

DECORATIVE BOARD

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This international application claims the benefit of Japanese Patent Application No. 2014-71573 filed March 31, 2014 in the Japan Patent Office, and the entire disclosure of Japanese Patent Application No. 2014-71573 is incorporated herein by reference.

TECHNICAL FIELD

[0002] The present invention relates to a decorative board.

BACKGROUND ART

[0003] Thermosetting resin decorative boards such as melamine decorative boards are conventionally known (see Patent Documents 1 and 2). Such decorative boards are widely used for furniture, interior materials (such as, for example, top boards and counters), and the like.

PRIOR ART DOCUMENTS

PATENT DOCUMENTS

[0004] Patent Document 1: Japanese Unexamined Patent Application Publication No. 2008-290444

Patent Document 2: Japanese Unexamined Patent Application Publication No. 2013-99939

SUMMARY OF THE INVENTION

PROBLEMS TO BE SOLVED BY THE INVENTION

[0005] A conventional decorative board has a problem in which it is easily warped. In an aspect of the present invention, it is desired to provide a decorative board with reduced warpage.

MEANS FOR SOLVING THE PROBLEMS

[0006] A decorative board according to an aspect of the present invention comprises a core layer including a fibrous base material, a thermoplastic resin, and an endothermic metal hydroxide; an intermediate layer including a mixed paper containing an endothermic metal hydroxide and a thermosetting resin; and a decorative layer including a decorative paper and a thermosetting resin. An amount of the thermoplastic resin included in the core layer is 10-100g/m². Warpage can be reduced in the decorative board according to the present invention.

BRIEF DESCRIPTION OF THE DRAWINGS

[0007] FIG. 1 is a cross-sectional view illustrating a structure of a decorative board according to Embodiment 1 of the present invention.

FIG. 2 is a cross-sectional view illustrating a structure of a decorative board according to Embodiment 14 of the present invention.

FIG. 3 is a photograph of the decorative board according to Embodiment 1 taken while the decorative board is irradiated with light from a bar-shaped fluorescent lamp.

FIG. 4 is a photograph of a decorative board according to Comparative Example 1 taken while the decorative board is irradiated with light from the bar-shaped fluorescent lamp.

EXPLANATION OF REFERENCE NUMERALS

[0008] 1...decorative layer, 2...intermediate layer, 3...prepreg, 4...core layer, 5...balancing layer, 7, 8...decorative board

MODE FOR CARRYING OUT THE INVENTION

[0009] Embodiments of the present invention will now be described.

(1) Core layer

A decorative board according to the present invention comprises a core

layer. The core layer includes a fibrous base material, a thermoplastic resin, and an endothermic metal hydroxide.

[0010] Examples of the fibrous base material include organic fiber base materials and inorganic fiber base materials. Examples of such an organic fiber base material include fibers made of polyethylene, polypropylene, vinylon, polyvinyl chloride, polyvinylidene chloride, polyacrylonitrile, polyamide, polyester, polyurethane, modifications thereof, and various copolymers represented by ethylene-vinyl acetate copolymers and the like, as well as mixtures thereof.

[0011] Examples of such an inorganic fiber base material include nonwoven fabrics and woven fabrics made of inorganic fiber such as glass fiber, rock wool, and carbon fiber. The inorganic fiber base material preferably weighs in a range of 10-200g/m². The use of an inorganic fiber base material further improves non-combustibility of the decorative board compared with the use of an organic fiber base material. In particular, the use of a glass fiber nonwoven fabric from among inorganic fiber base materials further improves heat resistance and flame resistance, as well as impregnation properties of slurry.

[0012] The thermoplastic resin functions, for example, as a binder. The thermoplastic resin is preferably acrylic resin emulsion. In particular, the use of an acrylic resin emulsion having a glass transition temperature (T_g) over 0°C is more preferable because it improves adhesion and formability of the core layer.

[0013] The use of an acrylic resin emulsion having an average particle diameter of 150-300nm from among acrylic resin emulsions having a T_g over 0°C is further preferable because it allows for a further improvement in binding force of the core layer, as well as bending workability and smoothness of the decorative board.

[0014] The reason for the improved smoothness of the decorative board is assumed to be that the acrylic resin emulsion is microparticulate. The

average particle diameter is a value calculated based on scattered light detected using a laser beam diffraction/scattering particle diameter measuring device (ELS-8000 manufactured by Otsuka Electronics Co., Ltd.) at the time of laser irradiation.

[0015] An amount of the thermoplastic resin included in the core layer (a weight of the thermoplastic resin included in the core layer per unit area) is 10-100g/m². Including 100g/m² or less further improves the non-combustibility of the decorative board. Including 100g/m² or less also leads to reduced occurrence of exudation of the thermoplastic resin when the decorative board is formed under heat and pressure.

[0016] Including the amount of 10g/m² or more of the thermoplastic resin in the core layer further improves adhesion of prepreg when the core layer is produced from prepreg. Including 10g/m² or more also allows for an easier control of the amount of impregnation of slurry when slurry is impregnated to the fibrous base material to produce the core layer.

[0017] Endothermic metal hydroxides contain crystal water, which is decomposed at high temperatures to release water. Since the reaction of decomposition and water release is an endothermic reaction, the core layer including an endothermic metal hydroxide inhibits a temperature rise in the decorative board on burning, thus providing an effect of improving the non-combustibility of the decorative board.

[0018] Examples of such an endothermic metal hydroxide include aluminum hydroxide, magnesium hydroxide, and calcium hydroxide, and aluminum hydroxide and magnesium hydroxide, in particular, are preferable. The use of an aluminum hydroxide or a magnesium hydroxide provides a more significant effect of improving the non-combustibility of the decorative board.

[0019] An amount of the endothermic metal hydroxide included in the core layer (a weight of the endothermic hydroxide included in the core layer per unit area) is preferably in a range of 100-300g/m². Including the amount in

this range increases the adhesion of prepreg and improves the non-combustibility of the decorative board when the core layer is produced from prepreg.

[0020] An average particle diameter of the endothermic metal hydroxide may be in a range, for example, of 1-50 μ m. This average particle diameter is an arithmetic average diameter calculated from particle size distribution (volume distribution) detected by a laser beam diffraction/scattering method (Microtrac method).

[0021] The average particle diameter of the endothermic metal hydroxide in the above-specified range improves dispersibility of the endothermic metal hydroxide in the slurry, thus improving the impregnation properties of the slurry into the fibrous base material. In addition, the decorative board obtains a smoothly finished surface.

