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(54) **Title:** RESIN COMPOSITION FOR PROCESSING OF FABRIC AND FABRIC OBTAINED USING THE SAME

(57) **Abstract:** A resin composition for processing of fabric and a fabric made by processing using the resin composition. The resin composition for processing of fabric comprises an acrylic resin (A), a phosphate ester (B), ammonium polyphosphate (C), aluminum hydroxide (D), and an aqueous medium (E), characterized in that: with respect to 100 parts by mass of the acrylic resin (A), the total amount of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) is 110-250 parts by mass; in the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D), the ratio of the phosphate ester (B) is 18-35% by mass, the ratio of the ammonium polyphosphate (C) is 30-70% by mass, and the ratio by mass, and the ratio of the aluminum hydroxide (D) is 10-35% by mass. This resin composition for processing of fabric can provide fabrics with excellent flame retardancy, water mark resistance, and blocking resistance.



RESIN COMPOSITION FOR PROCESSING OF FABRIC AND FABRIC OBTAINED USING THE SAME

Technical Field

This invention relates to a resin composition for processing of fabric which can provide fabrics with excellent flame retardancy, water mark resistance and blocking resistance, and a fabric made by processing using the resin composition.

Background Art

In the past, with respect to fabrics such as fabric blanks or the like, a resin coating agent (lining agent) has been coated on the back of a fabric in order to prevent ravel upon sewing and processing. The resin coating agent needs to be provided with flame retardancy according to the application. A mainstream method is generally the addition of halogen-based flame retardants in order to provide the resin coating agents with flame retardancy. However, for example, in members of automobiles, bromine-based flame retardants as halogen-based flame retardants become the limited subjects in the RoHS act, and non-halogen-based flame retardants begin to be used as the resin coating agents used in polyester fabrics for automobile seats.

However, the fabrics made by processing using the resin coating agents using non-halogen-based flame retardants have not proportionately met flame retardancy, water mark resistance, and blocking resistance.

Therefore, a flame-retardant lining agent, which is used as a flame retardant and makes use of ammonium polyphosphate and phosphate ester, has been proposed (for example, referring to Patent Literature 1). Although this flame-retardant lining agent has good flame retardancy and water mark resistance, it has insufficient blocking resistance, and thereby there are problems after the processing of fabrics.

Furthermore, it has been proposed that as a flame retardant, a flame-retardant coating agent comprising aluminum tris(diethyl)hypophosphonate, aluminum trimethylethylhypophosphonate, or aluminum tris(biphenyl)hypophosphonate can be used (for example, referring to Patent Literature 2). With respect to this flame-retardant lining agent, it also has good flame retardancy and water mark resistance, but it has insufficient blocking resistant agents, and thereby there are problems after the processing of fabrics.

Therefore, it is being sought that even though a resin coating agents using a non-halogen-based flame retardant is used, a fabric made by processing therewith still has the level capable of proportionately meeting flame retardancy, water mark resistance, and blocking resistance. Particularly, a resin composition for processing of fabric having excellent blocking resistance, which has great effect on the productivity of fabrics made by processing, is sought.

Prior Art Documents

Patent Literature

Patent Literature 1: JP-A-2006-233152

Patent Literature 2: Japanese Patent No. 5279154

Summary of Invention

Problem to be solved by the Invention

The problem to be solved by this invention is to provide a resin composition for processing of fabric which can provide fabrics with excellent flame retardancy, water mark resistance, and blocking resistance, and a fabric made by processing using the resin composition.

Means for Solving the Problem

Wide and intensive studies have been performed on the problem described above by the inventor, and it has been found that the problem described above can be solved by using various flame retardants in a particular ratio and thus this invention has been achieved.

