

Composite material, processes for the production thereof,
and the use thereof

The present invention relates to a composite material comprising at least three layers or films, of which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin which contains reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being possible for further layers to be present. The invention furthermore relates to a process for the production of the composite material and to the use thereof.

The invention preferably allows the production or treatment of furniture, furniture parts or cardboard, advantageously composite materials, with no risk of delamination while observing very particular compositions of individual layers or films.

It has already been disclosed to coat polyethylene graft polymers containing reactive groups with other substrates, including ethylene-vinyl acetate copolymer, producing composite materials. However, such composite layers are unsuitable for the production of furniture, furniture parts or for composites with cardboard since they do not have a combination of the desired decorative properties and the requirement for loading of these parts.

Polyolefin films for furniture and furniture parts have already been disclosed (cf., inter alia, EP-B-0213441). However, these polyolefin films or polyolefin-containing films must either contain fillers with particular reactive substances in certain amounts by weight and/or be pretreated by specific processes, for example by corona treatment or plasma treatment to enable them to be printable and/or bondable. In addition, these polyolefin films are very highly statically charged, so that they are only of limited utility for many applications.

The object of the present invention is to provide

a composite material which is suitable for furniture, furniture parts and for cardboard or for the coating or production thereof and which does not have these disadvantages. Corona or plasma aftertreatment should not
5 be necessary in the case of the composite materials or in the production thereof. Furthermore, additional antistatic coating should be unnecessary. The composite material should have good processing properties, be readily printable and have very good adhesion and should
10 be simple to produce or should be highly suitable for coatings of wood, wood materials and cardboard.

It has been found in accordance with the invention that these objects are achieved by a composite material comprising at least three layers or films, of
15 which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin which contains reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being
20 possible for further layers to be present. In accordance with the invention, the multilayer composite film has been produced by coextrusion or multiple extrusion for furniture, furniture parts or cardboard or the composite material comprises a corresponding composite film, where
25 one layer or film of the composite film is a polyolefin-containing decorative upper layer or film (1) with a thickness of from 60 to 600 μm which comprises a polyolefin having an MFI value (230/2.16 kg) of from 3 to 9 g/10 min or a polyolefin mixture having an MFI value
30 (230/2.16 kg) of from 3 to 9 g/10 min, selected from the group consisting of propylene homopolymers and copolymers and mixtures or alloys of propylene homopolymers and/or copolymers with a polyethylene, with or without addition of up to 20% by weight of an elastomer (based on the
35 total weight of the plastic in the decorative upper film), where the decorative layer or film contains (based on 100 parts by weight of the polymer of the upper layer or film) from 0.1 to 30 parts by weight of dyes or colour pigments, from 0.01 to 5 parts by weight of stabilizers

and from 0 to 50 parts by weight of fillers and/or other processing auxiliaries or additives, and at least one further layer or film is an adhesion-promoting intermediate layer or film (2) containing no fillers or having a low filler content and having a thickness of from 0.3 to 100 μm , comprising a propylene graft polymer which contains reactive groups and has an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min or a functionalized propylene graft polymer having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min, where the intermediate layer or the propylene graft polymer of the intermediate layer contains no polyethylene or has a low polyethylene content (polyethylene content of less than 10% by weight, based on the polymer). Adjacent to the intermediate layer or film (2), in particular thereunder, is at least one further layer or film comprising a lower layer or film (3) having a low filler content or containing no fillers and having a thickness of from 0.3 to 100 μm , comprising an ethylene-vinyl alcohol copolymer (EVOH) having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min and having an ethylene content, based on the ethylene-vinyl alcohol copolymer, of from 25 to 48% by weight.

As soon as the ethylene content or polyethylene content exceeds the stated values for the intermediate layer or film (2) and/or the lower layer or film (3), i.e. the ethylene or polyethylene content is increased, disadvantages arise. For example, the risk of delamination increases.

In a preferred embodiment, the polyolefin-containing decorative upper layer or film (1) contains, based on 100 parts by weight of polymer, from 0.5 to 25 parts by weight of dyes and/or colour pigments, from 0.05 to 3 parts by weight of UV and/or heat stabilizers, from 0 to 30 parts by weight of fillers and/or processing auxiliaries and additives, where the polyolefin or polyolefin mixture has an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min. The propylene graft polymer of the intermediate layer or film (2) or the functionalized

propylene graft polymer has been prepared by grafting on reactive substances, preferably monomeric substances or compounds containing polar groups, where the polyethylene content of the intermediate layer is less than 3% by weight, preferably contains no polyethylene, and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer of the lower layer or film (3) is greater than 60% by weight, where the polymers or polymer mixtures of the decorative upper layer or film (1), of the intermediate layer or film (2) and of the lower layer or film (3) have been selected so that they have an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.

