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(54) **DYE-CAPTURING LAUNDRY AID**

(57) The present invention relates to a dye-capturing laundry aid, a process for producing the same, and the use thereof. The dye-capturing laundry aid according to the present invention comprises: a support in the form of a sheet comprising water-insoluble fibers, and a binder composition comprising a binder, wherein the support is impregnated and/or bond and/or coated with the binder composition; wherein the binder in the binder composition is a polymer containing at least one amino group on its backbone and/or side chains; and wherein the dye-capturing laundry aid is biodegradable according to EN13432.

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Description

Technical field

[0001] The present invention relates to a dye-capturing laundry aid, a process for producing the same, and the use thereof.

Background art

[0002] Manufacturers of everyday items often color their products in order to improve consumer appeal. For instance, manufacturers of fabrics, such as tablecloths, bedding and clothing, typically dye their fabrics so that the end product is more aesthetically pleasing to the consumer. However, one problem that is often observed with this type of articles is that the laundering of colored fabrics in order to remove dirt may also remove dye compounds which are released to the wash liquor.

[0003] This may result in not only the deterioration of the color of the washed fabric from which the dye is released, but also in the discoloration of other fabrics present in the same wash liquor.

[0004] In an attempt to solve the above problem, laundry aids have been envisioned which are designed to capture dye molecules that have leached out of fabrics and into the wash liquor before they dye other fabrics. Typically, these are provided in the form of a woven or nonwoven fabric which is insoluble in the wash liquor and which is chemically treated such that it is able to scavenge the dyes from the wash liquor.

[0005] Generally, such laundry aids are coated and/or impregnated and/or bond with compositions comprising binders to obtain satisfactory performances in terms of wet tensile. Current solutions use synthetic non-biodegradable binders, which cannot obtain biobased certifications and compostability certifications.

[0006] EP 3 747 979 and EP 3 980 518 concern a method for producing a dye-capturing nonwoven fabric, the method comprising the steps of providing a nonwoven substrate and applying a composition to the nonwoven substrate, the composition comprising a cationic polymer such as polyamido-amine epichlorohydrin and a dye-capturing agent.

[0007] US 6,833,336 concerns a laundry additive comprising a substrate, and a dye absorber comprising a non-cationic polymeric amine comprising vinyl imidazole adhered to said substrate.

[0008] US 2016/0186097 A1 describes a dye-capturing laundry aid comprising a support in the form of a sheet comprising water-insoluble fibers, and a three-dimensional network entangled with at least some of the fibers contained in the support, the three-dimensional network comprising a first polymer that is cross-linked by a second polymer, wherein the first polymer is a polyamine comprising primary amine group, the first polymer being water soluble and cationic, and the second polymer is a water soluble polymer that is different from the first polymer and comprises repeating units comprising halohydrin and/or epoxide groups that are capable of forming covalent cross-links with the primary amine groups of the first polymer.

[0009] US 2002/055449 A1 concerns a laundry additive sachet comprising a laundry additive being located in a cavity of said sachet; wherein said laundry additive comprises a dye absorbing agent and/or a dirt binding agent, which is a cationic polymer.

[0010] There is, however, an increasing demand of laundry aids such as dye-capturing sheets which not only allow for a satisfactory performance in terms of dye catching, but are also based on materials that are biodegradable and/or compostable.

[0011] One problem that is generally observed when using biodegradable binders is that it is difficult to achieve the required strength properties which allow the laundry aid to remain intact in the washing machine. The present inventors have observed that certain biodegradable binders do not allow for a sufficient wet tensile strength and thus cause the laundry aids that contain them to break in the washing machine. Other biodegradable binders may be not compatible with other components that are generally used in such laundry aids, such as wet strength agents and dye-capturing agents.

Technical problem

[0012] Accordingly, there is a demand for a dye-capturing laundry aid which is made from materials which are biodegradable, but also has the required tensile strength such that it does not break in the washing machine, while maintaining a dye-capturing capability.

Summary of the invention

[0013] The present invention is aimed at solving the problems of the prior art by providing a dye-capturing laundry aid comprising: a support in the form of a sheet comprising water-insoluble fibers, and a binder composition comprising a binder, wherein the support is impregnated and/or bond and/or coated with the binder composition; wherein the binder in

the binder composition is a polymer containing at least one amino group on its backbone and/or side chains; and wherein the dye-capturing laundry aid is biodegradable according to EN13432.

[0014] Further, the present invention relates to a process for producing a dye-capturing laundry aid, the process comprising the steps of: providing a support in the form of sheet comprising water-insoluble fibers; providing a binder composition comprising a binder, wherein the binder is a polymer containing at least one amino group on its backbone and/or side chains; applying the binder composition onto the support; wherein the dye-capturing laundry aid is biodegradable according to EN13432 and wherein the dry add-on weight of the binder composition is at least 1 wt% with respect to the total basis weight of the laundry aid.