That is, this invention provides a resin composition for processing of fabric and a fabric made by processing using the resin composition. The resin composition for processing of fabric comprises an acrylic resin (A), a phosphate ester (B), ammonium polyphosphate (C), aluminum hydroxide (D), and an aqueous medium (E), characterized in that: with respect to 100 parts by mass of the acrylic resin (A), the total amount of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) is 110-250 parts by mass; in the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D), the ratio of the phosphate ester (B) is 18-35% by mass, the ratio of the ammonium polyphosphate (C) is 30-70% by mass, and the ratio of the aluminum hydroxide (D) is 10-35% by mass.

Effect of the Invention

The resin composition for processing of fabric of the invention can proportionately confer excellent flame retardancy, water mark resistance, and blocking resistance to fabrics made by processing using the resin composition. Therefore, it can be preferably used as a composition for treating the materials for the fabrics for use in seat materials used for transportation machinery such as automobiles, airplanes, trains, and the like; home interior materials such as curtains, chairs, and the like; industrial materials such as tent sheet texture, banners, theater curtains, and the like; bedding materials such as bedding covers, bed linens, and the like; clothing materials such as firefighter clothes, and the like, which require flame retardancy.

Description of Embodiments

The resin composition for processing of fabric of the invention comprises an acrylic resin (A), a phosphate ester (B), ammonium polyphosphate (C), aluminum hydroxide (D), and an aqueous medium (E), wherein with respect to 100 parts by mass of the acrylic resin (A), the total amount of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) is 110-250 parts by mass; in the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D), the ratio of the phosphate ester (B) is 18-35% by mass, the ratio of the ammonium polyphosphate (C) is 30-70% by mass, and the ratio of the aluminum hydroxide (D) is 10-35% by mass.

The acrylic resin (A) is a resin made from polymerization of polymeric monomers in which an acrylic monomer is used as a necessary component. Furthermore, a polymeric monomer having a carboxyl group is preferably used in order to be well dissolved or dispersed in the aqueous medium (E) described below.

The acrylic monomer (a1), which may be used as the raw material of the acrylic resin (A), may be exemplified by, for example, alkyl (meth)acrylates such as methyl (meth)acrylate, ethyl (meth)acrylate, n-propyl (meth)acrylate, isopropyl (meth)acrylate, n-butyl (meth)acrylate, sec-butyl (meth)acrylate, tert-butyl (meth)acrylate, isobutyl (meth)acrylate, 2-ethylhexyl (meth)acrylate, decyl (meth)acrylate, undecyl (meth)acrylate, dodecyl (meth)acrylate (lauryl (meth)acrylate), tridecyl (meth)acrylate, pentadecyl (meth)acrylate, hexadecyl (meth)acrylate, heptadecyl (meth)acrylate, octadecyl (meth)acrylate (stearyl (meth)acrylate), nonadecyl (meth)acrylate, eicosyl (meth)acrylate, and the like; aryl (meth)acrylates such as benzyl (meth)acrylate, phenylethyl (meth)acrylate, and the like; (meth)acrylates having an alicyclic structure such as cyclohexyl (meth)acrylate, isobornyl (meth)acrylate, and the like; alkyl-terminated polyalkylene glycol mono(meth)acrylates such as methoxy polyethylene glycol mono(meth)acrylate, methoxy polypropylene glycol mono(meth)acrylate, octyloxy polyethylene glycol mono(meth)acrylate, octyloxy polypropylene glycol mono(meth)acrylate, dodecyloxy polyethylene glycol mono(meth)acrylate, dodecyloxy polypropylene glycol mono(meth)acrylate, stearyloxy polyethylene glycol mono(meth)acrylate, stearyloxy polypropylene glycol mono(meth)acrylate, allyloxy polyethylene glycol mono(meth)acrylate, allyloxy polypropylene glycol mono(meth)acrylate, nonylphenoxy polyethylene glycol mono(meth)acrylate, nonylphenoxy polypropylene glycol mono(meth)acrylate, and the like; silane-based (meth)acrylates such as trimethylsilyloxy ethyl (meth)acrylate, and the like; (meth)acryloxy alkyl silane compounds such as 3-(meth)acryloxypropyltrimethoxysilane, 3-(meth)acryloxy propyl methyl dimethoxysilane, 3-(meth)acryloxy propyl triethoxysilane, 3-(meth)acryloxy propyl methyl diethoxysilane, and the like; fluorine-based (meth)acrylates such as perfluoroalkyl ethyl (meth)acrylate, and the like; (meth)acrylate compounds such as glycidyl (meth)acrylate, epoxy (meth)acrylate, ethylene glycol di(meth)acrylate, diethylene glycol di(meth)acrylate, trimethylolpropane

