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(54) Title: VINYL ACETATE-ETHYLENE COPOLYMER EMULSION AND BINDER COMPOSITION FOR TEXTILE LAMINATION APPLICATIONS BASED ON THE SAME

(57) Abstract: The present invention relates to a vinyl acetate-ethylene copolymer emulsion, and a binder composition for textile lamination applications which is based on the vinyl acetate-ethylene copolymer emulsion and a polyurethane dispersion. More specifically, the present invention relates to a binder composition for textile lamination applications with high binding strength and good water resistance, and a textile product which is laminated by the binder composition. The present invention also relates to processes for preparing the vinyl acetate-ethylene copolymer emulsion and the binder composition for textile lamination applications, and uses thereof.



Vinyl acetate-ethylene copolymer emulsion and binder composition for
textile lamination applications based on the same

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] The present invention relates to a vinyl acetate-ethylene copolymer emulsion, and a binder composition for textile lamination applications which is based on the vinyl acetate-ethylene copolymer emulsion and a polyurethane dispersion. More specifically, the present invention relates to a binder composition for textile lamination applications with high binding strength and good water resistance, and a textile product which is laminated by the binder composition. The present invention also relates to processes for preparing the vinyl acetate-ethylene copolymer emulsion and the binder composition for textile lamination applications, and uses thereof.

2. Description of the Related Art

[0002] Textile lamination is a process for laminating a textile with a textile or chemical materials by using a binder. Typically, the materials for laminating comprise cotton, polyester fibers, polyurethane foam, EVA foam, polyurethane synthetic leather, etc.. The binders commonly used in lamination comprise polyurethane reactive hot melt binders, solvent-based two-component polyurethane, non-solvent based two-component polyurethane, aqueous polyurethane binders, solvent-based chloroprene rubber binders, aqueous chloroprene rubber binders, natural rubber latex binders or the like.

[0003] Polyurethane binders such as hot melt binders or non-solvent based polyurethanes have high binding strength, good water resistance and heat resistance, but it is typically strict to control the production process for these binders and therefore the cost for manufacturing these binders is relative high.

[0004] Solvent-based binders such as solvent-based chloroprene rubber binders or solvent-based two-component polyurethanes also have high binding strength and good water resistance, but they typically contain large amount of solvents such as toluene, acetone, ethyl acetate or the like. These solvents will be released in operation and therefore will potentially damage the health of the worker and also lower the operation safety. Additionally, these binders will contain solvent residues and thus cannot be applied in lamination of high-quality textiles.

[0005] Aqueous binders systems such as aqueous chloroprene rubber binders or natural rubber latex binders systems are environmental friendly and safe, but these binders are typically weak in binding strength and therefore can only be used in low-end or mid-level lamination products. Besides, the natural rubber latex binders will release bad smell due to aqueous ammonia and therefore will be harmful to the worker during operation.

[0006] Recently, people are interested in developing aqueous polyurethane binders for textile lamination, because they are environmentally friendly and can also exhibit high binding strength and good water resistance.

[0007] US Pat. No. 5,872,182 relates to water-based sulfonated polyurethane compositions having improved characteristics such as adhesion, peeling strength and heat resistance, which are useful as adhesives, coatings and primers in the manufacture of footwear. However, US Pat. No. 5,872,182 aims to provide one-component water-based polyurethane compositions because they are easier to handle, safer and generally cost less.

[0008] U.S. Pat. No. 5,334,690 discloses water-based sulfonated polyurethanes which are obtained by reacting ionic polyester polyols, polycarbonate polyols and polyether polyols or mixtures thereof with a polyisocyanate or mixtures of polyisocyanates. However, U.S. Pat. No. 5,334,690 only directs to one-component water-based sulfonated polyurethanes.

[0009] Although aqueous polyurethane binders exhibit good performances in textile lamination, the cost of the raw materials for aqueous polyurethane binders is relative high, and thus their applications in large-scale textile lamination are restricted.

[0010] Therefore, a need still exists for cheaper binder compositions for textile lamination applications, especially high-quality textile lamination applications, which have one or more of the following properties: excellent binding strength; good water resistance; unodorous smell; and no poisonous residues.

BRIEF SUMMARY OF THE INVENTION

[0011] It has been surprisingly found by the present inventors that, by laminating vinyl acetate-ethylene copolymer emulsion with polyurethane dispersion, an excellent vinyl acetate-ethylene copolymer emulsion and polyurethane dispersion based binder composition which overcomes the defects of the existing polyurethane dispersion based binder compositions is obtained.

[0012] As compared to traditional polyurethane dispersion based binder compositions, the binder compositions of the present invention exhibit excellent original binding strength and good water resistance, and will not release irritating odor in use. Besides, the binder compositions of the present invention are environmentally friendly because they are solvent-free and will not leave poisonous residues. Therefore, the binder compositions of the present invention are suitable for used in high-quality textile lamination.

[0013] Thus, one object of the present invention is to provide a binder composition for textile lamination applications which is based on vinyl acetate-ethylene copolymer emulsion and polyurethane dispersion.

[0014] Another object of the present invention is to provide a process for preparing said binder composition for textile lamination applications.

[0015] Still another object of the present invention is to provide a use of the binder composition in textile lamination applications.

[0016] Furthermore, one object of the present invention is to provide a vinyl acetate-ethylene copolymer emulsion for binder composition for textile lamination applications.

[0017] Another object of the present invention is to provide a process for preparing said vinyl acetate-ethylene copolymer emulsion.

[0018] Still another object of the present invention is to provide a use of the vinyl acetate-ethylene copolymer emulsion in binder composition for textile lamination applications.

[0019] Furthermore, one object of the present invention is to provide a textile product which is laminated by the binder composition of the present invention.

DETAILED DESCRIPTION OF THE INVENTION

[0020] For the purposes of this description, unless otherwise indicated, all numbers expressing quantities of ingredients, reaction conditions, and so forth used in the description and claims are to be understood as being modified in all instances by the term "about". Accordingly, unless indicated to the contrary, the numerical parameters set forth in the following description and attached claims are approximations that may vary depending upon the desired properties sought to be obtained by the present invention. At the very least, and not as an attempt to limit the application of the doctrine of equivalents to the scope of the claims, each numerical parameter should at least be construed in light of the number of reported significant digits and by applying ordinary rounding techniques.

[0021] Notwithstanding that the numerical ranges and parameters setting forth the broad scope of the invention are approximations, the numerical values set forth in the specific Examples are reported as precisely as possible. Any numerical value, however, inherently contain certain errors necessarily resulting from the standard deviation found in their respective testing measurements.

[0022] It is noted that, as used in this description and the appended claims, the singular forms "a", "an" and "the" include plural referents unless expressly and unequivocally limited to one referent.

[0023] According to one aspect of the present invention, a binder composition for textile lamination applications is provided, said binder composition comprises:

(a) vinyl acetate-ethylene copolymer-based emulsion in an amount of about 10 to 95 %, preferably 60 to 85 %, based on the total weight of said binder composition;

(b) polyurethane dispersion in an amount of about 5 to 90 %, preferably 15 to 40 %, based on the total weight of said binder composition.

