

DECORATIVE BOARDS

BACKGROUND OF THE INVENTION

Field of the Invention

5 [0001] The present invention relates to a decorative board obtained by integrating a plurality of papers, which are in a stacked state and impregnated with synthetic thermosetting resins, by means of a hot press molding.

Description of the Related Art

10 [0002] A decorative board is used as a top board for furniture or building material. In general, the decorative board includes brown colored kraft paper and decorative paper on one side of the decorative board. The plurality of papers are impregnated with synthetic thermosetting resins and integrated by means of a hot press molding. A colored decorative board is conventionally used as a decorative board. The colored decorative
15 board includes a colored core layer and superficial layers laminated on both sides of the colored core layer. The colored core layer has colored core papers having an ash content of 15 to 55 % by weight (referred to JP-A-9-136386).

[0003] The aforementioned conventional decorative board has a substrate layer (colored
20 core layer) and superficial layers with different color tones. Accordingly, when it is attached as a top board onto a desk or the like, the boundary between the superficial layer and the substrate layer can be clearly seen. From a design point of view, this significantly deteriorates the appearance of the cut surface.

25 [0004] One method known for overcoming such a problem is a "unicolor core decorative board". The "unicolor core decorative board" is attached to both sides of the substrate layer, and has the same color as the substrate layer. The method for producing the "unicolor core decorative board" includes three different methods. For a substrate layer,

Method A uses a paper identical to the decorative paper of the superficial layer. For a substrate layer, Method B employs kraft paper having the same color as the decorative paper of the superficial layer. For a substrate layer, Method C impregnates a bleached kraft paper with a resin whereby the resin has the same color as the decorative paper of the
5 superficial layer.

[0005] Nevertheless, Method A involves a higher cost for producing a decorative board as compared to the method employing a kraft paper for a substrate layer. In addition, the decorative paper is not as strong as the kraft paper. This results in decreased flexural
10 strength, decreased impact resistance and an overall reduction in the performance of the decorative board.

[0006] In Method B, it is required to provide kraft paper colored the same as the decorative paper. This makes it necessary to keep a variety of colored paper in stock.
15 Another drawback is that the number of available colors is limited. Furthermore, any increase in the number of the colors of the kraft paper causes a resulting increase in the costs required for maintaining such a stock of kraft paper.

[0007] Method C involves difficulty in matching the color of the decorative paper with
20 the color of the resin. In addition, the device used for impregnating the kraft paper may get contaminated by other resins remaining in the device.

[0008] Accordingly, there is a need to provide a decorative board having superficial layers and a substrate layer, which, when viewed, appear identical in color even if the color
25 of the decorative paper used as the superficial layer is not identical to the color of the kraft paper used as the substrate layer.

SUMMARY OF THE INVENTION

[0009] In one aspect of the present invention, a decorative board to be attached to a body member is created using a plurality of papers impregnated with synthetic thermosetting resins, stacked and integrated by a hot press molding. The plurality of papers has one or more bleached kraft papers provided in the center and decorative papers provided on the outsides of the outermost kraft paper(s). The bleached kraft paper preferably has an ash content of 3% or less. The resin deposition content of the synthetic thermosetting resin impregnated in the bleached kraft paper is preferably between 38% and 48% by weight. A substrate layer is formed by subjecting the one or more bleached kraft papers to a hot press molding. The thickness of the substrate layer is preferably 2 mm or less. The substrate layer has a total light transmittance of preferably between 34.3% and 90.0%. The decorative paper has an ash content preferably between 8% and 55%. The resin deposition content of the synthetic thermosetting resin impregnated in the decorative paper is preferably between 48% and 55% by weight. The total light transmission of the decorative layer, formed by subjecting the decorative papers to hot press molding, is preferably 30% or less.

[0010] In embodiments of the decorative board of the present invention, the decorative layer and the substrate layer appear identical in color even if the color of the decorative paper employed for the decorative layer is not identical to the color of the kraft paper employed for the substrate layer.