tris(meth)acrylate, tetramethylene glycol tetrakis(meth)acrylate, 2-hydroxy-1,3-diacryloxy propane, 2,2-bis[4-(acryloxymethoxy)phenyl]propane, 2,2-bis[4-(acryloxyethoxy)phenyl]propane, dicyclopentenyl (meth)acrylate, tricyclodecanyl alkenyl (meth)acrylate, tris(acryloyloxyethyl)isocyanurate, urethane (meth)acrylate, and the like; (meth)acrylates having an alkylamino group such as dimethylaminoethyl (meth)acrylate, diethylaminoethyl (meth)acrylate, dimethylaminopropyl (meth)acrylate, and the like. These (meth)acrylate compounds (c) may be used alone or may be used in combination of two or more.

It is to be indicated that, in the invention, “(meth)acrylate” refers to one or both of methacrylate and acrylate, “(meth)acryloyl” refers to one or both of methacryloyl and acryloyl, and “(meth)acrylic acid” refers to one or both of methacrylic acid and acrylic acid.

Furthermore, in the case where a carboxyl group is introduced into the acrylic resin (A), for example, as the raw material thereof, polymeric monomers (a2) such as (meth)acrylic acid, itaconic acid, crotonic acid, fumaric acid, maleic acid, maleic anhydride, citraconic acid, and the like may be used. These polymeric monomers (a2) may be used alone or may be used in combination of two or more. Furthermore, after a carboxyl group is introduced into the acrylic resin (A) by using these polymeric monomers (a2) having a carboxyl group, a part or all of these carboxyl groups may be neutralized by alkalis including metal hydroxides (such as potassium hydroxide, sodium hydroxide, etc.), organics (such as ammonia, triethyl amine, etc.), and the like.

Furthermore, with respect to the raw material for the acrylic resin (A), as the polymeric monomers other than the acrylic monomers (a1) and the polymeric monomers (a2), other polymeric monomers (a3) can be further used. The polymeric monomer(a3) may be exemplified by aromatic vinyl compounds such as styrene, styrene derivatives (α -methylstyrene, p-dimethyl silyl styrene, (p-ethylenyl phenyl)methyl thioether, p-hexynyl styrene, p-methoxy styrene, p-tert-butyl dimethyl silyloxy styrene, o-methyl styrene, p-methyl styrene, p-tert-butyl styrene, α -methyl styrene, and the like), vinyl naphthalene, vinyl anthracene, 1,1-biphenyl ethylene, and the like; acrylamide compounds such as (meth)acrylamide, N,N-dimethylacrylamide, isopropylacrylamide, diacetone acrylamide, and the like; vinyl pyridine compounds such as 2-vinyl pyridine, 4-vinyl pyridine, naphthyl vinyl pyridine, and the like; conjugated dienes such as 1,3-butadiene, 2-methyl-1,3-butadiene, 2,3-dimethyl-1,3-butadiene, 1,3-pentadiene, 1,3-hexadiene, 1,3-cyclohexadiene, and the like; and the like. These polymeric monomers (a3) may be used alone or may be used in combination of two or more.

As the method for producing the acrylic resin (A), for example, a well-known emulsion polymerization method may be used.