[0024] For textile lamination applications, like footwear and bra making applications, vinyl acetate-ethylene copolymer-based emulsion is typically used for low-end applications due to lower bonding strength and water resistance. Traditionally, vinyl acetate-ethylene copolymer-based emulsion is just used for cost reduction when blending with another component, while the performances especially bonding strength and water resistance of the blended system would be lower than the pure system of said another component.

[0025] As compared to traditional polyurethane dispersion based binder compositions, the binder compositions of the present invention unexpectedly exhibit excellent original binding strength and good water resistance, and will not release irritating odor in use. Besides, the binder compositions of the present invention are environmentally friendly because they are solvent-free and will not leave poisonous residues. Therefore, the binder compositions of the present invention are suitable for used in high-quality textile lamination. The binder compositions of the present invention can be used in various kinds of application, for example, lamination of textile, such as lamination of clothes such as underwears, manufacture of footwears, lamination of bags, lamination of moisture-proof pads, manufacture of liners, and so on.

[0026] In some non-limiting embodiments of the present invention, the binder compositions of the present invention can include small amount of conventional additives. The conventional additives suitable for the binder compositions of the present invention can be those typically known in the art. Examples for these suitable additives include, but not limited to defoamers, pH adjusting agents, fungicides, etc..

[0027] The defoamers suitable for the inventive binder compositions can be those commonly used in the art. In some non-limiting embodiments of the present invention, examples of defoamers suitable for the inventive binder compositions include, but not limited to polyol defoamers, polyether defoamers, mineral oil defoamers, silicone defoamers, or mixtures thereof. In some non-limiting embodiments of the present invention, the defoamers can be used in an amount of about 0 to 2 %, preferably 0.05 to 0.4 %, based on the total weight of said binder composition.

[0028] The pH adjusting agents suitable for the inventive binder compositions can be those commonly used in the art. In some non-limiting embodiments of the present invention, examples of pH adjusting agents suitable for the inventive binder compositions include, but not limited to sodium hydroxide, potassium hydroxide, aqueous ammonia, and organic amines pH adjusting agents. In some non-limiting embodiments of the present invention, the pH adjusting agents can be used in an amount of about 0 to 5 %, preferably 0.05 to 1 %, based on the total weight of said binder composition.

[0029] The fungicides suitable for the inventive binder compositions can be those commonly used in the art. In some non-limiting embodiments of the present invention, examples of fungicides suitable for the inventive binder compositions include, but not limited to isothiazolinones such as methylisothiazolinone, benzisothiazolinone,

chloromethyl isothiazolinone, bromo-nitro-propanediol, dibromo cyano propanamide, formaldehyde, potassium sorbate, or mixtures thereof. In some non-limiting embodiments of the present invention, the fungicides can be used in an amount of about 0 to 1 %, preferably 0.05 to 0.3 %, based on the total weight of said binder composition.

[0030] According to one aspect of the present invention, a vinyl acetate-ethylene copolymer-based emulsion for the inventive textile binder composition is provided, wherein the copolymer comprises, based on the total weight of the copolymer:

- (1) about 60-95pphm (parts by weight / 100 parts by weight of monomers used for preparing the emulsion), preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

wherein the copolymer-based emulsion is formed by emulsion polymerization of the monomers in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

[0031] In some non-limiting embodiments of the present invention, the monomers used in emulsion polymerization can be composed of about 60-95pphm, preferably about 75-90 pphm of vinyl acetate, about 5-40pphm, preferably about 10-25 pphm of ethylene and about 0-10pphm, preferably about 0-5 pphm of other comonomers or functional monomers. Examples of other comonomers or functional monomers suitable for the present invention include, but not limited to, one or more selected from the group of:

polymerizable monomers having one olefinic bond, such as vinyl esters of polycarboxylic fatty acid, acrylates, methacrylates and maleate esters; specific examples of such polymerizable monomers include, but not limited to vinyl esters of linear or branched fatty acid having 1 - 14 carbon atoms, acrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, methacrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, and maleate esters of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms;

polymerizable monomers having one olefinic bond and at least one other functional group, such as acrylic acid, methacrylic acid, maleic acid, maleic anhydride, fumaric acid, crotonic acid, itaconic acid, b-acryloxy propionic acid, acrylamide, methylol acrylamide, hydroxyethyl acrylamide, hydroxypropyl acrylamide, acrylonitrile, methacrylonitrile, sodium vinylsulfonate, vinyl benzene sulfonate, mono-sodium 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propylsulfonate, methacrylate ethyl trimethyl ammonium chloride, vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(2-methoxyethoxy)silane, methylacryloxypropyltrimethoxysilane, ethylene glycol

acrylate, propylene glycol acrylate, glycidyl acrylate, ethyl acetoacetoxymethylacrylate or diacetone acrylamide; and

polymerizable monomers having two or more olefinic bonds, such as diallyl maleate; diallyl phthalate, triallyl cyanurate, allyl methacrylate, ethylene glycol dimethylacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, allyl acrylamide.

[0032] The emulsion polymerization is typically carried out in the presence of some conventional additives which are commonly used in the art.

[0033] It is typical to incorporate some conventional additives during the emulsion polymerization. In some non-limiting embodiments of the present invention, the conventional additives suitable for the emulsion polymerization in the present invention include those known in the art which are useful in the emulsion polymerization system, and which can improve the stability or pot life of the final emulsion. For example, those additives include, but not limited to emulsifier / stabilizer, polymerization initiator, redox reaction catalyst, pH adjusting agents, ionic strength regulator, molecular weight modifier, defoamers, fungicides, chelating agents, and the like.

[0034] In some non-limiting embodiments of the present invention, the emulsifier / stabilizer suitable for the present invention include, but not limited to small molecule surfactants and protective colloids.

[0035] In some non-limiting embodiments of the present invention, the small molecule surfactants suitable for the present invention include, but not limited to anionic surfactants, nonionic surfactants and combinations thereof.

[0036] Examples of anionic surfactants suitable for the present invention include, but not limited to: alkylsulfates, alkylsulfonates, alkyl benzenesulfonates, alkyl polyoxyethylene ether sulfates, alkylpolyoxyethylene-propylene ether sulfates, sodium fatty alcohol succinic acid mono ester sulfonates, disodium fatty alcohol polyoxyethylene ether sulfosuccinates, disodium fatty alcohol polyoxyethylene-propylene ether sulfosuccinates, alkylpolyoxyethylene phosphates, alkylpolyoxyethylene-propylene phosphates, and alkali metal salts and ammonium salts of fatty acids.

[0037] Examples of nonionic surfactants suitable for the present invention include, but not limited to: linear or branched alkyl alcohol polyoxyethylene ethers, linear or branched alkyl alcohol polyoxyethylene-propylene ethers, fatty acid polyoxyethylenemonoesters, fatty acid polyoxyethylene-propylenemonoesters. In some non-limiting embodiments of the present invention, the EO numbers of polyoxyethylene section in nonionic surfactants determine the HLB value of the nonionic surfactants, and the HLB value of the nonionic surfactants is typically in the range of about 20 to 40.