BRIEF DESCRIPTION OF THE DRAWINGS

[0011] FIG. 1 is a cross-sectional view of an embodiment of a decorative board before hot press molding;

FIG. 2 is a cross-sectional view of an embodiment of a decorative board after hot press molding;

FIG. 3 is a perspective view of a body member and an embodiment of a decorative board attached to an upper surface of the body member; and

FIG. 4 is a cross sectional view of a body member and an embodiment of a decorative board attached to a core member.

DETAILED DESCRIPTION OF THE INVENTION

5 [0012] Each of the additional features and teachings disclosed above and below may be utilized separately or in conjunction with other features and teachings to provide improved decorative boards. Representative examples of the present invention, which utilize many of these additional features and teachings both separately and in conjunction with one another, will now be described in detail with reference to the attached drawings. This
10 detailed description is merely intended to teach a person of ordinary skill in the art further details for practicing preferred aspects of the present teachings and is not intended to limit the scope of the invention. Only the claims define the scope of the claimed invention. Therefore, combinations of features and steps disclosed in the following detailed description may not be necessary to practice the invention in the broadest sense, and are
15 instead taught merely to particularly describe representative examples of the invention. Moreover, various features of the representative examples and the dependent claims may be combined in ways that are not specifically enumerated in order to provide additional useful configurations of the present teachings.

20 [0013] As shown in FIGS. 1 and 2, a decorative board 10 is formed by stacking a plurality of papers (decorative papers 12, kraft papers 14) impregnated with synthetic thermosetting resins and integrated by hot press molding. The center of the plurality of papers is composed from one or more kraft papers 14. The decorative papers 12 are overlaid on both the top and bottom sides of the kraft paper(s) 14. For the kraft paper 14,
25 a bleached kraft paper having an ash content of preferably 3% or less is used. For the decorative paper 12, a decorative paper having an ash content of between 8% and 55% and a basis weight of 45 g/m² to 160 g/m² is preferred. After undergoing hot press molding, the decorative board 10 preferably has a substrate layer 20 positioned in the center and

superficial (decorative) layers 16 and 18 positioned on the surface. The substrate layer 20 may be composed from one or more kraft papers 14. The superficial layers 16 and 18 may be composed of the decorative papers 12.

5 [0014] After undergoing hot press molding, the synthetic thermosetting resin impregnated into the decorative paper 12 or the kraft paper 14 becomes transparent or semi-transparent upon setting. As for the resin, a melamine resin, a diallyl phthalate resin, an epoxy resin or a polyester resin can be used. Among these, a melamine resin is most preferred because of its high transparency.

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[0015] The decorative paper 12 is colored, for example, by incorporating pigments or titanium oxide. Alternatively, its surface is provided with a desired pattern created through photogravure printing. The decorative paper has a basis weight of about 45 to 160 g/m². The decorative paper 12 may be provided with a figure, pattern, color or the
15 like, in order to enhance the design of the decorative board 10.

[0016] Bleached kraft paper can be used for the kraft paper 14. Kraft paper is grouped broadly into non-bleached kraft paper and bleached kraft paper. Due to the bleaching treatment, the decorative board 10 employs bleached kraft paper having a high whiteness.
20 The preferred bleached kraft paper is prescribed under Japanese Industrial Standard JIS-P-0001.

[0017] For the kraft paper 14, a bleached kraft paper having an ash content of 3% or less is preferred. Kraft paper 14 having an ash content exceeding 3% results in reduced light
25 transmittance of the substrate layer 20. Such a reduced light transmittance in the substrate layer 20 prevents the visible light entering the inside of the substrate layer 20 from reflecting diffusely within the inside of the substrate layer 20. The ash content is measured in accordance with Japanese Industrial Standard JIS-P-8128.

[0018] As shown in FIGS. 1 and 2, the decorative board 10 is produced, by stacking one or more pieces of kraft paper 14, overlaying decorative paper 12 on both the top and bottom sides of the kraft paper 14, and subjecting the kraft paper 14 and the decorative paper 12 to a heated pressure.

[0019] The kraft paper 14 and the decorative paper 12 may be impregnated with a synthetic thermosetting resin. The method for impregnating the thermosetting resin, for example, includes painting or spraying an unhardened thermosetting resin onto the surfaces of the kraft paper 14 and the decorative paper 12. The method for impregnating the thermosetting resin is not limited to the method described above.

