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(54) Title: CALCIUM CARBONATE FOR PARTICLE BOARDS

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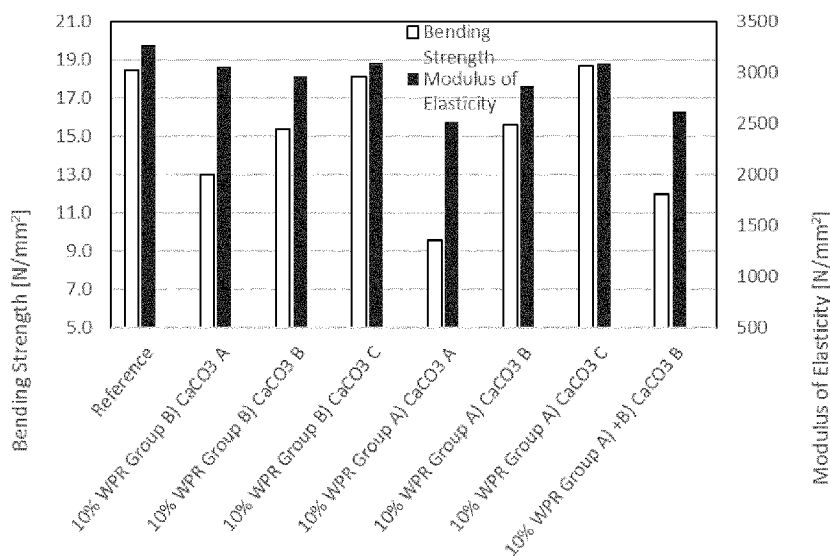


Fig. 1

(57) Abstract: The present invention relates to a particle board, a process for manufacturing the particle board as well as the use of at least one particulate calcium carbonate-containing material as wood particle replacement in a particle board.



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AMENDED CLAIMS

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Claims

1. Particle board comprising

5 a) a wood particle base layer having a first side and a reverse side, the wood particle base layer comprising

i) wood particles in an amount from 60.0 to 97.5 parts by weight (d/d) and at least one particulate calcium carbonate-containing material in an amount from 2.5 to 40.0 parts by weight (d/d), based on the total dry weight of the wood particles and at least one particulate calcium carbonate-containing material of the wood particle base layer,

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and

b) at least one wood particle surface layer being in contact with the first and/or reverse side of the wood particle base layer, the at least one wood particle surface layer comprising

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ii) wood particles in an amount from 70.0 to 97.5 parts by weight (d/d) and at least one particulate calcium carbonate-containing material in an amount from 2.5 to 30.0 parts by weight (d/d), based on the total dry weight of the wood particles and the at least one particulate calcium carbonate-containing material of the at least one wood particle surface layer,

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wherein the sum of the amount of the wood particles and the at least one particulate calcium carbonate-containing material in each of the wood particle base layer and the at least one wood particle surface layer is 100.0 parts by weight (d/d), based on the total dry weight of the wood particles and wherein the at least one particulate calcium carbonate-containing material in the layer is characterized in that the at least one particulate calcium carbonate-containing material has a weight median particle size d_{50} from 1.0 μm to 1 000.0 μm .

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2. Particle board according to claim 1, wherein the at least one particulate calcium carbonate-containing material is dolomite and/or at least one ground

calcium carbonate (GCC), such as marble, chalk, limestone and/or mixtures thereof, and/or at least one precipitated calcium carbonate (PCC), preferably at least one ground calcium carbonate (GCC).

- 5 3. Particle board according to claim 1 or 2, wherein the at least one particulate calcium carbonate-containing material of the wood particle base layer and/or the at least one wood particle surface layer has a) a weight median particle size d_{50} from 15.0 μm to 1 000.0 μm and preferably from 30.0 μm to 1 000.0 μm , and/or b) a specific surface area of $\leq 5.0 \text{ m}^2/\text{g}$, more preferably from 0.1 to 5.0 m^2/g and most preferably of from 0.2 to 1.0 m^2/g as measured by the
10 BET nitrogen method, and/or c) a top cut d_{98} from 100.0 to 1 200.0 μm , more preferably from 250.0 μm to 1 100.0 μm and most preferably from 500.0 μm to 1 000.0 μm .
- 15 4. Particle board according to any one of claims 1 to 3, wherein the at least one particulate calcium carbonate-containing material of the wood particle base layer and/or the at least one wood particle surface layer consists of calcium carbonate in an amount of $\geq 10.0 \text{ wt.-%}$, preferably of 20.0 wt.-%, more preferably of 50.0 wt.-%, even more preferably of 90.0 wt.-%, more
20 preferably of $\geq 95.0 \text{ wt.-%}$ and most preferably of $\geq 97.0 \text{ wt.-%}$, based on the total dry weight of the calcium carbonate-containing material.
- 25 5. Particle board according to any one of claims 1 to 4, wherein the wood particles of the wood particle base layer and the at least one wood particle surface layer originate from primary wood sources, such as softwood tree species, hardwood tree species, non-wood fibre plants, or secondary wood sources, such as recycled wood, and mixtures thereof.
- 30 6. Particle board according to any one of claims 1 to 5, wherein the wood particle base layer comprises the wood particles in an amount from 70.0 to 95.0 parts by weight (d/d) and the at least one particulate calcium carbonate-