The decorative upper layer or film (1) preferably has a thickness of from 80 to 400 μm , the intermediate layer or film (2) preferably has a thickness of from 0.5 to 25 μm , particularly preferably from 1 to 20 μm , and the lower layer or film (3) preferably has a thickness of from 0.5 to 25 μm , particularly preferably from 1 to 20 μm , and/or the total polypropylene (PP) content in the decorative upper layer or film is greater than 50% by weight, preferably greater than 60% by weight (based on the polymer of the decorative upper layer or film).

The functional or reactive groups on the propylene graft polymer are preferably carboxyl or carboxyl-containing groups, acid anhydride groups, sulphonyl groups or reactive nitrogen-containing groups or contain these corresponding acid or acid-anhydride groups.

The functionalized propylene graft polymer has preferably been grafted with maleic anhydride (MAH), maleic acid or azidosulphonylbenzoic acid (ASB).

In a preferred embodiment, the ethylene content of the ethylene-vinyl alcohol copolymer (EVOH) in the lower layer or film (3) is from 28 to 38% by weight (based on the EVOH). In combination with the other layers or films, this further reduces the risk of delamination and increases the adhesion.

The thickness of the decorative upper layer or film (1) is a multiple of the total of the thicknesses of

the intermediate layer or film (2) and the lower layer or film (3), and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer (EVOH) of the lower layer or film (3) has been adjusted to more than 65% by weight or is
5 more than 65% by weight.

In a preferred embodiment, one or more print layer(s) (4) has been arranged over part of the area, preferably in patterns or figures, of the decorative upper layer or film (1), and at least one lacquer layer
10 (5) has been arranged over the entire area or over part of the area thereof.

The ratio between the thickness of the decorative upper layer or film (1) and the total of the thicknesses of the intermediate layer or film (2) and the lower layer or film (3) is preferably from 6:1 to 25:1, preferably
15 from 7:1 to 20:1, and/or the ratio between the thicknesses of the decorative upper layer or film and the intermediate layer or film and the lower layer or film is from 12:1:1 to 42:1:1, preferably from 14:1:1 to 40:1:1, and/or the polyethylene in the mixture or alloy with propylene homopolymer and/or copolymer in the decorative
20 upper layer or film is an HDPE, LDPE, LLDPE and/or VLDPE, or a mixture of two or more of the constituents.

The composite material of the present invention
25 comprises either the composite film which comprises the layers or films (1), (2) and (3) and is used for coating wood, wood materials or cardboard and the like or a composite of this composite film with wood, wood materials, cardboard and the like directly.

In a preferred embodiment, the composite film, before printing and/or bonding (to wood, wood material or cardboard), has a water content which, based on the ethylene-vinyl alcohol copolymer employed, is and/or is set to from 0.05 to 15% by weight, preferably from 0.1 to
30 8% by weight (based on 100 parts by weight of the ethylene-vinyl alcohol copolymer employed).
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In a particularly preferred embodiment, the composite film is bonded, via the lower film (3), to a moulded article, moulding or board containing wood or

wooden parts, preferably a wood chipboard, a chipboard part or a chipboard section, a wooden material part, a wooden material board, a fibreboard or a fibre-containing board or cardboard or a cardboard section, by means of at least one adhesive layer, preferably based on polyvinyl acetate copolymer (PVAC), ethylene-vinyl acetate copolymer (EVA), methacrylic acid (or methacrylate) or polymethacrylate, polyurethane (PU), acrylic ester (or acrylate) or polyacrylate in the form of a one-component adhesive, two-component adhesive or heat-sealing adhesive, but preferably as an emulsion adhesive.