[0038] In some non-limiting embodiments of the present invention, examples of protective colloids suitable for the present invention include, but not limited to: partially hydrolyzed polyvinyl alcohols and derivatives thereof, cellulose ethers and derivatives thereof, starch and derivatives thereof, polyvinyl pyrrolidone, and mixtures thereof.

[0039] In some non-limiting embodiments of the present invention, the emulsifier / stabilizer can be used in an amount of about 1-10 ppm, preferably about 3-6 ppm.

[0040] In some non-limiting embodiments of the present invention, the emulsion polymerization is conducted in the presence of initiators for polymerization reaction. In some non-limiting embodiments of the present invention, the initiators suitable for the present invention include, but not limited to thermal initiators and redox initiators, preferably redox initiators.

[0041] The oxidizing agent and reducing agent suitable for being used as the redox initiators in the present invention are those known in the art. In some non-limiting embodiments of the present invention, examples of oxidizing agents suitable for the present invention include, but not limited to: ammonium persulfate, sodium persulfate, potassium persulfate, hydrogen peroxide, tert-butyl peroxide, etc.. In some non-limiting embodiments of the present invention, examples of reducing agents suitable for the present invention include, but not limited to: sodium formaldehyde-sulfoxylate, disodium 2-hydroxyl-2-sulfinatoacetate, ascorbic acid, erythorbic acid, alkali metal salts of ascorbic acid, alkali metal salts of erythorbic acid, sodium bisulfite, sodium sulfite, sodium metabisulfite, sodium thiosulfate, etc..

[0042] In some non-limiting embodiments of the present invention, the emulsion polymerization is initiated by a redox initiator consisting of one oxidizing agent and one reducing agent. In some non-limiting embodiments of the present invention, the initiator is used in an amount of about 0.05-0.6ppm.

[0043] In some non-limiting embodiments of the present invention, the initiating effect of redox initiator in the emulsion polymerization can be enhanced by incorporating small amount of catalyst. The redox initiator catalysts suitable for the present invention include, but not limited to ferrous salts and ferric salts.

[0044] Examples of pH adjusting agents, ionic strength regulator, molecular weight modifier, defoamers, fungicides, chelating agents, and the like suitable for the present invention may include, but not limited to those commonly used in the art of aqueous emulsion polymerization. Those skills in the art will understand how to choose these additives according to the specific application.

[0045] According to another aspect of the present invention, a process for preparing the vinyl acetate-ethylene copolymer-based emulsion for the inventive textile binder composition is provided, said process comprises emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95ppm, preferably about 75-90 ppm of moieties derived from vinyl acetate;
- (2) about 5-40ppm, preferably about 10-25 ppm of moieties derived from ethylene; and
- (3) about 0-10ppm, preferably about 0-5 ppm of moieties derived from other

comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

[0046] The vinyl acetate-ethylene copolymer-based emulsion can be obtained by emulsion polymerization of vinyl acetate, ethylene and other comonomers or functional monomers, in the presence of emulsifier / stabilizer. The emulsion polymerization process is well known in the art, and can be carried out in batch, semi-batch or continuous mode. In a preferable embodiment of the present invention, the emulsion may be obtained by the following steps: forming an aqueous phase by adding emulsifier / stabilizer, and other conventional additives such as defoamers, ionic strength regulator, molecular weight modifier and the like into water; feeding the aqueous phase to a reactor under slow stirring; evacuating the reactor under vacuum and purging with nitrogen for several times to remove any air inside the reactor; raising the temperature of the reactor to about 40-80°C, then increasing the speed of stirring, adding to the reactor part of the vinyl acetate monomer or mixture of the vinyl acetate monomer and the other comonomers or functional monomers, together with part of ethylene gas; after the temperature and the pressure of the reactor become stable, adding dropwise oxidizing agent and reducing agent respectively, as redox initiator, so that polymerization takes place, with increasing of temperature; adding remaining monomers when the temperature of the reactor reaches a predetermined value, about 60-90°C, until the consumption of the monomers. The temperature of the reactor was controlled at about 40-80°C during the emulsion polymerization process. After completion of polymerization, the reactor is cooled to selected temperature, about 50-70°C, and the polymerization product therein was transferred to a post-treatment reactor, while the unreacted ethylene gas was discharged as exhaust gas. Subsequently, certain amount of oxidizing agent and reducing agent were added to the post-treatment reactor, to reduce the amount of residual monomers by further initiating the polymerization of residual monomers. Alternatively, the amount of residual monomers and other volatile organics can be further reduced by physical extraction, for example by extraction with water vapor. Finally, the emulsion parameters of the copolymer-based emulsion thus obtained can be adjusted by feeding with additional water and/or other conventional additives such as fungicides, pH adjusting agents and the like. The emulsion thus obtained can have a solid content of about 40 to 70% by weight, preferably about 50 to 60% by weight based on the total weight of the emulsion.

[0047] The polyurethane dispersion used in the present invention can be a polymer dispersion obtained by polymerization of at least one polyisocyanate and at least one polyol as main comonomers, wherein the backbone of the polymer contains repeating carbamate units. In some non-limiting embodiments of the present invention, polyisocyanate contains two or more isocyanate groups per molecule. The isocyanate group can be aliphatic, alicyclic or aromatic isocyanate group. In some non-limiting embodiments of the present invention, examples of the polyisocyanate suitable for the present invention include, but not limited to ethylene diisocyanate, 1,6-hexamethylene diisocyanate, cyclohexane-1,4-diisocyanate, hydrogenated 2,4-toluene diisocyanate,

hydrogenated 2,6-toluene diisocyanate, isophorone diisocyanate, 4,4'-diphenylmethane diisocyanate, 2,4'-diphenylmethane diisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 1,4-phenylene diisocyanate, p-diphenylmethane diisocyanate, p-tetramethylxylene diisocyanate, 3-isocyanate methyl-1-methylcyclohexyl isocyanate, naphthalene-1,5-diisocyanate. The polyols used in obtaining the polyurethane dispersion according to the present invention can be polyester-, polyesteramide-, polyether-, or polycarbonate- polyols. In some non-limiting embodiments of the present invention, examples of the polyols suitable for the present invention include, but not limited to: polyester polyols obtained through esterification of a glycol such as ethylene glycol, propylene glycol, 1,4-butylene glycol, diethylene glycol, neopentyl glycol, hexylene glycol, glycerin, furan dimethanol, cyclohexane dimethanol, pentaerythritol, or ethanolamine, with a dicarboxylic acid, such as malonic acid, glutaric acid, adipic acid, maleic acid or anhydride thereof, succinic acid, terephthalic acid; polyether polyols obtained through polymerization of ethylene oxide, propylene oxide, tetrahydrofuran, ethylene glycol, propylene glycol, 1,4-butanediol, diethylene glycol, neopentyl glycol, hexylene glycol, glycerin, furan dimethanol, cyclohexane dimethanol or bisphenol A; polycarbonates polyols obtained through esterification of glycol such as propylene glycol, 1,4-butanediol, diethylene glycol, hexylene glycol with diaryl carbonate or phosgene. In some non-limiting embodiments of the present invention, in addition to main monomers of polyisocyanate and polyol, the polyurethane backbone can further include hydrazine or other chain extender containing active-hydrogen, such as hydrazine, hydrazide, hydrazine derivatives, amino alcohols, aliphatic or aromatic polyamines, including but not limited to: dimethyl hydrazine, 1,6-hexamethylene-dihydrazine, carbonic dihydrazide, adipic acid dihydrazide, succinic acid dihydrazide, oxalic acid dihydrazide, isophthalic acid dihydrazide, tartaric acid dihydrazide, acetone azine, ethylenediamine, propanediamine, butanediamine, hexamethylene diamine, cyclohexyl diamine, diethylene triamine, benzene diamine, piperazine, 2-methyl piperazine, xylene diamine, xylene diamine and isophorone diamine.