[0022] The core layer may include an inorganic filler other than an endothermic metal hydroxide, a silane coupling agent, a flame retardant, and the like. Examples of the inorganic filler include carbonates such as calcium carbonates, magnesium carbonates, and zinc carbonates, silica, talc, and fly ash. An average particle diameter of the inorganic filler may be in a range, for example, of 0.05-20 μ m. When the average particle diameter is in this range, the impregnation properties of the slurry into the fibrous base material are further improved. The average particle diameter of the inorganic filler is an arithmetic average diameter calculated from particle size distribution (volume distribution) detected by the laser beam diffraction/scattering method (Microtrac method).

[0023] Carbonates (for example, calcium carbonates), in particular, are preferable from among inorganic fillers. The use of a calcium carbonate further improves workability and machinability of the decorative board during the production process. Heavy calcium carbonates and light calcium carbonates (precipitated calcium carbonates), for example, may be used as the calcium carbonate. An average particle diameter of the calcium

carbonate may be, for example, 0.05-10 μ m, and more preferably 0.1-5 μ m. The average particle diameter of 0.05 μ m or more of the calcium carbonate causes less agglomeration of the calcium carbonate in the slurry, thus improving the impregnation properties of the slurry into the fibrous base material. The average particle diameter of 10 μ m or less of the calcium carbonate provides the decorative board with a smoother surface, thus improving an appearance of the decorative board.

[0024] Light calcium carbonate means calcium carbonate chemically produced by calcining limestone; heavy calcium carbonate means pulverized calcium carbonate produced by dry or wet grinding white crystalline limestone.

[0025] A blending ratio of the endothermic metal hydroxide in a total inorganic filler content of the core layer may be, for example, 30-100% by weight. When the blending ratio is 30% or more by weight, the non-combustibility of the decorative board is further improved. When the blending ratio is 100% or less by weight, the machinability of the decorative board is further improved.

[0026] The core layer including a silane coupling agent provides a lower weight increase rate and a further improved adhesion between the core layer and an intermediate layer, compared with the core layer including no silane coupling agent, in terms of boiling resistance according to JIS K-6902 "Testing method for laminated thermosetting high-pressure decorative sheets".

[0027] An amount of the silane coupling agent included in the core layer (a weight of the silane coupling agent included in the core layer per unit area) is preferably in a range of 1-15g/m². Including the amount in this range causes the above-described effect of the silane coupling agent to be more prominent.

[0028] Examples of the silane coupling agent include (meth)acryloyloxy group-containing silane such as 3-(meth)acryloyloxypropyl trimethoxysilane and 3-(meth)acryloyloxypropyl triethoxysilane; vinyl group-containing

silane such as vinyl trimethoxysilane and vinyl triethoxysilane; epoxy group-containing silane such as 3-glycidoxypropyl trimethoxysilane, 3-glycidoxypropyl methyl dimethoxysilane, and 3-glycidoxypropyl triethoxysilane; styryl group-containing silane such as p-styryl trimethoxysilane; amino group-containing silane such as 3-aminopropyl trimethoxysilane, 3-aminopropyl triethoxysilane, 3-(2-aminoethyl)aminopropyl trimethoxysilane, and 3-phenyl aminopropyl trimethoxysilane; and mercapto group-containing silane such as 3-mercaptopropyl trimethoxysilane, 3-mercaptopropyl triethoxysilane, and 3-mercaptopropyl methyl dimethoxysilane. The use of an epoxy group-containing silane or an amino group-containing silane, in particular, further improves crosslinking density of the core layer.

[0029] As the flame retardant, phosphorus flame retardants, nitrogen flame retardants, and phosphorus-nitrogen flame retardants are preferably used, and phosphorus-nitrogen flame retardants are particularly preferable. A phosphorus-nitrogen flame retardant is a compound having functions of both a phosphorus flame retardant and a nitrogen flame retardant. A single molecule of a phosphorus-nitrogen flame retardant contains both phosphorus atoms and nitrogen atoms, where, when exposed to high temperatures, phosphorus blocks oxygen by its strong dehydrating action and nitrogen produces ammonia gas and the like to block oxygen. Because of these actions, a phosphorus-nitrogen flame retardant provides high heat-insulating and flame-retardant effects. Thus, the core layer including a phosphorus-nitrogen flame retardant provides a high non-combustibility.

[0030] When a total amount of the phosphorus-nitrogen flame retardant is defined as 100% by weight, it is preferable that a total phosphorus content ratio is 1-50% by weight and a total nitrogen content ratio is 1-50% by weight, and it is more preferable that a total phosphorus content ratio is 1-30% by weight and a total nitrogen content ratio is 5-35% by weight.

[0031] When the total phosphorus content ratio and the total nitrogen content

ratio are in the above-specified ranges, the non-combustibility is further improved.

An amount of the flame retardant included in the core layer (a weight of the flame retardant included in the core layer per unit area) is preferably in a range of 1-100g/m². Including the amount in this range causes the above-described effect of the flame retardant to be more prominent.

[0032] The core layer may be produced by a method in which, for example, prepreg is produced by impregnating the fibrous base material with slurry containing the thermoplastic resin, the endothermic metal hydroxide, and the like, and heat and pressure are then applied to one or more (for example, two) sheets of the prepreg thus produced. The slurry to be used may further include the silane coupling agent, the flame retardant, and the like.

[0033] When the slurry is impregnated to the fibrous base material to produce the core layer, the value of an impregnation rate as indicated by Formula 1 is preferably in a range of 500-1200%.

[0034] [Formula 1]

$$\text{Impregnation rate} \begin{matrix} (\%) \end{matrix} = \frac{\text{Weight after impregnation} - \text{Weight before impregnation}}{\text{Weight before impregnation}} \times 100$$

In Formula 1, "weight before impregnation" means a weight of the fibrous base material. "Weight after impregnation" means a weight of the fibrous base material after it is impregnated with the slurry and then dried. When an impregnation rate is 1200% or less, falling of a slurry solid content from the prepreg is reduced, thus allowing for an easier handling of the prepreg. When the value of an impregnation rate is 500% or more, interlayer delamination of the prepreg is less likely to occur.

[0035] When the slurry is impregnated to the fibrous base material to produce the core layer, the amounts of the thermoplastic resin, the endothermic metal hydroxide, the silane coupling agent, the flame retardant, and the like

included in the core layer can be made in the above-specified preferred ranges by adjusting blending ratios of the thermoplastic resin, the endothermic metal hydroxide, the silane coupling agent, the flame retardant, and the like in the slurry.