- containing material in an amount from 5.0 to 30.0 parts by weight (d/d), based on the total dry weight of the wood particles and the at least one particulate calcium carbonate-containing material of the wood particle base layer, and/or the at least one wood particle surface layer comprises the wood particles in an amount from 75.0 to 95.0 parts by weight (d/d) and at least one particulate calcium carbonate-containing material in an amount from 5.0 to 25.0 parts by weight (d/d), based on the total dry weight of the wood particles and the at least one particulate calcium carbonate-containing material of the at least one wood particle surface layer.
7. Particle board according to any one of claims 1 to 6, wherein the wood particles of the wood particle base layer and of the at least one wood particle surface layer are the same or different; and/or the at least one particulate calcium carbonate-containing material of the wood particle base layer and of the at least one wood particle surface layer are the same or different, preferably the at least one particulate calcium carbonate-containing material of the wood particle base layer and of the at least one wood particle surface layer differ in their weight median particle size d_{50} .
8. Particle board according to any one of claims 1 to 7, wherein the wood particle base layer and/or the at least one wood particle surface layer comprise(s) at least one binder in an amount from 0.05 to 25.0 parts by weight (d/d), based on the total dry weight of the wood particles and the at least one particulate calcium carbonate-containing material, preferably the at least one binder is selected from the group comprising phenol-formaldehyde resin (PF), urea-formaldehyde resin (UF), melamine-formaldehyde resin (MF), melamine-urea-formaldehyde resin (MUF), urea-melamine-formaldehyde resin (UMF), urea-melamine-phenol-formaldehyde resin (UMPF), epoxy resin, methylene diphenyl diisocyanate resin (MDI), polyurethane resin (PU), resorcin resin, starch or carboxymethylcellulose and mixtures thereof, more preferably the at least one binder is selected from the

group comprising phenol-formaldehyde resin (PF), urea-formaldehyde resin (UF), melamine-formaldehyde resin (MF), melamine-urea-formaldehyde resin (MUF), urea-melamine-formaldehyde resin (UMF), urea-melamine-phenol-formaldehyde resin (UMPF), epoxy resin, methylene diphenyl diisocyanate resin (MDI), polyurethane resin (PU) and mixtures thereof.

9. Particle board according to any one of claims 1 to 8, wherein the wood particle base layer and/or the at least one wood particle surface layer further comprises at least one compound selected from the group comprising waxes, colorants, filler (differing from the at least one particulate calcium carbonate-containing material), dispersants, biocides, hardener and flame retardants.

10. Particle board according to any one of claims 1 to 9, wherein the particle board is a three-layer particle board consisting of the wood particle base layer and two wood particle surface layers, preferably one wood particle surface layer is in contact with the first side of the wood particle base layer and the other wood particle surface layer is in contact with the reverse side of the wood particle base layer.

11. Particle board according to any one of claims 1 to 10, wherein the particle board has a bending strength of $\geq 10 \text{ N/mm}^2$, preferably from 10 to 25 N/mm^2 and most preferably from 10 to 20 N/mm^2 ; and/or a modulus of elasticity of $\geq 1000 \text{ N/mm}^2$, preferably from 1600 to 3500 N/mm^2 and most preferably from 1600 to 3200 N/mm^2 ; and/or internal bond strength of $\geq 0.30 \text{ N/mm}^2$, more preferably from 0.35 to 1.0 N/mm^2 and most preferably from 0.35 to 0.9 N/mm^2 ; and/or a thickness swelling after 24 h water storage of $\leq 15 \%$, more preferably from 4.0 to 15.0 % and most preferably from 5.0 to 14 %.

12. Process for manufacturing a particle board according to any one of claims 1 to 11, the process comprising the steps of:

- a) providing wood particles, as defined in any one of claims 1 or 5 to 7, in dry form,
- b) providing at least one particulate calcium carbonate-containing material as defined in any one of claims 1 to 4, 6 or 7,
- 5 c) optionally providing at least one binder as defined in claim 8 and/or at least one compound as defined in claim 9,
- d) combining the wood particles of step a) simultaneously or separately in any order with the at least one particulate calcium carbonate-containing material of step b) and the optional at least one binder and/or at least one compound of step c) to form a wood particle-calcium carbonate-
- 10 containing material mixture which is suitable to form a wood particle base layer mat,
- e) combining the wood particles of step a) simultaneously or separately in any order with the at least one particulate calcium carbonate-containing material of step b) and the optional at least one binder and/or at least one compound of step c) to form a wood particle-calcium carbonate-
- 15 containing material mixture which is suitable to form at least one wood particle surface layer mat,
- f) forming a multi-layer mat of the wood particle-calcium carbonate-containing material mixtures obtained in steps d) and e), and
- 20 g) pressing the multi-layer mat of step f) in one or more steps into a solid particle board.
13. Process according to claim 12, wherein process steps d) and/or e) is/are
- 25 carried out in that the wood particles of step a) are combined simultaneously with the at least one particulate calcium carbonate-containing material of step b) and the optional at least one binder and/or at least one compound of step c), or process steps d) and/or e) is/are carried out in that the wood particles of step a) are combined separately with the at least one particulate calcium
- 30 carbonate-containing material of step b) and the optional at least one binder and/or at least one compound of step c).

14. Process according to any one of claims 12 or 13, wherein the wood particles
of step a) and/or the at least one particulate calcium carbonate-containing
material of step b) is/are provided in dry form.
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15. Use of at least one particulate calcium carbonate-containing material as wood
particle replacement in a particle board, characterized in that the at least one
particulate calcium carbonate-containing material has a weight median
particle size d_{50} from 1.0 μm to 1 000.0 μm , preferably from 15.0 μm to
10 1 000.0 μm and most preferably from 30.0 μm to 1 000.0 μm .