[0048] The process for preparing the polyurethane dispersion according to the present invention is well known in the art, and reference may be made to such as the preparation method for polyurethane dispersion as described in G. Oertel et al. in Polyurethane handbook 2nd Edition, a Carl Hanser publication, 1994.

[0049] The polyurethane dispersions suitable for the present invention can be also selected from polyurethane dispersions commercially available in the market, preferably those widely used in the area of textile lamination applications, such as Dispercoll U-53 and Dispercoll U-54 from Bayer.

[0050] In some non-limiting embodiments of the present invention, a binder composition for textile lamination applications can be obtained by blending a vinyl acetate-ethylene copolymer-based emulsion with a polyurethane dispersion. In some preferable embodiments of the present invention, the vinyl acetate-ethylene copolymer-based emulsion and the polyurethane dispersion are obtained according to the above mentioned formulations and processes respectively.

[0051] Thus, according to one aspect of the present invention, a process for preparing a binder composition for textile lamination applications is provided, said process comprises blending a vinyl acetate-ethylene copolymer-based emulsion with a polyurethane dispersion to obtain the binder composition for textile lamination applications.

[0052] In some non-limiting embodiments of the present invention, a process for preparing a binder composition for textile lamination applications is provided, said process comprises

(a) forming an ethylene-vinyl acetate copolymer-based emulsion by emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer;

(b) forming a polyurethane dispersion by polymerization of at least one polyisocyanate and at least one polyol as main comonomers;

(c) blending the vinyl acetate-ethylene copolymer-based emulsion and the polyurethane dispersion to form the binder composition.

[0053] In a specific embodiment of the present invention, the step (c) in the above mentioned process is carried out as follows: adding into a stirring autoclave having a volume of 15 liters the vinyl acetate-ethylene copolymer-based emulsion obtained in step (a) under a stirring speed of 300 rpm; adding into the autoclave slowly a pH adjusting agent, and a defoamer in about one half of the total amount used; after stirring 10 minutes, the polyurethane dispersion obtained in step (b) was charged into the autoclave under stirring, and then the mixture thus obtained was stirred for another 20 minutes; the remaining part of defoamer was added in, and then the mixture was stirred for further 5 minutes; adding into the autoclave a fungicide, stirring for another 5 minutes to obtain the binder composition for textile lamination applications.

[0054] The binder compositions for textile lamination applications according to the present invention exhibit excellent binding strength and can be used in high-quality textile lamination applications.

[0055] The binder compositions for textile lamination applications according to the present invention can be used to obtain a textile product though laminating a textile. Thus, in some non-limiting embodiments of the present invention, a textile product is provided, wherein the textile product is laminated by the binder composition of the present invention. In some non-limiting embodiments of the present invention, the textile

product thus obtained can include, but not limited to clothes such as underwears and bras, footwears, bags, moisture-proof pads, liners, and so on.

[0056] According to the concept of the present invention, the present invention comprises the following items:

1. A binder composition for textile lamination applications, said binder composition comprises:

(a) vinyl acetate-ethylene copolymer-based emulsion in an amount of about 10 to 95 %, preferably 60 to 85 %, based on the total weight of said binder composition;

(b) polyurethane dispersion in an amount of about 5 to 90 %, preferably 15 to 40 %, based on the total weight of said binder composition.

2. The binder composition according to item 1, wherein the vinyl acetate-ethylene copolymer comprises, based on the total weight of the copolymer:

(1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;

(2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and

(3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

wherein the copolymer-based emulsion is formed by emulsion polymerization of the monomers in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

3. The binder composition according to item 2, wherein the other comonomers or functional monomers include one or more selected from the group of:

polymerizable monomers having one olefinic bond, such as vinyl esters of polycarboxylic fatty acid, acrylates, methacrylates and maleate esters; specific examples of such polymerizable monomers include, but not limited to linear or branched vinyl esters of fatty acid having 1 - 14 carbon atoms, acrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, methacrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, and maleate esters of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms;

polymerizable monomers having one olefinic bond and at least one other functional group, such as acrylic acid, methacrylic acid, maleic acid, maleic anhydride, fumaric acid, crotonic acid, itaconic acid, b-acryloxy propionic acid, acrylamide, methylol acrylamide, hydroxyethyl acrylamide, hydroxypropyl acrylamide, acrylonitrile, methacrylonitrile, sodium vinylsulfonate, vinyl benzene sulfonate, mono-sodium 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propylsulfonate, methacrylate ethyl trimethyl

ammonium chloride, vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(2-methoxyethoxy)silane, methylacryloxypropyltrimethoxysilane, ethylene glycol acrylate, propylene glycol acrylate, glycidyl acrylate, ethyl acetoacetoxymethylacrylate or diacetone acrylamide; and

polymerizable monomers having two or more olefinic bonds, such as diallyl maleate; diallyl phthalate, triallyl cyanurate, allyl methacrylate, ethylene glycol dimethylacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, allyl acrylamide.

4. The binder composition according to any one of items 2 to 3, wherein the emulsifier / stabilizer include small molecule surfactant and protective colloid.

5. The binder composition according to item 4, wherein the small molecule surfactant is selected from the group of anionic surfactants, nonionic surfactants and combinations thereof.

6. The binder composition according to item 4, wherein the protective colloid is selected from the group of: partially hydrolyzed polyvinyl alcohols and derivatives thereof, cellulose ethers and derivatives thereof, starch and derivatives thereof, polyvinyl pyrrolidone, and mixtures thereof.

7. The binder composition according to any one of items 1 to 6, wherein the polyurethane dispersion is obtained by polymerization of at least one polyisocyanate and at least one polyol as main comonomers.

8. The binder composition according to item 7, wherein the polyisocyanate is selected from the group of ethylene diisocyanate, 1,6-hexamethylene diisocyanate, cyclohexane-1,4-diisocyanate, hydrogenated 2,4-toluene diisocyanate, hydrogenated 2,6-toluene diisocyanate, isophorone diisocyanate, 4,4'-diphenylmethane diisocyanate, 2,4'-diphenylmethane diisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 1,4-phenylene diisocyanate, p-diphenylmethane diisocyanate, p-tetramethylxylene diisocyanate, 3-isocyanate methyl-1-methylcyclohexyl isocyanate, naphthalene-1,5-diisocyanate.