[0036] For example, a blending ratio of the thermoplastic resin in the slurry may be 3-17% by weight in solid equivalent. A blending ratio of the endothermic metal hydroxide in the slurry may be 20-95% by weight. A blending ratio of the silane coupling agent in the slurry may be 0.1-10% by weight in solid equivalent. A blending ratio of the flame retardant in the slurry may be 0.1-15% by weight in solid equivalent. The above-specified blending ratios are values when a total amount of the slurry is defined as 100% by weight.

(2) Intermediate layer

The intermediate layer includes a mixed paper containing an endothermic metal hydroxide and a thermosetting resin. This intermediate layer causes a texture of the core layer to be less likely to appear on a surface of the decorative board, improves smoothness of the surface of the decorative board, and reduces warpage of the decorative board.

[0037] The mixed paper containing an endothermic metal hydroxide is obtained by, for example, making paper from pulp and slurry including the endothermic metal hydroxide and then removing water and drying the paper.

Examples of the pulp include natural pulp such as wood pulp, cotton pulp, and plant fiber pulp. In particular, chemical pulp, which is obtained by chemically processing wood pulp having short fiber lengths such as bleached hardwood kraft pulp and softwood kraft pulp, is preferable since it improves paper strength and impregnation properties of the mixed paper. The bleached hardwood kraft pulp and the softwood kraft pulp may be used together. The softwood kraft pulp may be either bleached or unbleached.

[0038] Examples of the endothermic metal hydroxide include aluminum hydroxide, magnesium hydroxide, and calcium hydroxide, and aluminum

hydroxide and magnesium hydroxide, in particular, are preferable. The use of an aluminum hydroxide or a magnesium hydroxide provides a more significant effect of improving the non-combustibility of the decorative board.

[0039] When a total amount of the endothermic metal hydroxide and the pulp is defined as 100% by weight, the ratio of the endothermic metal hydroxide (the unit is % by weight) is defined as a mixing ratio of the endothermic metal hydroxide in a mixed paper containing the endothermic metal hydroxide. A mixing ratio of the endothermic metal hydroxide is preferably 40-95% by weight, and more preferably 55-85% by weight. When the mixing ratio of the endothermic metal hydroxide is 40% or more by weight, the non-combustibility of the decorative board is further increased; when the mixing ratio is 95% or less by weight, paper strength of the mixed paper is further increased.

[0040] In addition to the pulp and the endothermic metal hydroxide, an agglomerated binder, a chemical agent, an organic fiber, an inorganic fiber, a fixing agent, for example, may be added to the slurry. Cylinder paper machines, Fourdrinier multiple-cylinder paper machines, cylinder/Fourdrinier combined paper machines, inclined wire paper machines, for example, may be used in the paper making process. The mixed paper containing the endothermic metal hydroxide may weigh, for example, 60-200g/m². When a weight of the mixed paper is in this range, the smoothness of the decorative board is further improved and warpage of the decorative board is further reduced. The mixed paper containing the endothermic metal hydroxide has self-extinguishing properties, thus inhibiting spreading of a flame.

[0041] Examples of the thermosetting resin include amino-formaldehyde resin, diallyl phthalate resin, unsaturated polyester resin, and mixed resin thereof. From among thermosetting resins, amino-formaldehyde resin, which is superior in various physical properties such as heat resistance and strength,

is preferable. Amino-formaldehyde resin can be obtained by condensation of amino compounds such as melamine, urea, acetoguanamine, and benzoguanamine, with formaldehyde.

[0042] The intermediate layer may be produced by, for example, impregnating the mixed paper containing the endothermic metal hydroxide with a resin liquid including the thermosetting resin as a main component and then drying the paper. An impregnation rate when the mixed paper is impregnated with the resin liquid including the thermosetting resin as a main component and then dried is preferably in a range of 5-150%. This impregnation rate is a value defined by the above Formula 1. In this case, "weight before impregnation" in Formula 1 means a weight of the mixed paper containing the endothermic metal hydroxide; "weight after impregnation" means a weight of the mixed paper containing the endothermic metal hydroxide after it is impregnated with the resin liquid and then dried.

(3) Decorative layer

The decorative layer includes a decorative paper and a thermosetting resin. A decorative paper weighing 30-140g/m² for a thermosetting resin decorative board, for example, may be used as the decorative paper.

[0043] Amino-formaldehyde resin, diallyl phthalate resin, unsaturated polyester resin, and mixed resin thereof, for example, may be used as the thermosetting resin. From among resins, amino-formaldehyde resin, which is superior in heat resistance, wear resistance, and the like, is preferable, and melamine-formaldehyde resin, which is superior in water resistance, heat resistance, wear resistance, chemical resistance, and contamination resistance, is particularly preferable.

[0044] The decorative layer may be produced by a method, for example, in which the decorative paper is impregnated with a resin liquid including the thermosetting resin as a main component and then drying the paper. An impregnation rate when the decorative paper is impregnated with the resin

liquid and then dried is preferably in a range of 30-300%. In this case, "weight before impregnation" in Formula 1 means a weight of the decorative paper; "weight after impregnation" means a weight thereof after it is impregnated with the resin liquid and then dried.

(4) Others

The decorative board according to the present invention may be produced by, for example, applying heat and pressure to layers including the core layer, the intermediate layer, and the decorative layer by a press machine such as a flat press machine or a continuous press machine.

[0045] The order of stacking in the decorative board may be the order of, for example, the core layer, the intermediate layer, and the decorative layer. The core layer and the intermediate layer may be in direct contact with each other, or there may be another layer therebetween. The intermediate layer and the decorative layer may be in direct contact with each other, or there may be another layer therebetween.

[0046] The decorative board may have the decorative layer on one side thereof or may have the decorative layers on both sides thereof. When the decorative board has the decorative layer on one side thereof, it is preferable that the decorative board includes a balancing layer. In this case, the decorative board may include the intermediate layer and the decorative layer on one side of the core layer and include the balancing layer on an opposite side of the core layer. Including the balancing layer allows for a further reduction in warpage and breakage of the decorative board.

[0047] The balancing layer may be produced by, for example, impregnating a paper with a resin liquid and drying the paper. In this case, the balancing layer includes the paper and the resin included in the paper. Examples of the resin contained in the resin liquid include melamine resin, urea resin, guanamine resin, diallyl phthalate resin, unsaturated polyester resin, acrylic resin, and mixed resin thereof.

[0048] An example of the paper for the balancing layer is a surface paper

weighing 18-40g/m² for a decorative board.