[0015] Moreover, the present invention relates to the use of the dye-capturing laundry aid as described above to scavenge a dye or dyes from an aqueous medium.

[0016] It has been found that the use of a binder composition comprising a binder which is a polymer containing at least one amino group on its backbone and/or side chains allows to retain the dye-capturing properties and at the same time to achieve a good mechanical strength, such that the laundry aid does not break in the washing machine when in use, even when the laundry aid is made with materials that allow for it to be biodegradable according to EN13432.

Detailed description of the invention

Definitions

[0017] In the present invention, the term "average molecular weight" denotes number average molecular weight, unless stated otherwise.

[0018] In the present invention, the term "average" denotes mean average, unless stated otherwise.

[0019] In the present invention, references to amounts "by weight" are intended to be synonymous with "by mass". Further, as used herein, the term weight percent (wt%) refers to a percentage amount by weight.

[0020] In the present invention, references to the "dry weight" denote amounts expressed as dry content excluding the solvent mass.

[0021] In the present invention, the term "polymer" denotes a compound comprising at least ten repeating units such as, for example, a homopolymer, a copolymer, a graft copolymer, a branch copolymer or a block copolymer.

[0022] The term "dye-capturing" denotes the ability of binding, absorbing, adsorbing, scavenging or otherwise capturing a dye from a fluid, such as a washing liquor, and retaining the same such that it is not easily released again into the fluid from which it has been captured.

[0023] Where the present description refers to "preferred" embodiments/features, combinations of these preferred embodiments/features shall also be deemed as disclosed as long as this combination is technically meaningful.

[0024] Hereinafter, the use of the term "comprising" should be understood as disclosing in a non-limited way, that is to say that additional components or steps can be present or implemented, as long as this is technically meaningful. For a more restricted embodiment, the terms "consisting of" will be used and have to be understood as disclosing in a limited way, that is to say without any additional component or step.

Dye-capturing laundry aid

[0025] The present invention relates to a dye-capturing laundry aid (hereinafter also referred to as "laundry aid") comprising: a support in the form of a sheet comprising water-insoluble fibers, and a binder composition comprising a binder, wherein the support is impregnated and/or bond and/or coated with the binder composition; wherein the binder in the binder composition is a polymer containing at least one amino group on its backbone and/or side chains; and wherein the dye-capturing laundry aid is biodegradable according to EN13432.

Support

[0026] The laundry aid of the present invention comprises a support which is in the form of a sheet and comprises water-insoluble fibers.

[0027] The support may be a woven, knitted or non-woven material. Preferably the support is a nonwoven material. The term "nonwoven" refers to a fabric-like sheet having a structure of individual fibers. These are entangled and interlaid with each other, but not in an identifiable manner as in a woven or knitted fabric. Nonwovens may be formed from many processes such as, for example, spin laying, carding, air laying (also known as dry laying) and water laying processes. These result in spin-laid, carded, air-laid (also known as dry-laid) and wet-laid nonwovens, respectively.

[0028] In the present invention, the support is preferably a wet-laid nonwoven. A wet-laid nonwoven may be produced by suspending fibers in water, pumping the dispersion in order to continuously deposit the fibers on a forming wire before water is drawn off. The nonwoven can have a single-layer structure or a two-layer or multilayer structure.

[0029] The term "fiber" as used herein refers to a material form characterized by an extremely high ratio of length to diameter. The terms "fiber" and "filament" can be used interchangeably for the purposes of the present invention unless otherwise specifically indicated.

[0030] In the present invention, the support comprises water-insoluble fibers. Examples of suitable fiber types include cellulose fibers, cotton and polylactic acid.

[0031] In a preferred embodiment, the support comprises cellulose fibers, preferably natural cellulose and/or man-made cellulose. In a further preferred embodiment, the support comprises a blend of natural cellulose and man-made cellulose.

[0032] In the present invention, natural cellulosic fibers include cellulose wood pulp. Man-made cellulosic fibers (also referred to herein as "regenerated cellulose fibers") include lyocell and viscose (also referred to herein as "Rayon").

[0033] In a preferred embodiment, the water-insoluble fibers comprised in the support of the laundry aid of the present invention comprise a blend of cellulose wood pulp and at least one of lyocell and viscose fibers.

[0034] Preferably, the water-insoluble fibers contained in the support of the laundry aid of the present invention comprise cellulose wood pulp in an amount of 20 wt% or more, 30 wt% or more, 40 wt% or more, or 50 wt% of more, and 95 wt% or less, 90 wt% or less, 85 wt% or less, or 80 wt% or less based on the total weight of the support.