As the phosphate ester (B), an aliphatic phosphate ester may be used, or an aromatic phosphate ester may be used. However, due to low volatility, the generation of olefin gases

can be inhibited upon thermal decomposition, and thus an aromatic phosphate ester is preferred. The aromatic phosphate ester may be exemplified by triphenyl phosphate, tolyl diphenyl phosphate, tricresyl phosphate, tris(xylene) phosphate, tris(tert-butyl phenyl) phosphate, tris(isopropyl phenyl) phosphate, 2-ethylhexyl diphenyl phosphate, bisphenol A-bis(diphenyl phosphate), resorcinol-bis(diphenyl phosphate), and the like. Furthermore, among the aromatic phosphates, bis(diphenyl phosphate)s of aromatic compounds having 2 phenolic hydroxyl groups are preferred. Furthermore, among the bis(diphenyl phosphate)s of aromatic compounds having 2 phenolic hydroxyls, bisphenol A-bis(diphenyl phosphate) and resorcinol-bis(diphenyl phosphate) are preferred, and aromatic ring-fused phosphates such as bisphenol A-bis(diphenyl phosphate) and the like are more preferred due to being capable of improving the storage stability of the resin composition. These phosphate esters (B) may be used alone or may be used in combination of two or more.

The ammonium polyphosphate (C) is a substance obtained by neutralizing polyphosphoric acid with ammonia (aqueous ammonia). As a raw material for ammonium polyphosphate (i.e., polyphosphoric acid), from the aspect of improvement of water resistance, the polymerization degree is preferably 20-2000, and the polymerization degree is further preferably 400-2000. Furthermore, with respect to the ammonium polyphosphate (C), from the aspect of improvement of water resistance, ammonium polyphosphate wherein hydrophobic treatment is performed on the surface thereof is preferred. Materials used in the hydrophobic treatment may be exemplified by, for example, silicone, epoxy resin, melamine resin, and the like. Among these ammonium polyphosphates (C), ammonium polyphosphate on which surface treatment with silicone is performed is preferred.

As the aluminum hydroxide (D), for example, aluminum hydroxide having an average particle diameter of 0.5-50 μm commercially available as flame retardants may be used. However, from the view point of the dispersion stability of the resin composition for processing of fabric and the inhibition of coarse grain generated when processing the fabric, aluminum hydroxide having an average particle diameter of 1-15 μm is preferred.

From the view point where flame retardancy, water mark resistance, and blocking resistance become balanced, with respect to 100 parts by mass of the acrylic resin (A), the added amount of the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) in the resin composition for processing of fabric is in a range of 110-250 parts by mass, preferably in a range of 120-200 parts by mass.

Furthermore, with respect to the ratio of each component in the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide, the ratio of the phosphate ester (B) is 18-35% by mass, the ratio of the ammonium polyphosphate (C) is 30-70% by mass, and the ratio of the aluminum hydroxide (D) is 10-35% by mass.

The phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) are substances as flame retardants added to the resin composition for processing of fabric of the invention, but the flame retardants other than those may be added

to the resin composition for processing of fabric of the invention.

The aqueous medium (E) used in the resin composition for processing of fabric of the invention may be exemplified by water, water-miscible organic solvents, and mixtures thereof. Water-miscible organic solvents may be exemplified by, for example, alcohols such as methanol, ethanol, n-propanol and isopropanol, and the like; ketones such as acetone, methyl ethyl ketone, and the like; polyalkylene glycols such as ethylene glycol, diethylene glycol, propylene glycol, and the like; alkylethers of polyalkylene glycols; lactams such as N-methyl-2-pyrrolidone, and the like; and the like. In this invention, water may be used alone, otherwise a mixture of water and a water-miscible organic solvent may be used, and a water-miscible organic solvent may be used alone.