An impregnation rate when the paper for the balancing layer is impregnated with the resin liquid and then dried is preferably in a range of 260-320%. This impregnation rate is a value defined by the above Formula 1. In this case, "weight before impregnation" in Formula 1 means a weight of the paper for the balancing layer; "weight after impregnation" means a weight thereof after it is impregnated with the resin liquid and then dried.

EMBODIMENT 1

[0049] (1) Production of slurry

The following components were mixed to produce a slurry. The values in parts by weight show values in solid equivalent.

[0050] Acrylic resin emulsion (Product no. RAX-208 manufactured by Aica Kogyo Co., Ltd.): 32 parts by weight

Aluminum hydroxide: 300 parts by weight

3-glycidoxypopyl trimethoxysilane: 3.5 parts by weight

Phosphorus-nitrogen flame retardant: 18 parts by weight

Water: 170 parts by weight

The acrylic resin emulsion is an example of the thermoplastic resin. The glass transition temperature (T_g) of the acrylic resin emulsion is 60°C. The acrylic resin emulsion contains 2-ethylhexyl acrylate and methyl methacrylate as main monomers. The average particle diameter of the acrylic resin emulsion is 200nm. The acrylic resin emulsion functions as a binder.

[0051] The aluminum hydroxide is an example of the endothermic metal hydroxide. The average particle diameter of the aluminum hydroxide is 8μm. 3-glycidoxypopyl trimethoxysilane is an example of the silane coupling agent. The phosphorus-nitrogen flame retardant has a phosphorus content of 16% and a nitrogen content of 22%.

[0052] The composition of slurries in Embodiment 1 as well as in other embodiments and comparative examples described later is shown in Table 1.

[0053]

[Table 1]

	Composition of slurry in core layer [parts by weight]					
	Acrylic resin emulsion	Aluminum hydroxide	Calcium carbonate	Silane coupling agent	Flame retardant	Total solid content
Embodiment 1	32	300	0	3.5	18	353.5
Embodiment 2	32	300	0	3.5	18	353.5
Embodiment 3	32	300	0	3.5	18	353.5
Embodiment 4	32	300	0	3.5	18	353.5
Embodiment 5	32	300	0	3.5	18	353.5
Embodiment 6	58	300	0	3.5	18	379.5
Embodiment 7	17	300	0	3.5	18	338.5
Embodiment 8	32	300	0	18	18	368
Embodiment 9	32	300	0	1.8	18	351.8
Embodiment 10	32	600	0	3.5	18	653.5
Embodiment 11	32	100	100	3.5	18	253.5
Embodiment 12	32	300	0	3.5	35	370.5
Embodiment 13	32	300	0	3.5	3.5	339
Embodiment 14	32	300	0	3.5	18	353.5
Embodiment 15	32	300	0	3.5	18	353.5
Embodiment 16	32	300	0	3.5	18	353.5
Embodiment 17	32	300	0	3.5	18	353.5
Embodiment 18	32	300	0	3.5	18	353.5
Embodiment 19	58	300	0	3.5	18	379.5
Embodiment 20	17	300	0	3.5	18	338.5
Embodiment 21	32	300	0	18	18	368
Embodiment 22	32	300	0	1.8	18	351.8
Embodiment 23	32	600	0	3.5	18	653.5
Embodiment 24	32	100	100	3.5	18	253.5
Embodiment 25	32	300	0	3.5	35	370.5
Embodiment 26	32	300	0	3.5	3.5	339
Embodiment 27	32	300	0	3.5	18	353.5
Embodiment 28	32	300	0	3.5	18	353.5
Embodiment 29	32	300	0	3.5	18	353.5
Embodiment 30	32	300	0	3.5	18	353.5
Embodiment 31	32	300	0	3.5	18	353.5
Embodiment 32	32	300	0	3.5	18	353.5
Embodiment 33	32	300	0	3.5	18	353.5
Embodiment 34	32	300	0	3.5	18	353.5
Embodiment 35	32	300	0	-	18	350
Embodiment 36	32	300	0	-	18	350
Embodiment 37	32	300	0	3.5	-	335.5
Embodiment 38	32	300	0	3.5	-	335.5
Embodiment 39	32	300	0	3.5	18	353.5
Embodiment 40	32	300	0	3.5	18	353.5
Embodiment 41	32	300	0	3.5	18	353.5
Comparative Example 1	32	300	0	3.5	18	353.5
Comparative Example 2	7	250	0	3.5	18	278.5
Comparative Example 3	76	250	0	3.5	18	347.5
Comparative Example 4	32	300	0	3.5	18	353.5
Comparative Example 5	32	300	0	3.5	18	353.5

(2) Production of prepreg

A glass fiber nonwoven fabric weighing 40g/m^2 was prepared as a fibrous base material. This fibrous base material was impregnated with the slurry produced in the above (1) and then dried such that the impregnation rate as defined by Formula 1 was 750%, to produce a prepreg. This prepreg included the fibrous base material, the acrylic resin emulsion, and the aluminum hydroxide.

[0054] The amounts (weights per unit area) of the acrylic resin emulsion, the aluminum hydroxide, the silane coupling agent, and the flame retardant included in a sheet of the prepreg were 27.16g/m^2 , 254.60g/m^2 , 2.97g/m^2 , and 15.28g/m^2 , respectively.

[0055] The composition of preregs in Embodiment 1 as well as in other embodiments and comparative examples described later is shown in Table 2.

[0056] [Table 2]