9. The binder composition according to item 7, wherein the polyol is selected from the group of polyesters / polyesteramides, polyethers, or polycarbonates polyols.

10. The binder composition according to any one of items 1 to 9, wherein the binder composition comprises about 0 to 2 %, preferably 0.05 to 0.4 % of a defoamer, based on the total weight of said binder composition.

11. The binder composition according to item 10, wherein said defoamer is selected from the group of polyol defoamers, polyether defoamers, mineral oil defoamers, silicone defoamers, or mixtures thereof.

12. The binder composition according to any one of items 1 to 11, wherein the binder composition comprises about 0 to 5 %, preferably 0.05 to 1 % of a pH adjusting agent, based on the total weight of said binder composition.

13. The binder composition according to item 12, wherein said pH adjusting agent is selected from the group of sodium hydroxide, potassium hydroxide, aqueous ammonia, and organic amines pH adjusting agents.

14. The binder composition according to any one of items 1 to 13, wherein the binder composition comprises about 0 to 1 %, preferably 0.05 to 0.3 % of a fungicide, based on the total weight of said binder composition.

15. The binder composition according to item 14, wherein said fungicide is selected from the group of isothiazolinones such as methylisothiazolinone, benzisothiazolinone, chloromethyl isothiazolinone, bromo-nitro-propanediol, dibromo cyano propanamide, formaldehyde, potassium sorbate, or mixtures thereof.

16. A process for preparing the binder composition for textile lamination applications according to any one of items 1 to 15, said process comprises blending a vinyl acetate-ethylene copolymer-based emulsion with a polyurethane dispersion to obtain the binder composition for textile lamination applications.

17. The process according to item 16, wherein the ethylene-vinyl acetate copolymer-based emulsion is formed by emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer;

18. The process according to any one of items 16 to 17, wherein the polyurethane dispersion is formed by polymerization of at least one polyisocyanate and at least one polyol as main comonomers;

19. A vinyl acetate-ethylene copolymer-based emulsion for binder composition for textile lamination applications, wherein the vinyl acetate-ethylene copolymer comprises, based on the total weight of the copolymer:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

wherein the copolymer-based emulsion is formed by emulsion polymerization of the monomers in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

20. The vinyl acetate-ethylene copolymer-based emulsion according to item 19, wherein the other comonomers or functional monomers include one or more selected from the group of:

polymerizable monomers having one olefinic bond, such as vinyl esters of polycarboxylic fatty acid, acrylates, methacrylates and maleate esters; specific examples of such polymerizable monomers include, but not limited to linear or branched vinyl esters of fatty acid having 1 - 14 carbon atoms, acrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, methacrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, and maleate esters of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms;

polymerizable monomers having one olefinic bond and at least one other functional group, such as acrylic acid, methacrylic acid, maleic acid, maleic anhydride, fumaric acid, crotonic acid, itaconic acid, b-acryloxy propionic acid, acrylamide, methylol acrylamide, hydroxyethyl acrylamide, hydroxypropyl acrylamide, acrylonitrile, methacrylonitrile, sodium vinylsulfonate, vinyl benzene sulfonate, mono-sodium 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propylsulfonate, methacrylate ethyl trimethyl ammonium chloride, vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(2-methoxyethoxy)silane, methylacryloxypropyltrimethoxysilane, ethylene glycol acrylate, propylene glycol acrylate, glycidyl acrylate, ethyl acetoacetoxymethylacrylate or diacetone acrylamide; and

polymerizable monomers having two or more olefinic bonds, such as diallyl maleate; diallyl phthalate, triallyl cyanurate, allyl methacrylate, ethylene glycol dimethylacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, allyl acrylamide.

21. The vinyl acetate-ethylene copolymer-based emulsion according to any one of items 19 to 20, wherein the emulsifier / stabilizer include small molecule surfactant and protective colloid.

22. The vinyl acetate-ethylene copolymer-based emulsion according to item 21, wherein the small molecule surfactant is selected from the group of anionic surfactants, nonionic surfactants and combinations thereof.

23. The vinyl acetate-ethylene copolymer-based emulsion according to item 21, wherein the protective colloid is selected from the group of: partially hydrolyzed polyvinyl alcohols and derivatives thereof, cellulose ethers and derivatives thereof, starch and derivatives thereof, polyvinyl pyrrolidone, and mixtures thereof.

24. The vinyl acetate-ethylene copolymer-based emulsion according to any one of items 19 to 23, wherein the copolymer-based emulsion has a solid content of about 40 to 70%

by weight, most preferably about 50 to 60% by weight based on the total weight of the emulsion.

25. A process for preparing the vinyl acetate-ethylene copolymer-based emulsion according to any one of items 19 to 24, said process comprises emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

26. The process according to item 25, wherein the emulsion polymerization is carried out in the presence of initiators for polymerization reaction.

27. Use of the vinyl acetate-ethylene copolymer-based emulsion according to any one of items 19 to 24 or obtainable by the process according to any one of items 25 to 26 in binder composition for textile lamination applications, such as lamination of clothes such as underwears, manufacture of footwears, lamination of bags, lamination of moisture-proof pads, manufacture of liners, and so on.

28. Use of the binder composition according to any one of items 1-15 or obtainable by the process according to any one of items 16-18 in textile lamination applications, such as lamination of clothes such as underwears, manufacture of footwears, lamination of bags, lamination of moisture-proof pads, manufacture of liners, and so on.

29. A textile product, wherein the textile product is laminated by the binder composition according to any one of items 1-15 or obtainable by the process according to any one of items 16-18.

[0057] Testing Method

[0058] In order to assess the performance of the binder compositions in textile lamination applications, a lamination sample was prepared with the binder composition.

[0059] Initially, a binder composition was applied onto one surface of a cotton substrate by a coater such as blade coater, and then the coated surface of one substrate was immediately laminated with the coated surface of another substrate to obtain a laminated substrate; the laminated substrate was heated and pressed by a hot press and was placed under room temperature for 24 hours to obtain a laminated sample I; the laminated sample I was divided into two part, one of which is cured under elevated temperature and pressure to obtain a cured sample II. The process conditions used in obtaining the laminated sample I and cured sample II were shown below:

wet coating weight: 75gsm;
hot lamination temperature: 160°C;
lamination pressure: 0.5kgf;
lamination time: 6s;
curing temperature: 180 °C;
curing pressure: 5kgf;
curing time: 2mins;

[0060] The laminated sample I and cured sample II thus obtained were then subjected to peeling strength test according to the following procedures.

[0061] The laminated sample I and cured sample II were cut into several pieces (2.5 * 5 cm²), on which the following testing results are obtained:

1. Peeling strength after lamination, which is directly obtained from piece of the laminated sample I;
2. Wet peeling strength after lamination, which is obtained from the piece of laminated sample I immediately after it has being immersed in cold water for 0.5 hour;
3. Peeling strength after curing, which is obtained from the piece of cured sample II immediately after it has being placed in environment for 24 hours;
4. Wet peeling strength after curing, which is obtained from the piece of cured sample II immediately after it has being placed in environment for 24 hours and then immersed in cold water for 0.5 hour.