A printing paste and the like may be added in order to provide the resin composition for processing of fabric of the invention with the adaptability (viscosity and the like) corresponding to the coating method described below. The printing paste is a material which thickens pigment printing agents and provides printing adaptability to screen printing and the like, and may be exemplified by, for example, the substances obtained by dissolving or dispersing sodium carboxymethylcellulose, hydroxyethylcellulose, propoxy cellulose, sodium aliginate, aliginate ester, polycarboxylate salt, and the like.

In addition to the substances described above, an additive of a pH adjusting agent such as aqueous ammonia and the like, a petroleum-based solvent such as mineral spirit and the like, a thickener, a crosslinking agent, an antioxidant, an ultraviolet absorbent, a pigment dispersant, a water resistant agent, a leveling agent, a defoaming agent or the like, may be added into the resin composition for processing of fabric of the invention.

The method for coating the resin composition for processing of fabric of the invention on a fabric may be exemplified by, for example, a method of screen printing by using a roll printing machine, a flat screen printing machine, a rotary screen printing machine or the like with a blade made of rubber, polyurethane resin or the like. Furthermore, a screen of 60-300 meshes is commonly used as the screen for use in the screen printing. After printing, a process of drying and heat treatment is performed at 100-150°C for 1-5 min, and fixation of the resin composition for processing of fabric on the fabric is performed.

As the method for coating the resin composition for processing of fabric of the invention on a fabric, in addition to the screen printing described above, various printing methods, which use a positively rotary roll coater, a reverse roll coater, a gravure coater (direct type, reverse direct type, offset type, reverse offset type), a knife coater, a blade coater, a rod coater, an air doctor coater, a curtain (flowing) coater, a fountain coater, a kiss coater (roll type, bead type) or the like, may also be applied. Furthermore, the pigment printing agent of the invention may also be coated on the fabric by dipping (padding) mode, a spray coating mode, a casting mode, a spin coating mode, and an ink jetting mode.

Examples

The present invention is specifically illustrated by Examples and Comparative Examples below.

(Synthesis Example 1: synthesis of acrylic resin (A-1))

After 240 parts by mass of n-butyl acrylate, 130 parts by mass of ethyl acrylate, 16 parts by mass of acrylonitrile, 2 parts by mass of itaconic acid, 4 parts by mass of methacrylic acid, 4 parts by mass of acrylamide, 120 parts by mass of water, 6 parts by mass of a nonionic emulsifier ("HITENOL LA-1" produced by DAI-ICHI KOGYO SEIYAKU CO., LTD), and 3 parts by mass of a nonionic emulsifier ("SR-10" produced by ADEKA CORPORATION) were mixed, emulsification was performed using a homogenizer ("TK Homodisper" produced by Tokushu Kika Kogyo Co., Ltd.) to prepare a monomer emulsion.

Next, 400 parts by mass of water was added in a flask equipped with a stirrer, a nitrogen introducing pipe, and a reflux condenser, and after the temperature was raised to 50°C along with stirring under nitrogen atmosphere, 2 parts by mass of ammonium persulfate (hereinafter simply referred to as "APS") and 2 parts by mass of sodium pyrosulfite (hereinafter simply referred to as "SMBS") were added to the flask for dissolution. Thereafter, the monomer emulsion prepared above, 40 parts by mass of a 5% by mass APS aqueous solution, and 40 parts by mass of a 5% by mass SMBS aqueous solution were dripped into the flask over 3 hours. It should be indicated that the temperature in the flask in the process of dripping was controlled at 50-60°C. After the dripping was finished, reaction was further performed at 60°C for 1 hour to obtain an acrylic resin (A-1). Thereafter, after cooled to room temperature, 7 parts by mass of a 25% by mass aqueous ammonia was added for neutralization, and water was added in a manner that the component of resin was up to 40% by mass and uniformly mixed to obtain an aqueous resin emulsion of acrylic resin (A-1).