[0020] The resin deposition content of the decorative paper 12 impregnated with the synthetic thermosetting resin is preferably between 48% and 55% by weight. The volatile content is preferably between 4% and 7% by weight. The resin deposition content refers to the weight percentage content of the resin in the impregnated paper and can be calculated in accordance with Equation (1). The volatile content refers to the percentage content of the volatile components in the impregnated paper and can be calculated in accordance with Equation (2). Equation (2) uses measurements based on the results of the measurement of the weight of the impregnated paper which was weighed initially and then allowed to stand for 20 minutes in an oven at $120\pm 2^{\circ}\text{C}$ for drying.

[0021] (1) Resin deposition content (% by weight) = $((\text{impregnated paper weight} - \text{original paper weight}) / \text{impregnated paper weight}) \times 100$

[0022] (2) Volatile content (% by weight) = $((\text{impregnated paper weight} - \text{absolutely dried impregnated paper weight}) / \text{impregnated paper weight}) \times 100$

[0023] The resin deposition content of the kraft paper 14 after impregnation with the synthetic thermosetting resin is preferably between 38% and 48% by weight. The volatile content is preferably between 3% and 9% by weight. A resin deposition content less than 38% by weight or a volatile content less than 3% by weight results in difficulty in spreading the thermosetting resin throughout the entire kraft paper 14 because the substrate layer 20 becomes partially or entirely white after the hot press molding. This occurs because the total light transmittance of the substrate layer 20 becomes less than 30%. A resin deposition content exceeding 48% by weight allows the excessive synthetic thermosetting resin impregnated in the kraft paper 14 to be released upon hot press molding. A volatile content exceeding 9% by weight results in blocking of the kraft paper 14 after impregnation with the synthetic thermosetting resin. "Blocking" refers to an adhesion between the impregnated papers before heating or before pressing.

[0024] The substrate layer 20 is formed as a result of the integration of one or more kraft papers 14 impregnated with the synthetic thermosetting resin by hot press molding. The thickness of the substrate layer 20 is preferably 2 mm or less and the total light transmittance of the substrate layer 20 is preferably between 30% and 90%. The total light transmittance can be measured in accordance with JIS-K-7150.

[0025] The stacked decorative paper 12 and kraft paper 14 is preferably pressurized by a heated pressing machine. The temperature of the press surface of the pressing machine is preferably between 120°C and 150°C. The pressing pressure is preferably between 5 MPa and 12 MPa. A press surface temperature less than 120°C results in an insufficient hardening of the synthetic thermosetting resin. A press surface temperature exceeding 150°C causes a yellowing of the synthetic thermosetting resin and brittleness in the decorative board 10. A pressing pressure less than 5 MPa results in difficulty in achieving a sufficiently uniform density in the decorative board 10, while a pressing pressure exceeding 12 MPa causes too high of a density in the decorative board 10 as well

as an insufficient thickness.

[0026] The body member 22 shown in FIGS. 3 and 4 is a board member to which the decorative board 10 may be attached. The body member 22, for example, may be a top
5 board of a piece of furniture.

[0027] As shown in FIGS. 3 and 4, the decorative board 10 can be attached to, for example, the top board of a rack, table, kitchen item or a door. The decorative board 10 can be attached to board members of many kinds of furniture, decoration-purpose lining
10 board members, exterior board members and inner wall members of various buildings. The decorative board 10 can be attached to the top of a body member 22 by means of an adhesive or the like.

[0028] As shown in FIG. 2, the decorative board 10 may have a substrate layer 20
15 constructed from one or more kraft papers 14. The thickness of the substrate layer 20 is preferably 2 mm or less. The ash content of the kraft paper 14 is 3% or less. The resin deposition content of the kraft paper 14 is preferably between 38% and 48% by weight, and the volatile content is preferably between 3% and 9% by. The temperature press surface of the hot press molding machine is preferably between 120°C and 150°C and has
20 a pressing pressure of preferably between 5 MPa and 12 MPa. As a result of the formation of the substrate layer 20 under the aforementioned conditions, the total light transmittance of the substrate layer 20 preferably lies between 30% and 90%. The decorative board 10 integrally has the substrate layer 20 positioned in the center and the superficial layers 16 and 18 positioned on both sides of the substrate layer.