The invention furthermore relates to a process for the production of a composite material comprising at least three layers or films, of which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin which contains reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being possible for further layers to be present. In accordance with the invention, the multi-layer composite film is produced by coextrusion or multiple extrusion for furniture, furniture parts or cardboard or the composite material comprises a corresponding composite film, where one layer or film of the composite film is

1. a polyolefin-containing decorative upper layer or film (1) with a thickness of from 60 to 600 μm which comprises a polyolefin having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min or a polyolefin mixture having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min, selected from the group consisting of propylene homopolymers and copolymers and mixtures or alloys of propylene homopolymers and/or copolymers with a polyethylene, with or without addition of up to 20% by weight of an elastomer (based on the total weight of the plastic in the decorative upper film), where the decorative layer or film contains (based on 100 parts by weight of the polymer of the upper layer or film) from 0.1

to 30 parts by weight of dyes or colour pigments, from 0.01 to 5 parts by weight of stabilizers and from 0 to 50 parts by weight of fillers and/or other processing auxiliaries or additives,

- 5 2. an adhesion-promoting intermediate layer or film (2) containing no fillers or having a low filler content and having a thickness of from at least 0.3 to 100 μm , comprising a propylene graft polymer which contains reactive groups and has an MFI value
10 (230°C/2.16 kg) of from 3 to 9 g/10 min or a functionalized propylene graft polymer, preferably having an MFI value (230°C/2.16 Kg of from 3 to 9g/10 min, where the intermediate layer or film or the propylene graft polymer of the intermediate
15 layer or film contains no polyethylene or has a low polyethylene content (polyethylene content of less than 10% by weight, based on the polymer), and
- 20 3. at least one underlying lower layer or film (3) having a low filler content or containing no fillers and having a thickness of from 0.3 to 100 μm , comprising an ethylene-vinyl alcohol copolymer (EVOH) having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min and having an ethylene content, based on the ethylene-vinyl alcohol copolymer, of from 25 to
25 48% by weight,

where the composite film is embossed after the multiple extrusion or coextrusion and is then or at a later time moistened using sprayed or atomized water or introduced steam.

30 Embodiments of the inventions will now be described, by way of example, and referenced to the accompanying drawings in which :

Figure 1 is a cross sectional view of a first embodiment of the invention.

35 Figure 2 is a cross sectional view of a second embodiment of the invention.

In a preferred embodiment of the novel process, the multiple extrusion is carried out using a composition in which the polyolefin-containing decorative upper layer

or film (1) contains, based on 100 parts by weight of polymer, from 0.5 to 25 parts by weight of dyes and/or colour pigments, from 0.05 to 3 parts by weight of UV and/or heat stabilizers, from 0 to 30 parts by weight of fillers and/or processing auxiliaries and additives, the propylene graft polymer of the intermediate layer or film (2) or the functionalized propylene graft polymer which is used has been prepared by grafting-on reactive substances, preferably monomeric substances or compounds containing polar groups, where the polyethylene content of the intermediate layer is less than 3% by weight, preferably contains no polyethylene, and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer of the lower layer (3) is greater than 60% by weight, where the polymers or polymer mixtures of the decorative upper layer or film (1), of the intermediate layer or film (2) and of the lower layer or film (3) are selected so that they have an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.

During the production, the layer thickness, the die gap, the flat film extruder die and/or the separation between the rolls or calenders is preferably set so that the decorative upper layer or film (1) is produced in a thickness of from 80 to 400 μm , the intermediate layer or film (2) is produced in a thickness of from 0.5 to 25 μm , preferably from 1 to 20 μm , and the lower layer or film (3) is produced in a thickness of from 0.5 to 25 μm , preferably from 1 to 20 μm , by multiple extrusion and/or the total propylene content in the decorative upper layer or film is set to greater than 50% by weight, preferably greater than 60% by weight (based on the total polymer content of the decorative upper layer or film).

In a preferred embodiment, the composite film is bonded, via the lower film (3), to a moulded article, moulding, plate or cardboard containing wood or wooden parts, preferably a wood chipboard, a chipboard part or a chipboard section, a wooden material part, a wooden material board, a fibreboard or a fibre-containing board or a cardboard section, by means of at least one adhesive

layer, preferably based on methacrylic ester (or methacrylate) or polymethacrylate, polyvinyl acetate copolymer (PVAC), ethylene-vinyl acetate copolymer (EVA), polyurethane, acrylic ester (or acrylate) and/or
5 polyacrylate, as a one-component adhesive, emulsion adhesive, two-component adhesive or heat-sealing adhesive, but preferably by means of an emulsion adhesive.

In the novel process, the composite contains a
10 lower layer or film (3) whose total ethylene content, preferably the ethylene content of the ethylene-vinyl alcohol copolymer (EVOH), is or is set to from 28 to 38% by weight.