[0062] All the peeling strength tests were carried out on an INSTRON tensile machine, with a tensile rate of 300mm/min.

[0063] The following Examples are included to demonstrate preferred embodiments of the invention. It should be appreciated by those of skill in the art that the techniques disclosed in the Examples which follow represent techniques discovered by the inventor to function well in the practice of the invention, and thus can be considered to constitute preferred modes for its practice. However, those of skill in the art should, in light of the present disclosure, appreciate that many changes can be made in the specific embodiments which are disclosed and still obtain a like or similar result without departing from the spirit and scope of the invention.

EXAMPLES

[0064] Unless indicated to the contrary, all parts and percentages are by weight.

Example 1

[0065] A vinyl acetate-ethylene copolymer-based emulsion (Emulsion 1) was prepared by emulsion polymerization according to the present invention with the formulation as listed in Table 1.

Table 1: the formulation of Emulsion 1

<u>Charge I (aqueous phase)</u>	
deionized water	3420 g
Disponil A3065 (BASF)	33.2 g
Celvol 205 (Sekisui)	50 g
Celvol 523 (Sekisui)	180 g
sodium acetate trihydrate	2.1 g
phosphoric acid	6.4 g
ferric chloride (40% aqueous solution)	0.26 g
Defoamers	1.2 g
<u>Charge II (monomers)</u>	
vinyl acetate	4100 g
ethylene	770 g
<u>Charge III (oxidizing agent and reducing agent)</u>	
<i>t</i> -butyl peroxide (70% aqueous solution)	4.2 g
water	190 g
disodium 2-hydroxy-2-sulfinatoacetate	3.7 g
water	220 g
<u>Charge IV (post-treatment solution)</u>	
water	150 g
<i>t</i> -butyl peroxide (70%)	1.4 g
Hydrogen peroxide (30%)	2.8 g
disodium 2-hydroxy-2-sulfinatoacetate	2.7 g

[0066] To a 10L reactor was added the aqueous phase under a stirring rate of 300 rpm. The reactor was evacuated and purged with nitrogen for three times to remove residual air. The stirring speed was then increased to 600 rpm. 2870 g vinyl acetate was added into the reactor by a feed pump within 10 mins, and then 539 g ethylene gas was charged into the reactor.

[0067] The reactor was heated to 55 °C and equilibrated for 5 mins. The oxidizing agent and the reducing agent were added with a rate of 300 g/h. The temperature of the reactor increased to 60 °C. After that, the temperature of the reactor was gradually increased to 78 °C within 15 mins, and then the temperature was controlled through adjusting the flow rate of the oxidizing agent and the reducing agent. When the temperature of the reactor reached 72 °C, the remaining ethylene gas was charged in with a rate of 462 g/h. When the temperature of the reactor reached 80 °C, the remaining vinyl acetate was charged in with a rate of 1230 g/h. The reaction temperature was controlled at 85 °C through adjusting the flow rate of the oxidizing agent and the reducing agent.

[0068] After the addition of vinyl acetate was completed, the reactor system was maintained for 15 mins. Subsequently, the temperature of the reactor was increased from 70 °C to 85 °C and maintained for 10 - 30 mins. The reactor was then cooled to 60 °C. The obtained emulsion was transferred to post-treatment reactor.

[0069] The post-treatment reactor was stirred at a speed of 200 rpm. The post-treatment solution was added in. The post-treatment reactor was then cooled to 40 °C.

[0070] The obtained vinyl acetate-ethylene copolymer-based emulsion (Emulsion 1) has the properties as show in Table 2:

Table 2: the properties of Emulsion 1

solid content	56.6% by weight
viscosity (BVF, 20 rpm)	2520 mPa.s
particle size (D50, measured by Malver MasterSizer 2000)	1.0 μm
particle size (D90, measured by Malver MasterSizer 2000)	2.0 μm
VAM residue (measured by GC)	257 ppm

Example 2

[0071] 7995 g of the vinyl acetate-ethylene copolymer-based emulsion obtained in Example 1 (Emulsion 1) was added to a 15L reactor which was stirred at a rate of 300 rpm/min. 15 g pH adjusting agent AMP-95 and 5 g defoamer Foamaster NZX were slowly added into the reactor, and the resulting mixture was stirred for 10 mins. 2000 g polyurethane dispersion Dispercoll U54 was added in and the mixture was stirred for 20 mins. 5 g defoamer Foamaster NZX was added in subsequently and the mixture was stirred for 5 mins. 20 g fungicide Acticide RS was added in and the mixture was stirred for 5 min to finally obtain a binder composition (Binder composition 1) with the formulation as listed in Table 3.

Table 3: the formulation of Binder composition 1.

	weight percentage
vinyl acetate-ethylene copolymer-based emulsion	79.55%
polyurethane dispersion Dispercoll U54	20%
pH adjusting agent AMP-95	0.15%
defoamer Foamaster NZX	0.1%
fungicide Acticide RS	0.2%

Example 3

[0072] The process in Example 2 was repeated except that the amounts of various components were varied to obtain a binder composition (Binder composition 2) with the formulation as listed in Table 4.

Table 4: the formulation of Binder composition 2.

	weight percentage
vinyl acetate-ethylene copolymer-based emulsion	69.55%
polyurethane dispersion Dispercoll U54	30%
pH adjusting agent AMP-95	0.15%
defoamer Foamaster NZX	0.1%
fungicide Acticide RS	0.2%

Example 4

[0073] The process in Example 2 was repeated except that the amounts of various components were varied to obtain a binder composition (Binder composition 3) with the formulation as listed in Table 5.

Table 5: the formulation of Binder composition 3.

	weight percentage
vinyl acetate-ethylene copolymer-based emulsion	59.55%
polyurethane dispersion Dispercoll U54	40%
pH adjusting agent AMP-95	0.15%
defoamer Foamaster NZX	0.1%
fungicide Acticide RS	0.2%

Comparative Example 1

[0074] A commercial available Polyurethane Dispersion emulsion (Dispercoll U54, 100%) for textile lamination was provided as comparative Binder composition 1.

Comparative Example 2

[0075] A commercial available Polyurethane Dispersion emulsion (Dispercoll U53, 100%) for textile lamination was provided as comparative Binder composition 2.

Comparative Example 3

[0076] A commercial available natural rubber latex emulsion imported from Malaysia (natural rubber latex emulsion from Malaysia, 60% solid content) was provided as comparative Binder composition 3.

Comparative Example 4

[0077] A commercial available vinyl acetate-ethylene copolymer-based emulsion (the emulsion of Example 1) was provided as comparative Binder composition 4.

[0078] The peeling strength of Binder compositions 1 - 3 and comparative Binder compositions 1 - 4 were tested according to the testing method as described hereinbefore and the results are listed in Table 7.