[0035] Preferably, the water-insoluble fibers contained in the support of the laundry aid of the present invention comprise lyocell in an amount of 5 wt% or more, 10 wt% or more, 15 wt% or more, or 20 wt% or more, and 50 wt% or less, 40 wt% or less, or 35 wt% or less based on the total weight of the support.

[0036] Preferably, the water-insoluble fibers contained in the support of the laundry aid of the present invention comprise viscose in an amount of 5 wt% or more, 10 wt% or more, 15 wt% or more, or 20 wt% or more, and 50 wt% or less, 40 wt% or less, or 35 wt% or less based on the total weight of the support.

[0037] There is no particular limitation on the diameters and lengths of the fibers incorporated in the support. Instead, the diameters and lengths can be determined by the user based upon their knowledge of their art and depending upon the intended end use. Generally, cellulose fibers (natural and man-made) have a range of diameters and length that depends on fiber type and source of fiber.

[0038] Fibers such as those used in wet-laying processes typically have a length from about 0.5 to 30 mm and a diameter of from 5 to 50 μm.

[0039] The support can consist of fibers or may comprise fibers and other components. For example, wet strength agents can be added in order to improve the structural integrity of the fiber-containing support. Examples of wet strength agents are the same that are listed below as wet strength agents for the binder composition of the present invention.

[0040] When present in the support, wet strength additives may be present in an amount of 0.05 wt% or more, 0.1 wt% or more, or 0.2 wt% or more and 2 wt% or less, 1 wt% or less or 0.5 wt% or less based on the total weight of the support.

[0041] The support is provided in the form of a sheet. For example, typical laundry aids are provided in the form of a cloth-like sheet that tumbles and deforms easily without breaking during the churning motion of a domestic washing machine. In particular, the support can be provided as a woven or nonwoven sheet/web, preferably as a nonwoven sheet. The size of such a sheet is not particularly limited, and can depend upon the intended use, but a sheet having a length of 5-30 cm, a width of 5-30 cm and a thickness of <0.5 cm can often be satisfactory. The sheet can, moreover, be subsequently manipulated into the form of a block, sphere, cylinder, tube, torus, a porous sachet and so forth.

Binder composition

[0042] In the present invention, the support is coated and/or impregnated and/or bond with a binder composition.

[0043] In the present invention, the term "coated with the binder composition" denotes that at least one surface of the support or a part thereof is covered by a layer formed by the binder composition. The term "impregnated with the binder composition" means that at least one component of the binder composition penetrates the cavities within the support along at least a portion of the thickness of the support. When the support is impregnated with the binder composition, a tridimensional matrix structure may form around the fibers of the support. When the support is impregnated with the binder composition, the binder composition may also additionally cover a surface thereof. The term "bond with the binder composition" indicates that at least one component of the binder composition is bound with at least one component of the support, for example by chemical bond or by forming a network that is interlaced with the fibers of the support. Without wishing to be bound by any theory, it is believed that when the support is bonded with the binder composition, covalent bonds may form between the fibers and at least one component of the binder composition such as the binder and/or the dye capturing additive.

[0044] Preferably, in the present invention the support is coated and impregnated with the binder composition.

[0045] The amount in dry weight of binder composition in the dye-capturing laundry aid of the present invention is preferably 1 wt% or more, more preferably 5 wt% or more, more preferably 8 wt% or more, more preferably 10 wt% or more, and preferably 30 wt% or less, more preferably 25 wt% or less, more preferably 22 wt% or less, more preferably 20 wt% or less with respect to the total basis weight of the laundry aid.

Binder

[0046] The binder composition used in the laundry aid of the present invention comprises a binder, which is a polymer containing at least one amino group on its backbone and/or side chains.

[0047] Preferably, the binder is a polymer containing at least one amino group on its backbone and/or side chains which is positively charged when dispersed and/or dissolved in an aqueous composition having a pH of 7 or less, preferably 6 or less. That is, preferably the binder is a polymer containing at least one amino group on its backbone and/or side chains which is cationic when dispersed and/or dissolved in an aqueous composition having a pH of 7 or less, preferably 6 or less.

[0048] The amino group may be a primary amine, a secondary amine, a tertiary amine or a quaternary amine. The polymer used in the laundry aid of the present invention may comprise more than one type of amino group, i.e. it may comprise primary amines and/or secondary amines and/or tertiary amines and/or quaternary amines.

[0049] Preferably, the polymer containing at least one amino group on its backbone and/or side chains is biobased, that is, it is obtainable from a natural source. Examples of natural sources are plant, fungal and animal sources. Examples of animal sources include crustaceans, including crab, prawns and shrimp shells.

[0050] Preferably, the polymer containing at least one amino group on its backbone and/or side chains is a polysaccharide. The term "polysaccharide" denotes polymers composed of more than 10 monosaccharide units bound together.