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[0029] The decorative board 10 preferably has a substrate layer 20 having a high total light transmittance of 30% to 90%. Accordingly, as shown in FIG. 3, the visible light 26 enters the inside of the substrate layer 20 from the board cross section 24 of the decorative

board 10 and hits the fibers of the bleached kraft paper within the inside of the substrate layer 20 while diffusing, and then hits the upper superficial layer 16 and the lower superficial layer 18. After repeating such a diffused reflection, the visible light 26 exits the board cross section 24 and can be observed again externally. The visible light exiting the board cross section 28 has a color which is close to the color of the superficial layers 16 and 18 due to the repetitive diffused reflection. As a result, it becomes difficult to distinguish the colors of the substrate layer 20 and the superficial layers 16 and 18, and the substrate layer 20 and the superficial layers 16 and 18 are recognized as being generally the same. Consequently, the design of the decorative board 10 becomes improved.

[0030] In order to allow the visible light 26 to hit the superficial layers 16 and 18 while repeating the diffused reflection, it is preferable that the total light transmittance of the superficial layers 16 and 18 is 30% or less. A total light transmittance of the superficial layers 16 and 18 exceeding 30% allows the visible light 26 entering the inside of the substrate layer 20 to leak out through the superficial layers 16 and 18. Resultingly, the substrate layer 20 and the superficial layers 16 and 18 appear different in color.

[0031] The decorative board 10 is constructed in a vertically symmetric design. As a result, there is almost no warp, and therefore, its manufacturing and the handling can be remarkably improved.

[0032] [Example 1] A pale yellow color decorative paper having a pigment and titanium oxide incorporated at 45% and a basis weight of 100 g/m² was provided. This decorative paper was impregnated with an early condensate solution of a modified melamine resin and then dried. As a result, a decorative paper impregnated with a melamine resin having a resin deposition content of 53% by weight and a volatile content of 6% by weight was formed. A bleached kraft paper having a basis weight of 200 g /m² and an ash content of 0% was provided. This kraft paper was impregnated with an early

condensate solution of a modified melamine resin and then dried. As a result, a kraft paper impregnated with a melamine resin having a resin deposition content of 44% by weight and a volatile content of 7% by weight was formed. Three melamine resin-impregnated bleached kraft papers were stacked, and melamine resin-impregnated decorative paper was overlaid on the top and bottom sides to form a laminate. Two laminates were provided, and a polypropylene film having a thickness of 20 μm was sandwiched between the two laminates. The two laminates were pressurized by heating with a pressing machine. The pressing machine provided a press surface temperature of 145°C, a pressing pressure of 8 MPa and a heating time of 30 minutes. The two laminates were cooled to room temperature and then taken out of the pressing machine, thereby obtaining two decorative boards. The decorative board was cut at an angle of 45 degrees, and the state of the board cross section was inspected macroscopically.

[0033] [Example 2] Example 2 involved eight (8) pieces of kraft paper while Example 1 used three (3) pieces of kraft paper. Otherwise, the decorative board of Example 2 was produced in a similar manner to that produced in Example 1.

[0034] [Example 3] Example 3 used bleached kraft paper having a basis weight of 100 g/m^2 and an ash content of 3%. Otherwise, the decorative board of Example 3 was produced in a similar manner to that produced in Example 1.

[0035] [Example 4] Example 4 used a brown printing paper having a pigment and titanium oxide incorporated at 20%, a basis weight of 80 g/m^2 and a brown wood pattern print given by a photogravure printing on the surface of the printing paper. Otherwise, the decorative board of Example 4 was produced in a similar manner to that produced in Example 1.

[0036] [Comparative Example 1] The decorative board of Comparative Example 1 used ten (10) pieces of kraft paper impregnated with a melamine resin. Otherwise, the

decorative board of Comparative Example 1 was produced in a similar manner to that produced in Example 1.

[0037] [Comparative Example 2] Comparative Example 2 used bleached kraft paper
5 having a basis weight of 100 g/m² and an ash content of 4%. Otherwise, the decorative board of Comparative Example 2 was produced in a similar manner to that produced in Example 1.