	Amount of each component included [g/m ²]				
	Acrylic resin emulsion	Aluminum hydroxide	Calcium carbonate	Silane coupling agent	Flame retardant
Embodiment 1	27.16	254.60	0	2.97	15.28
Embodiment 2	27.16	254.60	0	2.97	15.28
Embodiment 3	27.16	254.60	0	2.97	15.28
Embodiment 4	27.16	254.60	0	2.97	15.28
Embodiment 5	27.16	254.60	0	2.97	15.28
Embodiment 6	45.85	237.15	0	2.77	14.23
Embodiment 7	15.07	265.88	0	3.10	15.95
Embodiment 8	26.09	244.57	0	14.67	14.67
Embodiment 9	27.29	255.83	0	1.53	15.35
Embodiment 10	14.69	275.44	0	1.61	8.26
Embodiment 11	37.87	118.34	118.34	4.14	21.30
Embodiment 12	25.91	242.91	0	2.83	28.34
Embodiment 13	28.32	265.49	0	3.10	3.10
Embodiment 14	27.16	254.60	0	2.97	15.28
Embodiment 15	27.16	254.60	0	2.97	15.28
Embodiment 16	27.16	254.60	0	2.97	15.28
Embodiment 17	27.16	254.60	0	2.97	15.28
Embodiment 18	27.16	254.60	0	2.97	15.28
Embodiment 19	45.85	237.15	0	2.77	14.23
Embodiment 20	15.07	265.88	0	3.10	15.95
Embodiment 21	26.09	244.57	0	14.67	14.67
Embodiment 22	27.29	255.83	0	1.53	15.35
Embodiment 23	14.69	275.44	0	1.61	8.26
Embodiment 24	37.87	118.34	118.34	4.14	21.30
Embodiment 25	25.91	242.91	0	2.83	28.34
Embodiment 26	28.32	265.49	0	3.10	3.10
Embodiment 27	27.16	254.60	0	2.97	15.28
Embodiment 28	27.16	254.60	0	2.97	15.28
Embodiment 29	27.16	254.60	0	2.97	15.28
Embodiment 30	27.16	254.60	0	2.97	15.28
Embodiment 31	27.16	254.60	0	2.97	15.28
Embodiment 32	27.16	254.60	0	2.97	15.28
Embodiment 33	27.16	254.60	0	2.97	15.28
Embodiment 34	27.16	254.60	0	2.97	15.28
Embodiment 35	27.43	257.14	0	-	15.43
Embodiment 36	27.43	257.14	0	-	15.43
Embodiment 37	28.61	268.26	0	3.13	-
Embodiment 38	28.61	268.26	0	3.13	-
Embodiment 39	27.16	254.60	0	2.97	15.28
Embodiment 40	27.16	254.60	0	2.97	15.28
Embodiment 41	27.16	254.60	0	2.97	15.28
Comparative Example 1	27.16	254.60	0	2.97	15.28
Comparative Example 2	7.54	269.30	0	3.77	19.39
Comparative Example 3	65.61	215.83	0	3.02	15.54
Comparative Example 4	27.16	254.60	0	2.97	15.28
Comparative Example 5	27.16	254.60	0	2.97	15.28

The values in Table 2 show weights of the components included in a square meter of the prepreg.

(3) Production of intermediate layer

An aluminum hydroxide mixed paper (Product name: Sanwall, Manufactured by Sanzen Paper Manufacturing Co., Ltd., Aluminum hydroxide mixing ratio of 69% by weight) weighing 110g/m^2 was prepared as a mixed paper. This mixed paper is an example of the mixed paper containing an endothermic metal hydroxide.

[0057] This mixed paper was impregnated with a resin liquid including a melamine-formaldehyde resin as a main component and then dried such that the impregnation rate as defined by Formula 1 was 30%, to produce an intermediate layer. This intermediate layer included the mixed paper containing the aluminum hydroxide and the melamine-formaldehyde resin included in the mixed paper. Melamine-formaldehyde resin is an example of the thermoplastic resin. The amount of the melamine-formaldehyde resin included in the intermediate layer was 33g/m^2 .

[0058] The details of intermediate layers in Embodiment 1 as well as in other embodiments and comparative examples described later are shown in Table 3.

[0059] [Table 3]

Intermediate layer			
Base material	Weight (g/m ²)	Impregnation rate (%)	Amount of impregnation (g/m ²)
Al mixed paper	110	30	33
Al mixed paper	180	30	54
Al mixed paper	80	30	24
Al mixed paper	110	100	110
Al mixed paper	110	10	11
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	180	30	54
Al mixed paper	80	30	24
Al mixed paper	110	100	110
Al mixed paper	110	10	11
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	110	30	33
Al mixed paper	-	-	-
Al mixed paper	110	30	33
Al mixed paper	110	30	33
KP paper	190	50	95
KP paper	110	30	33

In Table 3, "aluminum mixed paper" means an aluminum hydroxide mixed paper; "KP paper" means a kraft pulp paper. "Weight" in Table 3 means a weight of the aluminum hydroxide mixed paper. "Impregnation rate" in Table 3 means an amount (in solid equivalent) of the resin impregnated per square meter of the aluminum hydroxide mixed paper or the kraft pulp paper.

(4) Production of decorative layer

A white decorative paper weighing 100g/m^2 for a thermosetting resin decorative board was impregnated with a resin liquid including a melamine-formaldehyde resin as a main component and then dried such that the impregnation rate as defined by Formula 1 was 130%, to produce a decorative layer. This decorative layer included the decorative paper and the melamine-formaldehyde resin included in the decorative paper. Melamine-formaldehyde resin is an example of thermosetting resin. The amount of the melamine-formaldehyde resin included in the decorative layer was 130g/m^2 .

(5) Production of decorative board

Two sheets of the prepreg, one sheet of the intermediate layer, and one sheet of the decorative layer were stacked from below in this order. Heat and pressure were then applied thereto using a flat-finishing plate under the conditions of 132°C , 70kgf/cm^2 , and 64 minutes, to form them into a decorative board, when the two sheets of the prepreg formed a core layer.

[0060] As shown in FIG. 1, a decorative board 7 produced as described above is a stack of a core layer 4 made of two sheets of prepreg 3, an intermediate layer 2, and a decorative layer 1.

The structures of decorative boards in Embodiment 1 as well as in other embodiments and comparative examples described later are shown in Table 4.

[0061] [Table 4]

Component parts of decorative board				
	Decorative layer	Intermediate layer	Core layer	Balancing layer
Embodiment 1	Present	Present	Present	-
Embodiment 2	Present	Present	Present	-
Embodiment 3	Present	Present	Present	-
Embodiment 4	Present	Present	Present	-
Embodiment 5	Present	Present	Present	-
Embodiment 6	Present	Present	Present	-
Embodiment 7	Present	Present	Present	-
Embodiment 8	Present	Present	Present	-
Embodiment 9	Present	Present	Present	-
Embodiment 10	Present	Present	Present	-
Embodiment 11	Present	Present	Present	-
Embodiment 12	Present	Present	Present	-
Embodiment 13	Present	Present	Present	-
Embodiment 14	Present	Present	Present	Present
Embodiment 15	Present	Present	Present	Present
Embodiment 16	Present	Present	Present	Present
Embodiment 17	Present	Present	Present	Present
Embodiment 18	Present	Present	Present	Present
Embodiment 19	Present	Present	Present	Present
Embodiment 20	Present	Present	Present	Present
Embodiment 21	Present	Present	Present	Present
Embodiment 22	Present	Present	Present	Present
Embodiment 23	Present	Present	Present	Present
Embodiment 24	Present	Present	Present	Present
Embodiment 25	Present	Present	Present	Present
Embodiment 26	Present	Present	Present	Present
Embodiment 27	Present	Present	Present	-
Embodiment 28	Present	Present	Present	Present
Embodiment 29	Present	Present	Present	-
Embodiment 30	Present	Present	Present	Present
Embodiment 31	Present	Present	Present	-
Embodiment 32	Present	Present	Present	Present
Embodiment 33	Present	Present	Present	-
Embodiment 34	Present	Present	Present	Present
Embodiment 35	Present	Present	Present	-
Embodiment 36	Present	Present	Present	Present
Embodiment 37	Present	Present	Present	-
Embodiment 38	Present	Present	Present	Present
Embodiment 39	Present	Present	Present	-
Embodiment 40	Present	Present	Present	-
Embodiment 41	Present	Present	Present	-
Comparative Example 1	Present	-	Present	-
Comparative Example 2	Present	Present	Present	-
Comparative Example 3	Present	Present	Present	-
Comparative Example 4	Present	Present	Present	-
Comparative Example 5	Present	Present	Present	-