Table 7: the peeling strength of Binder compositions 1 - 3
and comparative Binder compositions 1 - 4

	Peeling strength after lamination	Wet peeling strength after lamination	Peeling strength after curing	Wet peeling strength after curing
Binder composition 1	8.7N	1.2N	12.3N	7.7N
Binder composition 2	6.1N	2.1N	11.2N	8.5N
Binder composition 3	4.7N	1.8N	10.5N	6.7N
comparative Binder composition 1	5.9N	2.7N	7.8N	4.5N
comparative Binder composition 2	6.0N	2.6N	10.0N	8.0N
comparative Binder	2.6N	2.5N	3.0N	2.7N

composition 3				
comparative Binder composition 4	4.1N	0.9N	3.0N	2.1N

[0079] Analysis:

[0080] The vinyl acetate-ethylene copolymer-based emulsion obtained in Example 1 (Emulsion 1) has a VAM residue content of 257 ppm as shown in Table 2, therefore the inventive Binder compositions 1 - 3 which were prepared from Emulsion 1 also exhibited a low VAM residue content in use. Besides, the Peeling strength after lamination, Wet peeling strength after lamination, Peeling strength after curing and Wet peeling strength after curing of the inventive Binder compositions 1 - 3 were superior than those of comparative Binder compositions 1 - 4, as shown in Table 7, which demonstrated that the binder compositions of the present invention are suitable for used in various applications, especially high-quality textile lamination.

[0081] All of the methods disclosed and claimed herein can be made and executed without undue experimentation in light of the present disclosure. While the products and methods of this invention have been described in terms of preferred embodiments, it will be apparent to those of skill in the art that variations may be applied to the methods and in the steps or in the sequence of steps of the method described herein without departing from the concept, spirit and scope of the invention.

WHAT IS CLAIMED IS:

1. A binder composition for textile lamination applications, said binder composition comprises:

(a) vinyl acetate-ethylene copolymer-based emulsion in an amount of about 10 to 95 %, preferably 60 to 85 %, based on the total weight of said binder composition;

(b) polyurethane dispersion in an amount of about 5 to 90 %, preferably 15 to 40 %, based on the total weight of said binder composition.

2. The binder composition according to claim 1, wherein the vinyl acetate-ethylene copolymer comprises, based on the total weight of the copolymer:

(1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;

(2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and

(3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

wherein the copolymer-based emulsion is formed by emulsion polymerization of the monomers in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

3. The binder composition according to claim 2, wherein the other comonomers or functional monomers include one or more selected from the group of:

polymerizable monomers having one olefinic bond, such as vinyl esters of polycarboxylic fatty acid, acrylates, methacrylates and maleate esters; specific examples of such polymerizable monomers include, but not limited to linear or branched vinyl esters of fatty acid having 1 - 14 carbon atoms, acrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, methacrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, and maleate esters of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms;

polymerizable monomers having one olefinic bond and at least one other functional group, such as acrylic acid, methacrylic acid, maleic acid, maleic anhydride, fumaric acid, crotonic acid, itaconic acid, b-acryloxy propionic acid, acrylamide, methylol acrylamide, hydroxyethyl acrylamide, hydroxypropyl acrylamide, acrylonitrile, methacrylonitrile, sodium vinylsulfonate, vinyl benzene sulfonate, mono-sodium 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propylsulfonate, methacrylate ethyl trimethyl ammonium chloride, vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(2-methoxyethoxy)silane, methylacryloxypropyltrimethoxysilane, ethylene glycol

acrylate, propylene glycol acrylate, glycidyl acrylate, ethyl acetoacetoxymethylacrylate or diacetone acrylamide; and

polymerizable monomers having two or more olefinic bonds, such as diallyl maleate; diallyl phthalate, triallyl cyanurate, allyl methacrylate, ethylene glycol dimethylacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, allyl acrylamide.

4. The binder composition according to any one of claims 2 to 3, wherein the emulsifier / stabilizer include small molecule surfactant and protective colloid.

5. The binder composition according to claim 4, wherein the small molecule surfactant is selected from the group of anionic surfactants, nonionic surfactants and combinations thereof.

6. The binder composition according to claim 4, wherein the protective colloid is selected from the group of: partially hydrolyzed polyvinyl alcohols and derivatives thereof, cellulose ethers and derivatives thereof, starch and derivatives thereof, polyvinyl pyrrolidone, and mixtures thereof.

7. The binder composition according to any one of claims 1 to 6, wherein the polyurethane dispersion is obtained by polymerization of at least one polyisocyanate and at least one polyol as main comonomers.

8. The binder composition according to claim 7, wherein the polyisocyanate is selected from the group of ethylene diisocyanate, 1,6-hexamethylene diisocyanate, cyclohexane-1,4-diisocyanate, hydrogenated 2,4-toluene diisocyanate, hydrogenated 2,6-toluene diisocyanate, isophorone diisocyanate, 4,4'-diphenylmethane diisocyanate, 2,4'-diphenylmethane diisocyanate, 2,4-toluene diisocyanate, 2,6-toluene diisocyanate, 1,4-phenylene diisocyanate, p-diphenylmethane diisocyanate, p-tetramethylxylene diisocyanate, 3-isocyanate methyl-1-methylcyclohexyl isocyanate, naphthalene-1,5-diisocyanate.

9. The binder composition according to claim 7, wherein the polyol is selected from the group of polyesters / polyesteramides, polyethers, or polycarbonates polyols.

10. The binder composition according to any one of claims 1 to 9, wherein the binder composition comprises about 0 to 2 %, preferably 0.05 to 0.4 % of a defoamer, based on the total weight of said binder composition.

11. The binder composition according to claim 10, wherein said defoamer is selected from the group of polyol defoamers, polyether defoamers, mineral oil defoamers, silicone defoamers, or mixtures thereof.

12. The binder composition according to any one of claims 1 to 9, wherein the binder composition comprises about 0 to 5 %, preferably 0.05 to 1 % of a pH adjusting agent, based on the total weight of said binder composition.

13. The binder composition according to claim 12, wherein said pH adjusting agent is selected from the group of sodium hydroxide, potassium hydroxide, aqueous ammonia, and organic amines pH adjusting agents.

14. The binder composition according to any one of claims 1 to 9, wherein the binder composition comprises about 0 to 1 %, preferably 0.05 to 0.3 % of a fungicide, based on the total weight of said binder composition.

15. The binder composition according to claim 14, wherein said fungicide is selected from the group of isothiazolinones such as methylisothiazolinone, benzisothiazolinone, chloromethyl isothiazolinone, bromo-nitro-propanediol, dibromo cyano propanamide, formaldehyde, potassium sorbate, or mixtures thereof.

16. A process for preparing the binder composition for textile lamination applications according to any one of claims 1 to 15, said process comprises blending a vinyl acetate-ethylene copolymer-based emulsion with a polyurethane dispersion to obtain the binder composition for textile lamination applications.