The thickness of the decorative upper layer or
15 film (1) is set so that it is a multiple of the total of the thicknesses of the intermediate layer or film (2) and the lower layer or film (3) in the extrusion, and/or the vinyl alcohol content of the ethylene-vinyl alcohol copolymer (EVOH) of the lower film (1) has been adjusted
20 to more than 65% by weight or is more than 65% by weight.

Preferably one or more print layer(s) (4) is arranged over part of the area, preferably in patterns or figures, of the decorative upper layer or film (1), and at least one lacquer layer (5) is applied over the entire
25 area or over part of the area thereof.

In a preferred embodiment, the ratio between the thickness of the upper layer or film (1) and the total of the thicknesses of the intermediate layer or film (2) and the lower layer or film (3) is adjusted to from 6:1 to
30 25:1, preferably from 7:1 to 20:1, and/or the ratio between the thicknesses of the upper layer or film (1) and the intermediate layer or film (2) and the lower layer or film (3) is held at from 12:1:1 to 42:1:1, preferably from 14:1:1 to 40:1:1. The polyethylene used
35 in the mixture or alloy with propylene homopolymer and/or copolymer in the decorative upper layer or film (1) is preferably an HDPE, LDPE, LLDPE and/or VLDPE, preferably HDPE.

In a particularly preferred embodiment of the

novel process, the composite film, preferably the lower layer or film (3), before printing and/or bonding (to wood, wood material or cardboard), is adjusted to a water content of, based on the ethylene-vinyl alcohol copolymer employed, from 0.05 to 15% by weight, preferably from 0.1 to 8% by weight (based on 100 parts by weight of the ethylene-vinyl alcohol copolymer employed). The water here is applied or coated, preferably sprayed or applied in the form of a water mist or water vapour, to the lower layer or film (3). After the water content has been adjusted, the composite film is wound up in such a way that the lower layer or film (3) forms the "inner roll layer" (storage or transport as far as bonding) or the composite film or composite material is bonded after moistening or after adjustment of the water content, if appropriate after drying, while maintaining or substantially maintaining said water content.

The invention furthermore relates to the use of the composite material for the production of furniture, furniture parts, preferably drawers, and also to the use of the composite material for or as coated cardboard, preferably for files, book covers and office organization materials.

Examples

25 Example 1 (Figure 1)

1. PP homopolymer/HDPE (80/20 mixture)
in total 100 parts by weight

+ 20 parts by weight of pigments
+ 3 parts by weight of additives

30 PP : MFI 230°C/2.16 kg - 6 g/10 min
 HDPE : MFI 230°C/2.16 kg - 7 g/10 min

2. PP graft polymer

1% of grafted-on MAH

MFI 230°C/2.16 kg - 5.5 g/10 min

3. EVOH having an ethylene content of 32%
MFI 230°C/2.16 kg - 5 g/10 min

Example 2 (Figure 1)

- 5 1. PP homopolymer/PP elastomer
in total 100 parts by weight
95 parts by weight of PP
MFI 230°C/2.16 kg -
6 g/10 min
5 parts by weight of PP elastomer (modified
10 polypropylene)
MFI 230°C/2.16 kg -
5.8 g/10 min

+ 10 parts by weight of pigments
+ 3 parts by weight of additives
- 15 2. PP graft polymer
1% of grafted-on ASB
MFI 230°C/2.16 kg - 4.5 g/10 min
3. EVOH having an ethylene content of 32%
MFI 230°C/2.16 kg - 5.5 g/10 min

20 Example 3 (Figure 2)

- 25 1. PP homopolymer 80 parts
HDPE 15 parts
SEBS 5 parts
+ pigments 15 parts
+ additives 3 parts
PP : MFI 230°C/2.16 kg - 6 g/10 min
HDPE : MFI 230°C/2.16 kg - 7 g/10 min
- 30 2. PP graft polymer
1% of grafted-on MAH
MFI 230°C/2.16 kg - 4.5 g/10 min
3. EVOH having an ethylene content of 26%
MFI 230°C/2.16 kg - 4.5 g/10 min

4. Print layers

5. Layer of two-component PU lacquer

The composite films of Examples 1 to 3 were used for bonding to wood materials.

5 Example 4 (Figure 1)

	1. PP homopolymer	80 parts
	Linear low density PE	18 parts
	PE elastomer	2 parts
	Pigments	2 parts
10	Additives	3 parts
	PP	: MFI 230°C/2.16 kg - 7 g/10 min
	LLDPE	: MFI 230°C/2.16 kg - 8 g/10 min
	PE elastomer	: MFI 230°C/2.16 kg - 8 g/10 min

Example 4 relates to bonding of cardboard.



