Claims

1. Method for producing a laminated structure comprising:

a method step for densifying a hygroscopic material comprising the steps of:

a) providing the hygroscopic material to be densified;

b) pre-conditioning of the hygroscopic material by adjusting the moisture content of the hygroscopic material to a value of 5 - 30%;

c) simultaneously heating and pressing the hygroscopic material under predefined temperature and pressure conditions, whereby the pressure is increased to a value of 5 - 50 MPa and the temperature is increased to a value of 100 - 220°C, whereby the moisture content of the hygroscopic material is kept constant;

d) obtaining a densified material;

whereby:

(A) a layer of the hygroscopic material is densified in said method step of densifying a hygroscopic material and afterwards laminated with at least one further layer, whereby the at least one further layer is made of:

(i) another layer of hygroscopic material densified with the said method step for densifying a hygroscopic material; and/or

(ii) plant-based material, animal-based material and/or wood-based material, plant and/or wood fibers, wood-chips, wood flour, cellulose, starch, lignin, wood bark, wood extractives, algae, chitin-based materials, chitosan-based materials, native wood, protein, coal, char, carbon black and/or active coal; and/or

(iii) metals and/or metal alloys; and/or

(iv) polymeric materials; and/or

(v) inorganic materials;

whereby the laminated structure is produced such that the laminated structure comprises:

a) a backside made of a layer of a densified or non-densified wood veneer

b) a frontside made of a layer of a densified or non-densified wood veneer

c) an integrated circuit, a memory device, a tracking device, a sensing device, an antenna and/or an electromagnetic coil,

whereby the layers are laminated and at least one of the layers of wood veneer are made of densified wood veneer

or:

(B) whereby in step a) of said method step for densifying the hygroscopic material, the hygroscopic material to be densified, is provided in the form of a stack comprising at least two layers, whereby at least one layer is/are made of hygroscopic material, and whereby all layers of the stack are densified together, and

whereby the stack comprises an electronic functionality, a magnetic functionality, and/or an optical label.

2. Method according to claim 1, whereby the method comprises a further step b1) of gas-tight packaging of the pre-conditioned hygroscopic material in a gas-tight casing before step c).

3. Method according to claim 1or 2, whereby the hygroscopic material to be densified is selected from plant materials, natural fiber materials, synthetic fiber materials, mineral wool, animal wool, skin-based materials, chitin-based materials, chitosan-based materials, protein-based materials, and/or the mixtures of such materials.

4. Method according to any one of claims 1 - 3, whereby the hygroscopic material to be densified is wood.

5. Method according to any one of claims 1 – 4, whereby the method is effected such that a density of the obtained densified material is 1.01 – 100 times the density of the hygroscopic material before the treatment.

6. Method according to any one of claims 1 – 5, whereby in step c) the pressure is increased to a value of 5 – 50 MPa, and/or the temperature is increased to a value of 120 - 190°C or 130 - 190°C.

7. Method according to any one of claims 1 – 6, whereby step c) comprises the following sub-steps:

   c1) the hygroscopic material is pre-heated to a first temperature at a first pressure and kept for a predefined first dwell time;

   c2) while keeping the first temperature, the pressure is raised to a second pressure, and kept for a predefined second dwell time;

   c3) while keeping the second pressure, the temperature is increased to a second temperature and kept for a predefined third dwell time;

   c4) reducing the temperature to room temperature;

   c5) reducing the pressure to ambient pressure.

8. Method according to any one of claims 1 - 7, whereby the electronic functionality, the magnetic functionality, and/or the optical label is arranged on a layer of cellulosic material.

9. Method according to any one of claims 1 - 8, whereby at least two layers of the stack are made of wood.

10. Method according to any one of claims 1 - 9, whereby after step d), a recess and/or an engraving is produced at least in the outermost layer.

11. Method according to claim 10, whereby the electronic functionality, the magnetic functionality and/or the optical label is placed in the recess.

12. Method according to claim 11, whereby the electronic functionality is arranged such that it is in electrical contact with the other electrical functionality comprised in the stack.

13. Method for producing a product comprising the steps of (i) one producing a laminated structure according to any one of claims 1-12, and (ii) manufacturing the product at least partly from the laminated structure obtained in step (i), whereby the product is a musical instrument or a part of it, a furniture, a door, a door handle, a floor covering, a wall covering, a revetment, an automotive part, a covering for a ceiling, a sports equipment, a load-bearing

element, a card, an electronic device, or a casing for an electronic device, a data storage device, or a casing for a mobile phone.

14. Method according to claim 13, whereby the product is a payment card, a credit card, a debit card, an identity card, a member card and/or an access card.