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(54) **MANUFACTURE OF BOARD**

HERSTELLUNG VON FASERPLATTEN

FABRICATION DE PANNEAU DE FIBRES

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(56) References cited:
DD-A- 205 382 DD-A- 242 193

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Description

This invention relates to the manufacture of board of lignocellulose-containing material, such as fiber board.

Board of this kind is manufactured by disintegrating the material to particles containing fiber bundles and fibers.
 5 Glue is added to the disintegrated material and the material is dried and a web is formed which finally is pressed at increased temperature for curing the glue so that a board is formed. Fiber board is made of material which is disintegrated by defibering, i.e. of more or less free fibers.

The binding agent normally used is urea formaldehyde glue, which is admixed to the disintegrated material. The amount of glue can be 6% or more. The glue is relatively expensive, and it is therefore desired to minimize the glue addition.
 10 A smaller amount of glue, however, deteriorates the strength of the completed board. In view thereof, the glue addition must be optimized.

At the drying of the glued material, a great or small amount of water soluble formaldehyde is given off from the glue. After the separation of the drying gas from the fiber material, for example in a cyclone, the liquid content is condensed out of the gas. In conventional cleaning processes the water soluble formaldehyde then causes problems. The formaldehyde following along with the material to the final pressing also can cause problems when it is successively given off from the completed board. When glue is added to the material after its drying, the problem with formaldehyde separation arises at the pressing as well as from the completed board.
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Fiber board manufactured according to the dry method normally is called MDF (Medium Density Fiberboard) and is a board product made of wood fiber. The yield exceeds 95%. The starting material preferably is wood chips, which are defibered with relatively low energy input, 100-500 kWh/ton fibers, for freeing the fibers. The defibered fiber material is glued, dried, formed to a web and pressed in a hot press. Alternatively, the material can be dried prior to the gluing. The material normally is preheated prior to the defibering to above 150°C whereafter the defibering is carried out under pressure at this high temperature in order to facilitate the freeing of the fibers. At such a high temperature, however, the material can be degraded and miscoloured due to occurring hydrolysis. A short heating time reduces this shortcoming, but miscolouring yet cannot be avoided, and at the same time the energy consumption increases.
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The urea formaldehyde glue normally used can be mixed with the fiber material on the conveying line (blow line) from the defibering apparatus or in a separate mixing device. The amount of admixed glue can be 6% or more.

When the fiber material subsequently is dried in a tube drier by means of gas at high temperature, a great or small amount of water soluble formaldehyde is given off from the glue. As stated above, the formaldehyde following along with the fiber material to the final pressing also can cause problems when it is given off successively from the completed board. This applies especially to gluing after the drying of the material, which can be carried out at the manufacture of fiber board.
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The aforesaid problems can be reduced by the present invention, which simultaneously offers further advantages. According to the invention, the fiber material is treated with an impregnation liquid containing fiber surface activating chemicals and preheated before it is finally disintegrated.
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Examples of such chemicals are such which affect the lignin, such as Na_2SO_3 and NaHSO_3 . These chemicals can be added in an amount of 1-30 kg/ton material expressed as Na_2SO_3 . According to the invention, it is possible to increase the ISO-brightness of the completed product, to reduce the energy consumption at the defibering, to reduce the glue amount at maintained strength or to increase the strength at maintained glue amount. Furthermore, also the formaldehyde separation can be reduced substantially.
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The invention is described in greater detail in the following with reference to some embodiments thereof.

Fiberboard is manufactured by impregnating the raw material in the form of chips of, for example, softwood with lignin affecting chemicals, such as Na_2SO_3 and NaHSO_3 , in an amount of 1-30, preferably 10-20 kg/ton fiber material expressed as Na_2SO_3 .
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The impregnation, which has to be carried out rapidly, can last some minute. Thereafter the temperature is increased to 150-200°C, preferably 160-180°C, for 2-3 minutes. However, the preheating can of course be performed prior to or at the same time as the impregnation. The pH value is kept within 2-12. This implies, that an impregnation solution with Na_2SO_3 and NaHSO_3 will contain sulphite in the form of HSO_3^- and/or SO_3^{2-} . The pH value suitably can be controlled by NaOH. Due to this chemical treatment (sulphonation), the subsequent defibering can be carried out to the desired defibering degree with an energy input lower than normal. The energy consumption is in the interval 50-400 kWh/ton fiber material. The energy saving can amount to about 10% compared with conventional defibering.
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Owing to the impregnation, also the brightness of the completed fiber board increases.

As regards the fiber disintegration in the defibered material, it was found that both the fine material content and the shives content were reduced, i.e. the proportion of prima fiber has increased.
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It was also found at the impregnation according to the invention that the strength properties of the completed board have improved substantially. The tensile strength as well as the elasticity modules and the fiber bond have increased by at least 10%. Alternatively, this effect can be utilized for reducing the amount of glue addition at maintained strength properties. A 10% increase in the fiber bond corresponds to a 1% decrease in glue addition. The sulphonation according to the invention also implies, that the separation of formaldehyde can be reduced, due to the fact, that the sulphite

ions in the impregnation solution react with the formaldehyde so that it is bound in the fiber material instead of being given off from the completed board.