Claims

1. A composite material comprising at least three layers or films, of which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin which contains reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being possible for further layers to be present, characterized in that the multilayer composite film has been produced by coextrusion or multiple extrusion for furniture, furniture parts or cardboard or the composite material comprises a corresponding composite film, where one layer or film of the composite film comprises

1. a polyolefin-containing decorative upper layer or film with a thickness of from 60 to 600 μm which comprises a polyolefin having an MFI value (230/2.16 kg) of from 3 to 9 g/10 min or a polyolefin mixture having an MFI value (230/2.16 kg) of from 3 to 9 g/10 min, selected from the group consisting of propylene homopolymers and copolymers and mixtures or alloys of propylene homopolymers and/or copolymers with a polyethylene, with or without addition of up to 20% by weight of an elastomer (based on the total weight of the plastic in the decorative upper film), where the decorative layer or film contains (based on 100 parts by weight of the polymer of the upper layer or film) from 0.1 to 30 parts by weight of dyes or colour pigments, from 0.01 to 5 parts by weight of stabilizers and from 0 to 50 parts by weight of fillers and/or other processing auxiliaries or additives,
2. an adhesion-promoting intermediate layer or film containing no fillers or having a low filler content and having a thickness of from at least 0.3 to 100 μm , comprising a propylene graft polymer which contains reactive groups and has an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min



or a functionalized propylene graft polymer having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min, where the intermediate layer or the propylene graft polymer of the intermediate layer contains no polyethylene or has a low polyethylene content (polyethylene content of less than 10% by weight, based on the polymer), and

3. at least one underlying lower layer or film having a low filler content or containing no fillers and having a thickness of from 0.3 to 100 μm , comprising an ethylene-vinyl alcohol copolymer (EVOH) having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min and having an ethylene content, based on the ethylene-vinyl alcohol copolymer, of from 25 to 48% by weight.
2. A composite material according to Claim 1, characterized in that the polyolefin-containing decorative upper layer or film contains, based on 100 parts by weight of polymer, from 0.5 to 25 parts by weight of dyes and/or colour pigments, from 0.05 to 3 parts by weight of UV and/or heat stabilizers, from 0 to 30 parts by weight of fillers and/or processing auxiliaries and additives, where the polyolefin or polyolefin mixture has an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.
3. A composite material according to Claim 1 or Claim 2 characterised in that the propylene graft polymer of the intermediate layer or film or the functionalized propylene graft polymer has been prepared by grafting-on reactive substances, and the polyethylene content of the intermediate layer or film is less than 3% by weight.
4. A composite according to any one of the preceding claims characterised in that the vinyl alcohol content of the ethylene-vinyl alcohol copolymer of the lower layer or film is greater than 60% by weight.
5. A composite material according to any one of the preceding claims characterised in that the polymers or



polymer mixtures of the decorative upper layer or film, of the intermediate layer or film and of the lower layer or film have been selected so that they have an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.

6. A composite material according to any one of the preceding claims characterized in that the decorative upper layer or film has a thickness of from 80 to 400 μm , the intermediate layer or film has a thickness of from 0.5 to 25 μm and the lower layer or film has a thickness of from 0.5 to 25 μm .

7. A composite material according to any one of the preceding claims characterised in that the total polypropylene (PP) content in the decorative upper layer or film is greater than 50% by weight (based on the polymer of the decorative upper layer or film).

8. A composite material according to any one of the preceding claims characterized in that the functional or reactive groups on the propylene graft polymer are carboxyl or carboxyl-containing groups, acid anhydride groups, sulphonyl groups or reactive nitrogen-containing groups.

9. A composite material according to any one of the preceding claims characterized in that the functionalized propylene graft polymer has been grafted with maleic anhydride (MAH), maleic acid or azidosulphonylbenzoic acid (ASB).

10. A composite material according to any one of the preceding claims characterized in that the ethylene content of the ethylene-vinyl alcohol copolymer (EVOH) in the lower layer or film is from 28 to 38% by weight (based on the EVOH).

11. A composite material according to any one of the preceding claims characterized in that the thickness of the decorative upper layer or film is a multiple of the total of the thicknesses of the intermediate layer or film and the lower layer or film.