(Example 1: preparation of resin composition for processing of fabric (1))

45.75 parts by mass (18 parts by mass in terms of resin) of the aqueous resin emulsion of acrylic resin (A-1) obtained in Synthesis Example 1 (the component of resin was 40% by mass), 0.8 parts by mass of ethylene glycol, 0.05 parts by mass of a preservative ("Rocima BT NV-2" produced by The Dow Chemical Company), 0.05 parts by mass of a defoaming agent ("Nopco NXZ" produced by SAN NOPCO KOREA, LTD.), 6 parts by mass of bisphenol A-bis(diphenyl phosphate), 19 parts by mass of a silicone resin coated ammonium polyphosphate, 5 part of aluminum hydroxide, 1.2 parts by mass of a nonionic surfactant("Sinopol 613" produced by Sino-Japan Chemical Co., Ltd.), 0.05 parts by mass of a nonionic surfactant ("Surfyinol 420" produced by Air Products Corporation), 10.5 parts by mass of water, and 16 parts by mass of a thickener ("MHS-30007P6" produced by Akzo Nobel Corporation; a 5% by mass aqueous solution of methyl ethoxyethyl cellulose) were

uniformly mixed by using a disperser to obtain a resin composition for processing of fabric (1).

[Production of a fabric for evaluation]

The resin composition for processing of fabric (1) obtained above was coated onto a polyester fabric (200g/m^2) at 100g/m^2 using a bar coator, and was dried at 150°C with a drying machine for 2 min to obtain a fabric for evaluation.

[Evaluation of flame retardancy]

Evaluation of flame retardancy was performed on the fabric for evaluation obtained above using a combustion test machine ("MVSS-2" produced by SUGA Test Instruments Co., Ltd.) according to the test method of Federal Motor Vehicle Safety Standard FMVSS302. It should be indicated that the evaluation was performed according to the following standard. With respect to the flame retardancy, a fabric evaluated with "5" or "4" was judged as qualified.

- 5: fire was extinguished before the marked line was reached.
- 4: the combustion speed is less than 50mm/min .
- 3: the combustion speed is 50mm/min or more and less than 75mm/min .
- 2: the combustion speed is 75mm/min or more and less than 100mm/min .
- 1: the combustion speed is 100mm/min or more.

[Evaluation of water mark resistance]

The fabric for evaluation obtained above was cut into 20cm squares, and 5ml of hot water at 95°C was dripped to the central part of the coated surface of the obtained resin composition for processing of fabric(1), visual observation was performed to determine whether dirt existed. The water mark resistance was evaluated according to the following standard. With respect to water mark resistance, that with "3" or "2" was judged as qualified.

- 3: No mark of water droplet was confirmed.
- 2: Any mark of water droplets existed, but no dirt was confirmed (annular stains).
- 1: dirt (annular stains) was clearly confirmed.

[Evaluation of blocking resistance]

a polyester fabric of an uncoated resin composition for processing of fabric (1) was overlaid on the coated surface of the resin composition for processing of fabric (1) of the fabric for evaluation obtained above, and pressing was performed at 150°C for 1 min along with pressurization at 60.3 kPa with a pressing machine. Whether blocking generated on the fabric for evaluation was confirmed after pressing. With respect to blocking resistance, that with "5" or "4" was judged as qualified.

- 5: not sealed or substantially not sealed.

- 4: slightly sealed but capable of being peeled by hand.
- 3: sealed and peeled with resistance.
- 2: sealed and not capable of being easily peeled by hand.
- 1: tightly sealed and not capable of being peeled.

(Examples 2-9: preparation of resin compositions for processing of fabric (2)-(9))

The same was performed as in Example 1, except that the added amounts of components (A)-(D) were changed to the composition shown in Table 1, to obtain resin compositions for processing of fabric (1)-(9).

(Comparative Examples 1-8: preparation of resin compositions for processing of fabric (R1)-(R8))

The same was performed as in Example 2, except that the added amounts of components (A)-(D) were changed to the compositions shown in Table 2, to obtain resin compositions for processing of fabric (R1)-(R8).