EXAMPLE

Raw material in the form of chips was exposed to different impregnation treatment. One batch was treated with 10 kg Na₂SO₃ per ton chips, and one batch with 10 kg NaHSO₃ per ton chips. A reference batch was not impregnated.

The different batches were preheated to about 170°C and thereafter defibered. In the blow line after the defibering, urea formaldehyde glue of the type E2 was added in an amount of 10% dry glue calculated on dry fiber. The material was thereafter dried to a dry matter content of about 90%. The fibers were dry formed to a mat, which was prepressed with a pressure of about 1.5 MPa and hot pressed for 5-6 minutes at 170°C. The board thus manufactured was tested on strength, ISO-brightness and formaldehyde content (perforator value). The relative energy consumption for the different batches was also measured. The results were as follows:

Property	Reference batch	Na ₂ SO ₃ batch	NaHSO ₃ batch
Bending strength MPa	38.4	43.8	40.0
Internal bond strength MPa	1.8	2.1	2.0
ISO-brightness %	24	26	26
Formaldehyde content mg CH ₂ O/100 g	27	20	18
Relative energy consumption	1.0	0.95	0.95

The results confirm the technical effects stated above.

The invention, of course, is not restricted to the embodiments described above, but can be varied within the scope of the invention idea as defined by the appendant claims.

Claims

1. A method of manufacturing fiberboard according to the dry method starting with lignocellulose-containing material which is disintegrated, glued, dried, formed to a web and pressed,
characterized in that the material, before it is finally disintegrated is treated with an impregnation solution containing fiber surface activating chemicals in an amount of 1-30 kg/ton fiber material, expressed as Na₂SO₃, and preheated to 150-200°C whereby the pH value is kept within 2-12 and that the disintegration is performed with an energy input of 50-400 kWh/ton fiber material.
2. A method as defined in claim 1,
characterized in that the fiber surface activating chemicals are of a type affecting the lignin.
3. A method as defined in claim 2,
characterized in that the impregnation solution contains Na₂SO₃ and/or NaHSO₃.
4. A method as defined in anyone of claims 1-3,
characterized in that the disintegrated material first is glued and thereafter dried before it is formed to a web.
5. A method as defined in anyone of claims 1-3,
characterized in that the disintegrated material first is dried and thereafter glued before it is formed to a web.

Patentansprüche

1. Verfahren zur Herstellung einer Faserplatte nach den Trockenverfahren, ausgehend von Lignozellulose enthaltendem Material, das zerkleinert, geleimt, getrocknet und zu einem Flächengebilde geformt und verpreßt wird, dadurch gekennzeichnet, daß das Material, bevor es schließlich zerkleinert wird, mit einer Imprägnierlösung behandelt wird, die die Faseroberfläche aktivierende Chemikalien in einer Menge von 1-30 kg/Tonne Fasermaterial, ausgedrückt als Na₂SO₃, enthält, und auf 150-200°C vorerhitzt wird, wobei der pH-Wert zwischen 2-12 gehalten wird und daß die Zerkleinerung mit einer Energiezufuhr von 50-400 kWh/Tonne Fasermaterial ausgeführt wird.

2. Verfahren nach Anspruch 1, dadurch gekennzeichnet, daß die die Faseroberfläche aktivierenden Chemikalien von einer Art sind, die Lignin beeinflusst.
- 5 3. Verfahren nach Anspruch 2, dadurch gekennzeichnet, daß die Imprägnierlösung Na_2SO_3 und/oder NaHSO_3 enthält.
4. Verfahren nach einem der Ansprüche 1-3, dadurch gekennzeichnet, daß das zerkleinerte Material zuerst geleimt und anschließend getrocknet wird, bevor es zu einem Flächengebilde geformt wird.
- 10 5. Verfahren nach einem der Ansprüche 1-3, dadurch gekennzeichnet, daß das zerkleinerte Material zuerst getrocknet und anschließend geleimt wird, bevor es zu einem Flächengebilde geformt wird.

Revendications

- 15 1. Procédé de fabrication de panneau de fibres selon la méthode sèche en partant d'un matériau contenant de la lignocellulose qui est désintégré, collé, séché et conformé en un ruban puis comprimé, caractérisé en ce que le matériau, avant qu'il soit finalement désintégré est traité avec une solution d'imprégnation contenant des agents chimiques d'activation de la surface des fibres en une quantité de 1-30 kg/tonne du matériau en fibres, exprimée en tant que Na_2SO_3 et, préchauffé jusqu'à 150-200°C de manière que la valeur du pH soit maintenue entre 2-12 et en ce que la désintégration est effectuée avec une admission d'énergie de 50-400 KWh/tonne de matériau en fibres.
- 20 2. Procédé selon la revendication 1, caractérisé en ce que les agents chimiques d'activation de la surface des fibres sont d'un type affectant la lignine.
- 25 3. Procédé selon la revendication 2, caractérisé en ce que la solution d'imprégnation contient Na_2SO_3 et/ou NaHSO_3 .
4. Procédé selon l'une quelconque des revendications 1-3, caractérisé en ce que le matériau désintégré est tout d'abord collé et ensuite séché avant d'être conformé en un ruban.
- 30 5. Procédé selon l'une quelconque des revendications 1-3, caractérisé en ce que le matériau désintégré est tout d'abord séché et ensuite collé avant d'être conformé en un ruban.