[0038] [Comparative Example 3] Comparative Example 3 used kraft paper having a
10 resin deposition content of 35% by weight and a volatile content of 1% by weight and impregnated with a melamine resin. Otherwise, the decorative board of Comparative Example 3 was produced in a similar manner to that produced in Example 1.

[0039] [Comparative Example 4] Comparative Example 4 used non-bleached kraft
15 paper having a basis weight of 200 g/m² and an ash content of 0%. Otherwise, the decorative board of Comparative Example 4 was produced in a similar manner to that produced in Example 1.

[0040] [Comparative Example 5] Comparative Example 5 used decorative paper on
20 only one side of the bleached kraft paper. Otherwise, the decorative board of Comparative Example 5 was produced in a similar manner to that produced in Example 1.

[0041] [Comparative Example 6] Comparative Example 6 used brown decorative paper
with pigment and titanium oxide incorporated at 5% and which had a basis weight of 80
25 g/m². Otherwise, the decorative board of Comparative Example 6 was produced in a similar manner to that produced in Example 1.

[0042] Table 1

	Color tone of deco- rative paper	Results of observation of board cross section	Thick- ness of substra- te layer [mm]	Total light trans- mittance of substrate layer [%]	Total light trans- mittance of decorative layer [%]
Example 1	Pale yellow	Pale yellow, similar to color of superficial layer	0.73	67.8	10.6
Example 2	Pale yellow	Pale yellow, similar to color of superficial layer	1.92	35.5	10.6
Example 3	Pale yellow	Pale yellow, similar to color of superficial layer	0.38	34.3	10.6
Example 4	Pale brown	Pale brown, similar to color of superficial layer	0.71	65.0	0.2
Comparative Example 1	Pale yellow	White, different from color of superficial layer	2.39	26.7	10.6
Comparative Example 2	Pale yellow	White, different from color of superficial layer	0.38	27.6	10.6
Comparative Example 3	Pale yellow	White, different from color of superficial layer	0.68	28.8	10.6
Comparative Example 4	Pale yellow	Brownish-red, different from color of superficial layer	0.73	1.8	10.6
Comparative Example 5	Pale yellow	White, different from color of superficial layer	0.73	67.8	10.6
Comparative Example 6	Brown	White, different from color of superficial layer	0.73	66.0	38.0

[0043] Table 1 shows the results of the observations of the board cross sections, the thicknesses of the substrate layers, the total light transmittances of the substrate layers and the total light transmittances of the superficial layers with respect to the decorative boards
5 produced in Examples 1 to 4 and Comparative Examples 1 to 5.

[0044] Based on the results of Examples 1 to 4 shown in Table 1, it was revealed that when the substrate layer thickness is 2 mm or less and the total light transmittance is between 30% and 90%, the substrate layer and the superficial layers appear identical color.
10 On the contrary, the results of Comparative Examples 1 to 4 indicated that when the substrate layer thickness exceeds 2 mm, or when the total light transmittance of the substrate layer is not within the range of between 30% and 90%, the substrate layer and the superficial layers do not appear to be identical color. The results of Comparative Example 5 indicated that when the decorative paper is provided only on the one side of the
15 bleached kraft paper, the substrate layer and the superficial layers exhibit different color tones due to an insufficient diffused reflection of the visible light within the inside of the substrate layer.

[0045] While the embodiments of invention have been described with reference to
20 specific configurations, it will be apparent to those skilled in the art that many alternatives, modifications and variations may be made without departing from the scope of the present invention. Accordingly, embodiments of the present invention are intended to embrace all such alternatives, modifications and variations that may fall within the spirit and scope of the appended claims. For example, embodiments of the present invention should not
25 be limited to the representative configurations, but may be modified, for example, as described below.

[0046] The decorative board 10 may be attached to the body member 22 or may be

formed integrally with the body member 22. For example, the body member 22 may have decorative layers (decorative-paper layers) and substrate layers (bleached-kraft-paper layers), laminated alternatively. The decorative layers for constituting the body member 22 can be formed similarly to the superficial layers 16 for constituting the decorative board 10. The substrate layers for constituting the body member 22 can be formed similarly to the substrate layer 20 for constituting the decorative board 10. The decorative layers and substrate layers can be subjected to the hot press molding at the same time with the hot press molding of the decorative board 10. As a result, the decorative board 10 and the body member 22 can be formed integrally.