With respect to the resin compositions for processing of fabric (2)-(9) and (R1)-(R8) obtained in Examples 2-9 and Comparative Examples 1-8, fabrics for evaluation were produced following the same process as that in Example I, and flame retardancy, water mark resistance, and blocking resistance were evaluated.

The compositions and evaluation results of the resin compositions for processing of fabric (1)-(9) obtained in Examples 1-9 were shown in Table 1, and the compositions and evaluation results of the resin compositions for processing of fabric (R1)-(R8) obtained in Comparative Examples 1-8 were shown in Table 2. It should be indicated that the compositions in both Table 1 and Table 2 were the added amounts in terms of the nonvolatile components.

[Table 1]

Table 1		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Example 8	Example 9
Composition (parts by mass)	Acrylic resin (A)	18	18	18	18	18	15	25	18	18
	Phosphate ester (B)	6	9	7.5	10	10	6	6		6
									6	
	Ammonium polyphosphate (C)	19	12	15	10	15	19	19	19	
										19
	Aluminum hydroxide (D)	5	9	7.5	10	5	5	5	5	5
	Total amount of (B)+(C)+(D)	30	30	30	30	30	30	30	30	30
Total amount of (B)+(C)+(D) with respect to 100 parts by mass of the acrylic resin (A)		167	167	167	167	167	200	120	167	167
Ratio of each component in the sum (B)+(C)+(D) (mass %)		20	30	25	33	33	20	20	20	20
		63	40	50	33	50	63	63	63	63
		17	30	25	33	17	17	17	17	17
Evaluation results	Evaluation of coated fabrics	4	4	4	4	4	4	4	4	4
		2	3	3	3	3	3	3	2	2
		5	5	5	5	5	5	4	4	4

[Table 2]

Table 2		Comparative Example 1	Comparative Example 2	Comparative Example 3	Comparative Example 4	Comparative Example 5	Comparative Example 6	Comparative Example 7	Comparative Example 8
Composition (parts by mass)	Acrylic resin (A)	18	18	18	18	18	18	30	10
	Phosphate ester (B)	10	6	4.5	12	5.5	15	6	6
	Ammonium polyphosphate (C)	18	12	21	12	21.5	7.5	19	19
	Silicone-treated APP								
	Aluminum hydroxide (D)	2	12	4.5	6	3	7.5	5	5
	Total amount of (B)+(C)+(D)	30	30	30	30	30	30	30	30
	Total amount of (B)+(C)+(D) with respect to 100 parts by mass of the acrylic resin (A)	167	167	167	167	167	167	100	300
Ratio of each component in the sum (B)+(C)+(D) (mass %)	Component (B)	33	20	15	40	18	50	20	20
	Component (C)	60	40	70	40	72	25	63	63
	Component (D)	7	40	15	20	10	25	17	17
	Flame retardancy	4	4	4	4	4	4	3	4
Evaluation results	Water mark resistance	2	1	1	3	1	3	3	1
	Blocking resistance	3	5	5	3	5	3	3	5

Abbreviations in Tables 1 and 2 are as shown below.

BDP: bisphenol A-bis(diphenyl phosphate)

RDP: resorcinol-bis(diphenyl phosphate)

Silicone-treated APP: ammonium polyphosphate whose surface had been treated with silicone

Epoxy-treated APP: ammonium polyphosphate whose surface had been treated with epoxy resin

From the evaluation results shown in Table 1, it can be confirmed that the fabrics using the resin composition for processing of fabric of the invention have balanced flame retardancy, water mark resistance, and blocking resistance, and have excellent properties.

On the other hand, Comparative Example 1 is an example wherein the ratio of aluminum hydroxide (D) is less than 10% by mass, and it can be confirmed that blocking resistance is insufficient.

Comparative Example 2 is an example wherein the ratio of aluminum hydroxide (D) exceeds 35% by mass, and it can be confirmed that water mark resistance is insufficient.

