. The method according to any one of claims 1 to 27, in which the viscosity of an aqueous solution containing 70 wt.-% of said pre-reacted binder composition does not increase by more than 500 cP when left to stand at 20°C for 12 hours.

29. The method according to any one of claims 1 to 28, wherein the pre-reacted binder composition is a pre-reacted binder prepared by mixing starting materials comprising the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) and wherein the total amount of the at least one carbohydrate component (a) and the at least one nitrogen-containing component (b) in the starting materials with respect to the total weight of the binder composition before pre-reaction is at least 20 wt.-%.

30. The method according to claim 29, wherein the total amount of the at least one carbohydrate component (a) and the at least one nitrogen-containing component (b) in the starting materials to prepare the pre-reacted binder composition with respect to the total weight of the binder composition before pre-reaction is at least 40 wt.-%.

31. The method according to claim 29, wherein the total amount of the at least one carbohydrate component (a) and the at least one nitrogen-containing component (b) in the starting materials with respect to the total weight of the binder composi-

tion before pre-reaction is at least 60 wt.-%.

32. The method according to claim 29, wherein the total amount of the at least one carbohydrate component (a) and the at least one nitrogen-containing component (b) in the starting materials with respect to the total weight of the binder composition before pre-reaction is at least 80 wt.-%.

33. The method according to claim 29, wherein the total amount of the at least one carbohydrate component (a) and the at least one nitrogen-containing component (b) in the starting materials with respect to the total weight of the binder composition before pre-reaction is at least 95 wt.-%.

34. The method according to any one of claims 1 to 33, wherein the total amount of the reaction product(s) of the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) with respect to the total weight of the pre-reacted binder composition is at least 20 wt.-%.

35. The method according to claim 34, wherein the total amount of the reaction product(s) of the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) with respect to the total weight of the pre-reacted binder composition is at least 40 wt.-%.

36. The method according to claim 34, wherein the total amount of the reaction product(s) of the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) with respect to the total weight of the pre-reacted binder composition is at least 60 wt.-%.

37. The method according to claim 34, wherein the total amount of the reaction product(s) of the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) with respect to the total weight of the pre-reacted binder composition is at least 80 wt.-%.

38. The method according to claim 34, wherein the total amount of the reaction product(s) of the at least one carbohydrate component (a), and the at least one nitrogen-containing component (b) with respect to the total weight of the pre-reacted binder composition is at least 95 wt.-%.

39. A fiber or particle-containing product obtained by the method of any one of claims 1 to 38.