Core layers in the embodiments and comparative examples each include double the respective amounts of their components shown in Table 2, since the core layers are each made of two sheets of prepreg.

EMBODIMENT 2

- [0062] A decorative board was produced in a manner similar to that of Embodiment 1, except that an aluminum hydroxide mixed paper (Product name: Sanwall, Manufactured by Sanzen Paper Manufacturing Co., Ltd., Aluminum hydroxide mixing ratio of 69% by weight) weighing 180g/m² was used as the mixed paper in a process of producing an intermediate layer.

EMBODIMENT 3

- [0063] A decorative board was produced in a manner similar to that of Embodiment 1, except that an aluminum hydroxide mixed paper (Manufactured by Awa Paper Mfg. Co., Ltd., Aluminum hydroxide mixing ratio of 69% by weight) weighing 80g/m² was used as the mixed paper in a process of producing an intermediate layer.

EMBODIMENT 4

- [0064] A decorative board was produced in a manner similar to that of Embodiment 1, except that the impregnation rate when the aluminum hydroxide mixed paper was impregnated with the resin liquid was 100% in a process of producing an intermediate layer.

EMBODIMENT 5

- [0065] A decorative board was produced in a manner similar to that of Embodiment 1, except that the impregnation rate when the aluminum hydroxide mixed paper was impregnated with the resin liquid was 10% in a process of producing an intermediate layer.

EMBODIMENT 6

- [0066] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the acrylic resin emulsion blended was 58 parts by weight in a process of producing a slurry.

EMBODIMENT 7

[0067] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the acrylic resin emulsion blended was 17 parts by weight in a process of producing a slurry.

EMBODIMENT 8

[0068] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of 3-glycidoxypopyl trimethoxysilane blended was 18 parts by weight in a process of producing a slurry.

EMBODIMENT 9

[0069] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of 3-glycidoxypopyl trimethoxysilane blended was 1.8 parts by weight in a process of producing a slurry.

EMBODIMENT 10

[0070] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the aluminum hydroxide blended was 600 parts by weight in a process of producing a slurry.

EMBODIMENT 11

[0071] The amount of the aluminum hydroxide blended was 100 parts by weight in a process of producing a slurry. 100 parts by weight of a heavy calcium carbonate having an average particle diameter of 1 μ m was added to the slurry. A decorative board was produced in a manner otherwise similar to that of Embodiment 1.

EMBODIMENT 12

[0072] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the phosphorus-nitrogen flame retardant blended was 35 parts by weight in a process of producing a slurry.

EMBODIMENT 13

[0073] A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the phosphorus-nitrogen flame

retardant blended was 3.5 parts by weight in a process of producing a slurry.

EMBODIMENT 14

[0074] (1) Production of balancing layer

A surface paper weighing 24g/m^2 for a decorative board was impregnated with a resin liquid including a melamine-formaldehyde resin as a main component and then dried such that the impregnation rate as defined by Formula 1 was 280%, to produce a balancing layer. This balancing layer included the surface paper and the melamine resin included in the surface paper. The amount of the melamine-formaldehyde resin included in the balancing layer was 67.2g/m^2 .

[0075] (2) Production of decorative board

One sheet of the balancing layer produced in the above (1), two sheets of prepreg, one sheet of an intermediate layer, and one sheet of a decorative layer were stacked from below in this order. Heat and pressure were then applied thereto using a flat-finishing plate under the conditions of 132°C , 70kgf/cm^2 , and 64 minutes, to form them into a decorative board. The prepreg, the intermediate layer, and the decorative layer used in this embodiment were identical to those of Embodiment 1.

[0076] As shown in FIG. 2, a decorative board 8 produced as described above is a stack of a balancing layer 5, the core layer 4 made of two sheets of the prepreg 3, the intermediate layer 2, and the decorative layer 1. The decorative board 8 includes the intermediate layer 2 and the decorative layer 1 on one side of the core layer 4 (a top side thereof in FIG. 2) and includes the balancing layer 5 on an opposite side of the core layer 4 (a bottom side thereof in FIG. 2).

EMBODIMENT 15

[0077] A decorative board was produced in a manner similar to that of Embodiment 14, except that the intermediate layer was identical to that of Embodiment 2.

EMBODIMENT 16

[0078] A decorative board was produced in a manner similar to that of Embodiment 14, except that the intermediate layer was identical to that of Embodiment 3.

EMBODIMENT 17

[0079] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 4.

EMBODIMENT 18

[0080] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 5.

EMBODIMENT 19

[0081] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 6.

EMBODIMENT 20

[0082] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 7.

EMBODIMENT 21

[0083] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 8.

EMBODIMENT 22

[0084] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 9.

EMBODIMENT 23

[0085] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment

10.

EMBODIMENT 24

[0086] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 11.

EMBODIMENT 25

[0087] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 12.

EMBODIMENT 26

[0088] A decorative board was produced in a manner similar to that of Embodiment 14, except that the prepreg was identical to that of Embodiment 13.

EMBODIMENT 27

[0089] A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of 3-glycidoxypentyl trimethoxysilane, 3-(2-aminoethyl)aminopentyl trimethoxysilane of the same amount was blended in a process of producing a slurry.

EMBODIMENT 28

[0090] A decorative board was produced in a manner similar to that of Embodiment 14, except that, in place of 3-glycidoxypentyl trimethoxysilane, 3-(2-aminoethyl)aminopentyl trimethoxysilane of the same amount was blended in a process of producing a slurry.