12. A composite material according to any one of the preceding claims characterised in that the vinyl alcohol content of the ethylene-vinyl alcohol copolymer (EVOH) of



the lower layer or film has been adjusted to more than 65% by weight or is more than 65% by weight.

13. A composite material according to any one of the preceding claims characterized in that one or more print layer(s) has been arranged over part of the area of the decorative upper layer or film, and at least one lacquer layer has been arranged over the entire area or over part of the area thereof.

14. A composite material according to any one of the preceding claims characterized in that the ratio between the thickness of the upper layer or film and the total of the thicknesses of the intermediate layer or film and the lower layer or film is from 6:1 to 25:1.

15. A composite material according to any one of the preceding claims characterized in that the ratio between the thicknesses of the upper layer or film and the intermediate layer or film and the lower layer or film is from 12:1:1 to 42:1:1.

16. A composite material according to any one of the preceding claims characterized in that the polyethylene in the mixture or alloy with propylene homopolymer and/or copolymer in the decorative upper layer or film is an HDPE, LDPE, LLDPE and/or VLDPE.

17. A composite material according to any one of the preceding claims characterized in that the composite film, before printing and/or bonding (to wood, wood material or cardboard), has a water content of, based on the ethylene-vinyl alcohol copolymer employed, from 0.05 to 15% by weight (based on 100 parts by weight of the ethylene-vinyl alcohol copolymer employed).

18. A composite material according to any one of the preceding claims characterized in that the composite film is bonded, via the lower film, to a moulded article, moulding or board containing wood or wooden parts, a wooden material part, a wooden material board, a fibre-board or a fibre-containing board or cardboard or a cardboard section, by means of at least one adhesive layer.

19. A composite material according to Claim 18



characterized in that the or each adhesive layer is based on polyvinyl acetate copolymer (PVAC), ethylene-vinyl acetate copolymer (EVA), polyurethane (PU), acrylic ester and/or acrylate.

20. A composite material according to Claim 18 or Claim 19 characterized in that the or each adhesive layer is a one-component adhesive, two-component adhesive, heat-sealing adhesive or an emulsion adhesive.

21. A process for the production of a composite material according to any one of the preceding claims characterised in that the composite film is embossed after the multiple extrusion or coextrusion and is then or at a later time moistened using sprayed or atomized water or introduced steam.

22. Use of a composite material according to any one of claims 1 to 20 for the production of furniture, furniture parts and coated cardboard.

23. A composite material comprising at least three layers or films, of which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin which contains reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being possible for further layers to be present, characterized in that the multilayer composite film has been produced by coextrusion or multiple extrusion for furniture, furniture parts or cardboard or the composite material comprises a corresponding composite film, where one layer or film of the composite film comprises

1. a polyolefin-containing decorative upper layer or film with a thickness of from 60 to 600 μm which comprises a polyolefin having an MFI value (230/2.16 kg) of from 3 to 9 g/10 min or a polyolefin mixture having an MFI value (230/2.16 kg) of from 3 to 9 g/10 min, selected from the group consisting of propylene homopolymers and copolymers and mixtures or alloys of propylene homopolymers and/or copolymers with a polyethylene, with or without addition of up to



20% by weight of an elastomer (based on the total weight of the plastic in the decorative upper film), where the decorative layer or film contains (based on 100 parts by weight of the polymer of the upper layer or film) from 0.1 to 30 parts by weight of dyes or colour pigments, from 0.01 to 5 parts by weight of stabilizers and from 0 to 50 parts by weight of fillers and/or other processing auxiliaries or additives,

2. an adhesion-promoting intermediate layer or film containing no fillers or having a low filler content and having a thickness of from at least 0.3 to 100 μm , comprising a propylene graft polymer which contains reactive groups and has an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min or a functionalized propylene graft polymer having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min, where the intermediate layer or the propylene graft polymer of the intermediate layer contains no polyethylene or has a low polyethylene content (polyethylene content of less than 10% by weight, based on the polymer), and

3. at least one underlying lower layer or film having a low filler content or containing no fillers and having a thickness of from 0.3 to 100 μm , comprising an ethylene-vinyl alcohol copolymer (EVOH) having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min and having an ethylene content, based on the ethylene-vinyl alcohol copolymer, of from 25 to 48% by weight.