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[0047] The board member may have decorative-paper layers (superficial layers 16) and bleached-kraft-paper layers (substrate layers 20), which are laminated alternatively. Both surfaces of the board member may be constituted from the decorative-paper layers. As a result, the board material can have a thickness (for example, 6 mm or more, preferably 6 to 30 mm) which provides the typical strength found in board members of many kinds of furniture.

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[0048] When a board has a plurality of decorative-paper layers and bleached-kraft-paper layers, the decorative-paper layers may have the same color, or may have each different color, or may have colors for forming gradation on a cross section of the decorative board. Each of the bleached-kraft-paper layers generates color corresponding to the color of the decorative-paper layer located on the adjacent to the bleached-kraft-paper layer. For example, when the decorative layers with other colors are located on the both sides of the bleached-kraft-paper layer, the bleached-kraft-paper layer generates color between the colors of the decorative layers.

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[0049] The each bleached-kraft-paper layer (substrate layer) may comprise a total light transmittance of between 30% and 90%. The each decorative-paper layer may comprise a

total light transmission of less than 30%.

THIS INVENTION CLAIMS:

1. A decorative board comprising:

a plurality of papers impregnated with synthetic thermosetting resin, which are
5 stacked and integrated by a hot press molding;

wherein the plurality of papers comprise one or more bleached kraft papers
provided in the center and decorative paper provided on the outer sides of the outermost
pieces of the plurality of papers,

wherein the bleached kraft paper comprises an ash content of 3% or less,

10 wherein a resin deposition content of the synthetic thermosetting resin
impregnated into the bleached kraft paper is between 38% and 48% by weight,

wherein a thickness of a substrate layer formed by subjecting the one or more
bleached kraft papers to the hot press molding is 2 mm or less,

wherein the substrate layer comprises a total light transmittance of between 34.3%
15 and 90.0%,

wherein the decorative paper comprises an ash content of between 8% and 55%,

wherein a resin deposition content of the synthetic thermosetting resin
impregnated into the decorative paper is between 48% and 55% by weight, and

20 wherein a total light transmission of a decorative layer formed by subjecting the
decorative papers to the hot press molding is 30% or less.

2. A decorative board as in claim 1, wherein the synthetic thermosetting resin is a
melamine resin, a diallyl phthalate resin, an epoxy resin or a polyester resin.

25 3. A decorative board as in claim 1 or 2, wherein the decorative board is configured
to be attached to a body member.

4. A decorative board as in claim 3, wherein the body member comprises a plurality

of substrate layers and decorative layers alternately arranged; wherein the each substrate layer is constructed from bleached kraft paper similar to the bleached kraft papers of the decorative board; and wherein the each decorative layer is constructed from decorative paper similar to the decorative paper of the decorative board.

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5. A decorative board comprising:

a plurality of bleached-kraft-paper layers and decorative-paper layers alternately arranged;

wherein the decorative-paper layer is located on each side of the decorative board,

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wherein a thickness of the each bleached-kraft-paper layer is 2 mm or less,

wherein the each bleached-kraft-paper layer comprises a total light transmittance of between 30% and 90%,

wherein the each decorative-paper layer comprises a total light transmission of less than 30%.

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6. A decorative board as in claim 5,

wherein the each bleached-kraft-paper layer is formed by subjecting a bleached kraft paper impregnated with synthetic thermosetting resin to a hot press molding,

wherein the each decorative-paper layer is formed by subjecting a decorative

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paper impregnated with synthetic thermosetting resin to a hot press molding,

wherein the bleached kraft paper comprises an ash content of 3% or less,

wherein a resin deposition content of the synthetic thermosetting resin impregnated into the bleached kraft paper is between 38% and 48% by weight,

wherein the decorative paper comprises an ash content of between 8% and 55%,

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wherein a resin deposition content of the synthetic thermosetting resin impregnated into the decorative paper is between 48% and 55%.