EMBODIMENT 29

[0091] A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of the phosphorus-nitrogen flame retardant, a nitrogen flame retardant (Product name: APINON-901, Melamine sulfate as a main component, 48% total nitrogen, 9% total sulfur, Manufactured by Sanwa Chemical Co., Ltd.) of the same amount was blended in a process of producing a slurry.

EMBODIMENT 30

- [0092] A decorative board was produced in a manner similar to that of Embodiment 14, except that, in place of the phosphorus-nitrogen flame retardant, a nitrogen flame retardant (Product name: APINON-901, Melamine sulfate as a main component, 48% total nitrogen, 9% total sulfur, Manufactured by Sanwa Chemical Co., Ltd.) of the same amount was blended in a process of producing a slurry.

EMBODIMENT 31

- [0093] A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of RAX-208, RAX-208E of the same amount was blended in a process of producing a slurry. RAX-208E is an acrylic resin emulsion manufactured by Aica Kogyo Co. Ltd. The glass transition temperature (T_g) of RAX-208E is 0°C. Main monomers of RAX-208E are 2-ethylhexyl acrylate and methyl methacrylate.

EMBODIMENT 32

- [0094] A decorative board was produced in a manner similar to that of Embodiment 14, except that, in place of RAX-208, RAX-208E of the same amount was blended in a process of producing a slurry.

EMBODIMENT 33

- [0095] A decorative board was produced in in a manner similar to that of Embodiment 1, except that, in place of RAX-208, RAX-208D of the same amount was blended in a process of producing a slurry. RAX-208D is an acrylic resin emulsion manufactured by Aica Kogyo Co. Ltd. The glass transition temperature (T_g) of RAX-208D is 30°C. Main monomers of RAX-208D are 2-ethylhexyl acrylate and methyl methacrylate.

EMBODIMENT 34

- [0096] A decorative board was produced in a manner similar to that of Embodiment 14, except that, in place of RAX-208, RAX-208D of the same amount was blended in a process of producing a slurry.

EMBODIMENT 35

- [0097] A decorative board was produced in a manner similar to that of Embodiment 1, except that 3-glycidoxypropyl trimethoxysilane was not blended in the process of producing a slurry.

EMBODIMENT 36

- [0098] A decorative board was produced in a manner similar to that of Embodiment 14, except that 3-glycidoxypropyl trimethoxysilane was not blended in a process of producing a slurry.

EMBODIMENT 37

- [0099] A decorative board was produced in a manner similar to that of Embodiment 1, except that the phosphorus-nitrogen flame retardant was not blended in a process of producing a slurry.

EMBODIMENT 38

- [0100] A decorative board was produced in a manner similar to that of Embodiment 14, except that the phosphorus-nitrogen flame retardant was not blended in a process of producing a slurry.

EMBODIMENT 39

- [0101] A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of the aluminum hydroxide, a magnesium hydroxide of the same amount was blended in a process of producing a slurry.

EMBODIMENT 40

- [0102] A decorative board was produced in a manner similar to that of Embodiment 1, except that an aluminum hydroxide mixed paper having an aluminum hydroxide mixing ratio of 60% by weight was used in a process of producing an intermediate layer.

EMBODIMENT 41

- [0103] A decorative board was produced in a manner similar to that of Embodiment 1, except that an aluminum hydroxide mixed paper having an aluminum hydroxide mixing ratio of 80% by weight was used in a process of producing an intermediate layer.

(Comparative Example 1)

A decorative board was produced in a manner similar to that of Embodiment 1, except that an intermediate layer was not provided.

(Comparative Example 2)

A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the acrylic resin emulsion blended was 7 parts by weight and that the amount of the aluminum hydroxide blended was 250 parts by weight in a process of producing a slurry.

(Comparative Example 3)

A decorative board was produced in a manner similar to that of Embodiment 1, except that the amount of the acrylic resin emulsion blended was 76 parts by weight in a process of producing a slurry.

(Comparative Example 4)

A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of the intermediate layer, a phenol resin impregnated kraft paper having an impregnation rate of 50% was used. This phenol resin impregnated kraft paper having an impregnation rate of 50% was obtained by impregnating a kraft paper weighing 190g/m^2 with a phenol resin and then drying the paper such that the impregnation rate as defined by Formula 1 was 50%.

(Comparative Example 5)

A decorative board was produced in a manner similar to that of Embodiment 1, except that, in place of the intermediate layer, a phenol resin impregnated kraft paper having an impregnation rate of 30% was used. This phenol resin impregnated kraft paper having an impregnation rate of 30% was obtained by impregnating a kraft paper weighing 110g/m^2 with a phenol resin and then drying the paper such that the impregnation rate as defined by Formula 1 was 30%.

<Evaluation of decorative boards>

Evaluation tests were conducted on the decorative boards according to

the embodiments and comparative examples in terms of smoothness, non-combustibility, bending workability, weight increase rate, and warpage. Methods of the evaluation tests are described below.

[0104] (1) Smoothness

The decorative boards were visually observed. If there was no crack or orange peel in the decorative layer, the smoothness was determined as "○". If there was a minimal degree of orange peel, the smoothness was determined as "△".

[0105] The decorative boards of Embodiment 1 and Comparative Example 1 were irradiated with light from a bar-shaped fluorescent lamp and were photographed under such conditions. A photograph of the decorative board according to Embodiment 1 is shown in FIG. 3; a photograph of the decorative board according to Comparative Example 1 is shown in FIG. 4. A surface of the decorative board according to Embodiment 1 was highly smooth and thus faithfully reflected the shape of the fluorescent lamp. In contrast, a surface of the decorative board according to Comparative Example 1 was less smooth, and thus the shape of the fluorescent lamp was not distinct.

[0106] (2) Non-combustibility

Heat release tests for 20 minutes using a cone calorimeter in accordance with ISO5660 were performed. In the case where all the following α to γ were satisfied, the evaluation was ○, and the evaluation was × in other cases.

[0107] α : the total heat release is equal to or less than 8MJ/m^2

β : the maximum heat release rate remains not exceeding 200KW/m^2 for 10 consecutive seconds or more

γ : no crack or hole passing through to a reverse surface occurs during 20 minutes from the start of the test

[0108] (3) Bending workability

A 150mm wide sample was cut out from the decorative board. A

bar-shaped heater was then placed at a given distance from a surface of the sample, when an axial direction of the heater and a fiber direction of the decorative board were made parallel to each other. Under these conditions, the temperature of the heater was made 700°C and the temperature of the surface of the sample was made 170°C.