24. A composite material according to Claim 23, characterized in that the polyolefin-containing decorative upper layer or film contains, based on 100 parts by weight of polymer, from 0.5 to 25 parts by weight of dyes and/or colour pigments, from 0.05 to 3 parts by weight of UV and/or heat stabilizers, from 0 to 30 parts by weight of fillers and/or processing



auxiliaries and additives, where the polyolefin or polyolefin mixture has an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min, in that the propylene graft polymer of the intermediate layer or film or the functionalized propylene graft polymer has been prepared by grafting-on reactive substances, where the polyethylene content of the intermediate layer or film is less than 3% by weight and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer of the lower layer or film is greater than 60% by weight, where the polymers or polymer mixtures of the decorative upper layer or film, of the intermediate layer or film and of the lower layer or film have been selected so that they have an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.

25. A composite material according to Claim 23 or Claim 24 characterized in that the decorative upper layer or film has a thickness of from 80 to 400 μm , the intermediate layer or film has a thickness of from 0.5 to 25 μm and the lower layer or film has a thickness of from 0.5 to 25 μm and/or the total polypropylene content in the decorative upper layer or film is greater than 50% by weight (based on the polymer of the decorative upper layer or film).

26. A composite material according to any one of claims 23 to 25 characterized in that the functional or reactive groups on the propylene graft polymer are carboxyl or carboxyl-containing groups, acid anhydride groups, sulphonyl groups or reactive nitrogen-containing groups.

27. A composite material according to any one of claims 23 to 26 characterized in that the functionalized propylene graft polymer has been grafted with maleic anhydride (MAH), maleic acid or azidosulphonylbenzoic acid (ASB).

28. A composite material according to any one of claims 23 to 27 characterized in that the ethylene content of the ethylene-vinyl alcohol copolymer (EVOH) in the lower layer or film is from 28 to 38% by weight (based on the EVOH).



29. A composite material according to any one of claims 23 to 28 characterized in that the thickness of the decorative upper layer or film is a multiple of the total of the thicknesses of the intermediate layer or film and the lower layer or film, and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer (EVOH) of the lower layer or film has been adjusted to more than 65% by weight or is more than 65% by weight.

30. A composite material according to any one of claims 23 to 29 characterized in that one or more print layer(s) has been arranged over part of the area of the decorative upper layer or film, and at least one lacquer layer has been arranged over the entire area or over part of the area thereof.

31. A composite material according to any one of claims 23 to 30 characterized in that the ratio between the thickness of the upper layer or film and the total of the thicknesses of the intermediate layer or film and the lower layer or film is from 6:1 to 25:1, or the ratio between the thicknesses of the upper layer or film and the intermediate layer and the lower layer is from 12:1:1 to 42:1:1, or in that the polyethylene in the mixture or alloy with propylene homopolymer and/or copolymer in the decorative upper layer or film is an HDPE, LDPE, LLDPE and/or VLDPE.

32. A composite material according to any one of claims 23 to 31 characterized in that the composite film, before printing and/or bonding (to wood, wood material or cardboard), has a water content of, based on the ethylene-vinyl alcohol copolymer employed, from 0.05 to 15% by weight (based on 100 parts by weight of the ethylene-vinyl alcohol copolymer employed).

33. A composite material according to any one of claims 23 to 32 characterized in that the composite film is bonded, via the lower film to a moulded article, moulding or board containing wood or wooden parts, a wooden material part, a wooden material board, a fibre-board or a fibre-containing board or cardboard or a cardboard section, by means of at least one adhesive



layer.

34. A process for the production of a composite material comprising at least three layers or films, of which at least one layer or film is a polyolefin-containing layer or film, an adjacent intermediate layer or film comprises a polyolefin containing reactive groups, and an underlying layer or film comprises an ethylene-vinyl alcohol copolymer (EVOH), it being possible for further layers to be present, characterized in that the multilayer composite film is produced by coextrusion or multiple extrusion for furniture, furniture parts or cardboard or the composite material comprises a corresponding composite film, where one layer or film of the composite film is

1. a polyolefin-containing decorative upper layer or film with a thickness of from 60 to 600 μm which comprises a polyolefin having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min or a polyolefin mixture having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min, selected from the group consisting of propylene homopolymers and copolymers and mixtures or alloys of propylene homopolymers and/or copolymers with a polyethylene, with or without addition of up to 20% by weight of an elastomer (based on the total weight of the plastic in the decorative upper film), where the decorative layer or film contains (based on 100 parts by weight of the polymer of the upper layer or film) from 0.1 to 30 parts by weight of dyes or colour pigments, from 0.01 to 5 parts by weight of stabilizers and from 0 to 50 parts by weight of fillers and/or other processing auxiliaries or additives,
2. an adhesion-promoting intermediate layer or film containing no fillers or having a low filler content and having a thickness of from at least 0.3 to 100 μm , comprising a propylene graft polymer which contains reactive groups and has an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min



or a functionalized propylene graft polymer, where the intermediate layer or the propylene graft polymer of the intermediate layer contains no polyethylene or has a low polyethylene content (polyethylene content of less than 10% by weight, based on the polymer), and