17. The process according to claim 16, wherein the ethylene-vinyl acetate copolymer-based emulsion is formed by emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer;

18. The process according to any one of claims 16 to 17, wherein the polyurethane dispersion is formed by polymerization of at least one polyisocyanate and at least one polyol as main comonomers;

19. A vinyl acetate-ethylene copolymer-based emulsion for binder composition for textile lamination applications, wherein the vinyl acetate-ethylene copolymer comprises, based on the total weight of the copolymer:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

wherein the copolymer-based emulsion is formed by emulsion polymerization of the monomers in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

20. The vinyl acetate-ethylene copolymer-based emulsion according to claim 19, wherein the other comonomers or functional monomers include one or more selected from the group of:

polymerizable monomers having one olefinic bond, such as vinyl esters of polycarboxylic fatty acid, acrylates, methacrylates and maleate esters; specific examples of such polymerizable monomers include, but not limited to linear or branched vinyl esters of fatty acid having 1 - 14 carbon atoms, acrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, methacrylates of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms, and maleate esters of fatty alcohol wherein the fatty alcohol is linear or branched fatty alcohol having 1 - 16 carbon atoms;

polymerizable monomers having one olefinic bond and at least one other functional group, such as acrylic acid, methacrylic acid, maleic acid, maleic anhydride, fumaric acid, crotonic acid, itaconic acid, b-acryloxy propionic acid, acrylamide, methylol acrylamide, hydroxyethyl acrylamide, hydroxypropyl acrylamide, acrylonitrile, methacrylonitrile, sodium vinylsulfonate, vinyl benzene sulfonate, mono-sodium 2-methyl-2-[(1-oxo-2-propenyl)amino]-1-propylsulfonate, methacrylate ethyl trimethyl ammonium chloride, vinyltrimethoxysilane, vinyltriethoxysilane, vinyltri(2-methoxyethoxy)silane, methylacryloxypropyltrimethoxysilane, ethylene glycol acrylate, propylene glycol acrylate, glycidyl acrylate, ethyl acetoacetoxymethylacrylate or diacetone acrylamide; and

polymerizable monomers having two or more olefinic bonds, such as diallyl maleate; diallyl phthalate, triallyl cyanurate, allyl methacrylate, ethylene glycol dimethylacrylate, pentaerythritol triacrylate, pentaerythritol tetraacrylate, allyl acrylamide.

21. The vinyl acetate-ethylene copolymer-based emulsion according to any one of claims 19 to 20, wherein the emulsifier / stabilizer include small molecule surfactant and protective colloid.

22. The vinyl acetate-ethylene copolymer-based emulsion according to claim 21, wherein the small molecule surfactant is selected from the group of anionic surfactants, nonionic surfactants and combinations thereof.

23. The vinyl acetate-ethylene copolymer-based emulsion according to claim 21, wherein the protective colloid is selected from the group of: partially hydrolyzed polyvinyl alcohols and derivatives thereof, cellulose ethers and derivatives thereof, starch and derivatives thereof, polyvinyl pyrrolidone, and mixtures thereof.

24. The vinyl acetate-ethylene copolymer-based emulsion according to claim 19, wherein the copolymer-based emulsion has a solid content of about 40 to 70% by weight,

most preferably about 50 to 60% by weight based on the total weight of the emulsion.

25. A process for preparing the vinyl acetate-ethylene copolymer-based emulsion according to any one of claims 19 to 24, said process comprises emulsion polymerizing a monomeric composition comprising:

- (1) about 60-95pphm, preferably about 75-90 pphm of moieties derived from vinyl acetate;
- (2) about 5-40pphm, preferably about 10-25 pphm of moieties derived from ethylene; and
- (3) about 0-10pphm, preferably about 0-5 pphm of moieties derived from other comonomers or functional monomers,

in the presence of about 1-10pphm, preferably about 3-6 pphm of emulsifier / stabilizer.

26. The process according to claim 25, wherein the emulsion polymerization is carried out in the presence of initiators for polymerization reaction.

27. Use of the vinyl acetate-ethylene copolymer-based emulsion according to any one of claims 19 to 24 or obtainable by the process according to any one of claims 25 to 26 in binder composition for textile lamination applications, such as lamination of clothes such as underwears, manufacture of footwears, lamination of bags, lamination of moisture-proof pads and manufacture of liners.

28. Use of the binder composition according to any one of claims 1-15 or obtainable by the process according to any one of claims 16-18 in textile lamination applications, such as lamination of clothes such as underwears, manufacture of footwears, lamination of bags, lamination of moisture-proof pads and manufacture of liners.

29. A textile product, wherein the textile product is laminated by the binder composition according to any one of claims 1-15 or obtainable by the process according to any one of claims 16-18.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/084130

A. CLASSIFICATION OF SUBJECT MATTER

See the extra sheet

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)

IPC: C08F; C09J

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)

NKI, CNABS, CNTXT, WPI, EPODOC: ethylene, vinyl, acetate, polyurethane, emulsion, dispersion, textile

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	JP 09194811 A (SUMITOMO CHEM CO LTD) 29 July 1997 (29.07.1997) see description, paragraph [0003] to [0017] and examples	1-29
X	JP 2002249743 A (KONISHI CO LTD) 09 June 2002 (09.06.2002) see examples	1-29
X	JP 2003064333 A (CHUO RIKI KOGYO KK) 05 March 2003 (05.03.2013) see examples	1-29
X	JP 2002060712 A (KONISHI CO LTD) 26 February 2002 (26.02.2002) see examples	1-29
X	JP 2000212533 A (SUMITOMO CHEM CO LTD) 02 August 2000 (02.08.2000) see examples	1-29
X	CN 1788063 A (PPG IND OHIO INC) 14 June 2006 (14.06.2006) see examples	1-29

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

* Special categories of cited documents:	“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
“A” document defining the general state of the art which is not considered to be of particular relevance	“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
“E” earlier application or patent but published on or after the international filing date	“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
“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)	“&” document member of the same patent family
“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	

Date of the actual completion of the international search
05 July 2013 (05.07.2013)Date of mailing of the international search report
18 Jul. 2013 (18.07.2013)Name and mailing address of the ISA/CN
The State Intellectual Property Office, the P.R.China
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INTERNATIONAL SEARCH REPORT
Information on patent family members

International application No.
PCT/CN2012/084130

Patent Documents referred in the Report	Publication Date	Patent Family	Publication Date
JP 09194811 A	29.07.1997	JP 3289587 B	10.06.2002
JP 2002249743 A	06.09.2002	JP 3828371 B	04.10.2006
JP 2003064333 A	05.03.2003	None	
JP 2002060712 A	26.02.2002	JP 3350518 B	25.11.2002
JP 2000212533 A	02.08.2000	None	
CN 1788063 A	14.06.2006	US 2004229046 A1	18.11.2004
		WO 2004101700 A2	25.11.2004
		MX PA05012127 A	01.02.2006
		CN 100358965 C	02.01.2008
		CA 2523707 C	17.08.2010

INTERNATIONAL SEARCH REPORT

International application No.

PCT/CN2012/084130

A. CLASSIFICATION OF SUBJECT MATTER

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

C09J 131/04 (2006.01)i

C09J 175/04 (2006.01)i

C08L 31/04 (2006.01)i

C08L 75/04 (2006.01)i