[0109] The sample held such that its sides were horizontal was then pressed from above against an upper edge of a vertically arranged plate-shaped fixture, when the fiber direction of the decorative board and a longitudinal direction of the plate-shaped fixture were made parallel to each other. A cross sectional shape of the upper edge of the fixture is an arc shape having a given radius of curvature.

[0110] While the sample was pressed against the fixture as described above, both ends of the sample were pressed further down to a specific amount to bend the sample. Whether or not any crack occurred in the sample was then checked.

The sample was repeatedly tested with gradually reduced radii of curvature at the upper edge of the fixture. The minimum radius of curvature that did not cause a crack in the sample was determined as the value for evaluation of the bending workability.

[0111] (4) Weight increase rate

Weight increase rates of the decorative boards were measured according to boiling resistance in JIS K 6902 "Testing method for laminated thermosetting high-pressure decorative sheets". The standard value is 17% or less.

[0112] (5) Evaluation of warpage

A 50mm×300mm sample was cut out from the decorative board. The fiber direction of the decorative board was parallel to a transverse direction of this sample. The sample was cured in an environment with a room temperature of 40°C and a humidity of 30% for 24 hours. The height of warpage of the sample from a horizontal surface on which the sample was

placed (the distance, when one longitudinal end of the sample was pressed against the horizontal surface, between an opposite end of the sample and the horizontal surface) was then measured.

[0113] Evaluation results are shown in Table 5 and Table 6. "Thickness" in Table 5 means a thickness of the decorative board.

[0114] [Table 5]

Evaluation results					
	Thickness [mm]	Smoothness	Non-combustibility	Bending Workability	Weight increase rate (%)
Embodiment 1	0.63	○	○	6R	10.4
Embodiment 2	0.65	○	○	6R	12.8
Embodiment 3	0.62	○	○	6R	10.3
Embodiment 4	0.62	○	○	6R	12.1
Embodiment 5	0.61	○	○	6R	14.6
Embodiment 6	0.60	○	○	6R	12.2
Embodiment 7	0.61	○	○	6R	16.5
Embodiment 8	0.61	○	○	6R	12.9
Embodiment 9	0.63	○	○	6R	13.5
Embodiment 10	0.61	○	○	6R	14.9
Embodiment 11	0.60	○	○	6R	12.2
Embodiment 12	0.64	○	○	6R	15.8
Embodiment 13	0.65	○	○	6R	10.2
Embodiment 14	0.70	○	○	9R	4.5
Embodiment 15	0.72	○	○	9R	8.7
Embodiment 16	0.66	○	○	9R	5.8
Embodiment 17	0.66	○	○	9R	7.9
Embodiment 18	0.63	○	○	9R	8.2
Embodiment 19	0.64	○	○	9R	6.3
Embodiment 20	0.65	○	○	9R	11.6
Embodiment 21	0.64	○	○	9R	5.2
Embodiment 22	0.67	○	○	9R	9.8
Embodiment 23	0.64	○	○	9R	9.6
Embodiment 24	0.65	○	○	9R	6.5
Embodiment 25	0.67	○	○	9R	15.5
Embodiment 26	0.69	○	○	9R	7.5
Embodiment 27	0.67	○	○	6R	10.5
Embodiment 28	0.69	○	○	9R	9.8
Embodiment 29	0.68	○	○	6R	12.5
Embodiment 30	0.68	○	○	9R	10.8
Embodiment 31	0.66	○	○	6R	10.4
Embodiment 32	0.67	○	○	9R	6.9
Embodiment 33	0.65	○	○	6R	10.3
Embodiment 34	0.69	○	○	9R	7.9
Embodiment 35	0.66	○	○	6R	14.5
Embodiment 36	0.68	○	○	9R	11.9
Embodiment 37	0.67	○	○	6R	12.6
Embodiment 38	0.68	○	○	9R	10.7
Embodiment 39	0.62	○	○	6R	14.4
Embodiment 40	0.63	○	○	6R	10.2
Embodiment 41	0.65	○	○	6R	13.9
Comparative Example 1	0.65	△	○	9R	8.5
Comparative Example 2	- (No decorative board was formed)				
Comparative Example 3	0.69	○	×	6R	7.1
Comparative Example 4	0.73	○	×	9R	8.1
Comparative Example 5	0.63	○	×	9R	11.8

[0115]

[Table 6]

	Warpage [mm]
Embodiment 1	23
Embodiment 14	12
Comparative Example 1	29
Comparative Example 5	50

Good results were obtained for each of the evaluation items from the decorative boards according to the embodiments. In other words, the decorative boards according to the embodiments were decorative boards causing less warpage in spite of being thin and having a smooth appearance and superior bending workability, as well as non-combustibility. The decorative boards according to the comparative examples were inferior in any of the evaluation items of smoothness, bending workability, non-combustibility, and warpage.

CLAIMS

1. A decorative board comprising:
a core layer including:
 - a fibrous base material;
 - a thermoplastic resin, and
 - an endothermic metal hydroxide;an intermediate layer including:
 - a mixed paper containing an endothermic metal hydroxide; and
 - a thermosetting resin;a decorative layer including:
 - a decorative paper; and
 - a thermosetting resin,wherein an amount of the thermoplastic resin included in the core layer is 10-100g/m².
2. The decorative board according to claim 1, comprising a stack of the core layer, the intermediate layer, and the decorative layer stacked in this order.
3. The decorative board according to claim 1 or 2, wherein the endothermic metal hydroxide in the core layer or in the intermediate layer is an aluminum hydroxide or a magnesium hydroxide.
4. The decorative board according to any one of claims 1 to 3, wherein the thermoplastic resin in the core layer is an acrylic resin emulsion.
5. The decorative board according to any one of claims 1 to 4, wherein the core layer includes a silane coupling agent.
6. The decorative board according to any one of claims 1 to 5, wherein the

core layer includes a flame retardant.

7. The decorative board according to claim 6, wherein the core layer includes the flame retardant of 1-100g/m².

8. The decorative board according to claim 6 or 7, wherein the flame retardant is a nitrogen flame retardant or a phosphorus-nitrogen flame retardant.

9. The decorative board according to claim 8, wherein a phosphorus content of the phosphorus-nitrogen flame retardant is 1-30% by weight and a nitrogen content of the phosphorus-nitrogen flame retardant is 5-35% by weight.

10. The decorative board according any one of claims 1 to 9, comprising the intermediate layer and the decorative layer on one side of the core layer and a balancing layer on an opposite side of the core layer.