Comparative Example 3 is an example wherein the ratio of phosphate ester (B) is less than 18% by mass, and it can be confirmed that water mark resistance is insufficient.

Comparative Example 4 is an example wherein the ratio of phosphate ester (B) exceeds 35% by mass, and it can be confirmed that blocking resistance is insufficient.

Comparative Example 5 is an example wherein the ratio of ammonium polyphosphate (C) exceeds 70% by mass, and it can be confirmed that water mark resistance is insufficient.

Comparative Example 6 is an example wherein the ratio of phosphate ester (B) exceeds 35% by mass and the ratio of ammonium polyphosphate (C) is less than 30% by mass, and it can be confirmed that blocking resistance is insufficient.

Comparative Example 7 is an example wherein the total amount of phosphate ester (B), ammonium polyphosphate (C), and aluminum hydroxide (D) is less than 110 parts by mass with respect to 100 parts by mass of acrylic resin (A), and it can be confirmed that flame retardancy and blocking resistance are insufficient.

Comparative Example 8 is an example wherein the total amount of phosphate ester (B), ammonium polyphosphate (C), and aluminum hydroxide (D) exceeds 250 parts by mass with respect to 100 parts by mass of acrylic resin (A), and it can be confirmed that water mark resistance is insufficient.

What is claimed is:

1. A resin composition for processing of fabric comprising an acrylic resin (A), a phosphate ester (B), ammonium polyphosphate (C), aluminum hydroxide (D), and an aqueous medium (E), characterized in that:

with respect to 100 parts by mass of the acrylic resin (A), the total amount of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D) is 110-250 parts by mass,

in the sum of the phosphate ester (B), the ammonium polyphosphate (C), and the aluminum hydroxide (D), the ratio of the phosphate ester (B) is 18-35% by mass, the ratio of the ammonium polyphosphate (C) is 30-70% by mass, and the ratio of the aluminum hydroxide (D) is 10-35% by mass.

2. A fabric made by processing using the resin composition for processing of fabric according to claim 1.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2015/071198

A. CLASSIFICATION OF SUBJECT MATTER

D06M 13/282(2006.01)i; D06M 13/292(2006.01)n; D06M 11/45(2006.01)n

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

D06M

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

CNABS;CNKI;JPABS;DWPI;SIPOABS;VEN: DIC, URASE KK, acrylic ,crylic, phosphate, phosphate ester, ammonium polyphosphate, aluminum hydroxide, flame

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 2011025130 A (URASE KK) 10 February 2011 (2011-02-10) Claims 1, 4 to 6, Paragraph [0012] of its description	1-2
A	JP 2003238896 A (KYAPITARU PAINT KKET AL.) 27 August 2003 (2003-08-27) The whole document	1-2
A	CN 102851949 A (JIAX-N JIAXING ANRUI MATERIAL TECHNOLOGY CO LT) 02 January 2013 (2013-01-02) The whole document	1-2

☐ Further documents are listed in the continuation of Box C.
 ☒ See patent family annex.

* Special categories of cited documents:

“A” document defining the general state of the art which is not considered to be of particular relevance

“E” earlier application or patent but published on or after the international filing date

“L” document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

“O” document referring to an oral disclosure, use, exhibition or other means

“P” document published prior to the international filing date but later than the priority date claimed

“T” later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

“X” document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

“Y” document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

“&” document member of the same patent family

Date of the actual completion of the international search

10 October 2015

Date of mailing of the international search report

19 October 2015

Name and mailing address of the ISA/CN

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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.

PCT/CN2015/071198

Patent document cited in search report			Publication date (day/month/year)	Patent family member(s)			Publication date (day/month/year)
JP	2011025130	A	10 February 2011	None			
JP	2003238896	A	27 August 2003	None			
CN	102851949	A	02 January 2013	CN	102851949	B	31 December 2014