3. at least one underlying lower layer or film having a low filler content or containing no fillers and having a thickness of from 0.3 to 100 μm , comprising an ethylene-vinyl alcohol copolymer (EVOH) having an MFI value (230°C/2.16 kg) of from 3 to 9 g/10 min and having an ethylene content, based on the ethylene-vinyl alcohol copolymer, of from 25 to 48% by weight,

in that the composite film is embossed after the multiple extrusion or coextrusion and is then or at a later time moistened using sprayed or atomized water or introduced steam.

35. A process according to Claim 34, characterized in that the multiple extrusion is carried out using a composition in which the polyolefin-containing decorative upper layer or film contains, based on 100 parts by weight of polymer, from 0.5 to 25 parts by weight of dyes and/or colour pigments, from 0.05 to 3 parts by weight of UV and/or heat stabilizers, from 0 to 30 parts by weight of fillers and/or processing auxiliaries and additives, the propylene graft polymer of the intermediate layer or film or the functionalized propylene graft polymer has been prepared by grafting on reactive substances, where the polyethylene content of the intermediate layer or film is less than 3% by weight, and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer of the lower layer or film is greater than 60% by weight, where the polymers or polymer mixtures of the decorative upper layer or film, of the intermediate layer or film and of the lower layer or film are selected so that they have an MFI value (230°C/2.16 kg) of from 4 to 8 g/10 min.

36. Process according to Claim 34 or Claim 35 charac-



terized in that the decorative upper layer or film is produced in a thickness of from 80 to 400 μm , the intermediate layer or film is produced in a thickness of from 0.5 to 25 μm , preferably from 1 to 20 μm , and the lower layer or film is produced in a thickness of from 0.5 to 25 μm by multiple extrusion and/or the total propylene content in the decorative upper layer or film is set to greater than 50% by weight (based on the total polymer content of the decorative upper layer or film).

37. Process according to any one of Claims 34 to 36 characterized in that the composite film is bonded, via the lower film, to a moulded article, moulding or board containing wood or wooden parts, a wooden material part, a wooden material board, a fibreboard or a fibre-containing board or a cardboard section, by means of at least one adhesive layer.

38. A process according to any one of Claims 34 to 37 characterized in that the composite contains a lower layer or film whose total ethylene content is or is set to from 28 to 38% by weight.

39. A process according to any one of Claims 34 to 38 characterized in that the thickness of the decorative upper layer or film is a multiple of the total of the thicknesses of the intermediate layer or film and the lower layer or film in the extrusion, and the vinyl alcohol content of the ethylene-vinyl alcohol copolymer (EVOH) of the lower film has been adjusted to more than 65% by weight or is more than 65% by weight.

40. A process according to any one of Claims 34 to 39 characterized in that one or more print layer(s) is arranged over part of the area of the decorative upper layer or film and at least one lacquer layer is applied over the entire area or over part of the area thereof.

41. A process according to any one of Claims 34 to 40 characterised in that the ratio between the thickness of the upper layer or film and the total of the thicknesses of the intermediate layer or film and the lower layer or film is adjusted to from 6:1 to 25:1, or the ratio between the thicknesses of the upper layer or film and



the intermediate layer and the lower layer is held at from 12:1:1 to 42:1:1, and/or in that the polyethylene used or co-used in the mixture or alloy with propylene homopolymer and/or copolymer in the decorative upper layer or film is an HDPE, LDPE, LLDPE and/or VLDPE, preferably HDPE.

42. A process according to any one of Claims 34 to 41, characterized in that the composite film, before printing and/or bonding (to wood or wood material), is adjusted to a water content of, based on the ethylene-vinyl alcohol copolymer employed, from 0.05 to 15% by weight (based on 100 parts by weight of the ethylene-vinyl alcohol copolymer employed).

43. Use of a composite material according to any one of Claims 23 to 33 or a composite material prepared by a process according to any one of Claims 34 to 42 for the production of furniture, furniture parts and coated cardboard.