[0051] In the present invention, examples of suitable polysaccharides are chitosan, chitosan derivatives, chitin, chitin derivatives, starch derivatives, dextran derivatives and cyclodextrin derivatives. The term "derivative" denotes a compound that is obtained by chemical modification of an originator compound.

[0052] In a preferred embodiment, the binder in the binder composition used in the present invention is chitosan or a chitosan derivative. More specifically, the binder in the binder composition may be chitosan having a deacetylation degree of from 50 to 100 mol%, preferably 60 to 100 mol%, further preferably 75 to 100 mol%.

[0053] The amount in dry weight of binder in the laundry aid of the present invention is preferably 0.01 wt% or more, more preferably 0.02 wt% or more, more preferably 0.05 wt% or more, more preferably 0.1 wt% or more with respect to the total basis weight of the laundry aid. The amount in dry weight of binder in the laundry aid of the present invention is preferably 10 wt% or less, more preferably 5 wt% or less, more preferably 3 wt% or less with respect to the total basis weight of the laundry aid.

Wet strength agent

[0054] The binder composition in the dye-capturing laundry aid of the present invention preferably comprises a wet strength agent.

[0055] In the context of the present invention, the term "wet strength agent" denotes additives that increase the mechanical strength of the laundry aid when it is wetted. Wet strength agents in the context of the present invention are preferably able to form covalent bonds with dye capturing agents such as those listed below as dye capturing agents for the laundry aid of the present invention, thus making them insoluble in water and preventing their release when in use in a washing cycle.

[0056] Examples of wet strength agents that may be comprised in the binder composition are a butadiene-styrene emulsion, carboxylated styrene-butadiene emulsion, acrylonitrile-butadiene emulsion, polyacrylamide resin, polyamide-epichlorohydrin resin, acrylonitrile-butadiene-styrene emulsion, and styrene acrylonitrile and mixtures thereof.

[0057] In a preferred embodiment, the binder composition comprises a wet strength agent which is a polyamide-epichlorohydrin resin.

[0058] The amount in dry weight of wet strength agent in the dye-capturing laundry aid of the present invention is preferably 0.2 wt% or more, more preferably 0.5 wt% pr more, more preferably 1 wt% or more, more preferably 1.5 wt% or more, and is preferably 5 wt% or less, more preferably 4 wt% or less, more preferably 3 wt% or less, more preferably 2.5 wt% or less with respect to the total basis weight of the laundry aid.

Dye-capturing agent

[0059] The binder composition in the dye-capturing laundry aid of the present invention preferably comprises a dye-capturing agent.

[0060] In the context of the present invention, the term "dye-capturing agent" denotes additives that are able to scavenge a dye or dyes from an aqueous medium.

[0061] Examples of dye-capturing agents that may be comprised in the binder composition are a vinylpyrrolidone/vinylimidazole copolymer, a maleic/acrylic acid copolymer, a polyacrylic-maleic phosphono-end group copolymer, polyvinyl amine, polyvinylpyrrolidone, polyvinyl pyridine-N-oxide, polyvinyl imidazole, polyvinyl alcohol, polyamine-N-oxide and polyvinyl oxazolidone, and polymers containing a quaternary ammonium group such as copolymers of diallyl(3-chloro-2-

hydroxypropyl) amine hydrochloride and diallyldimethylammonium chloride, and mixtures thereof.

[0062] In a preferred embodiment, the binder composition comprises a dye-capturing agent which is selected from a vinylpyrrolidone/vinylimidazole copolymer, polyvinylpyrrolidone, polyvinyl pyridine-N-oxide, and mixtures thereof. In a further preferred embodiment, the binder composition comprises a dye-capturing agent which is a vinylpyrrolidone/vinylimidazole copolymer.

[0063] The amount in dry weight of dye-capturing agent in the dye-capturing laundry aid of the present invention is preferably 0.02 wt% or more, more preferably 0.05 wt% pr more, more preferably 0.1 wt% or more, more preferably 0.2 wt% or more, and is preferably 5 wt% or less, more preferably 4 wt% or less, more preferably 3 wt% or less, more preferably 2.5 wt% or less with respect to the total basis weight of the laundry aid.

Other components of the binder composition

[0064] The binder composition in the dye-capturing laundry aid of the present invention may comprise further components, including acids and plasticizers.

[0065] For example, the binder composition in the dye-capturing laundry aid of the present invention may comprise organic and/or inorganic acids such as acetic acid, citric acid, citric acid monohydrate, glycolic acid, hydrochloric acid, lactic acid, malic acid, malonic acid, maleic acid, tartaric acid, succinic acid and mixtures thereof.

[0066] The total amount in dry weight of these acids in the laundry aid is preferably 0.001 wt% or more, more preferably 0.002 wt% or more, more preferably 0.005 wt% or more, more preferably 0.01 wt% or more, more preferably 0.1 wt% or more, and preferably 2 wt% or less, more preferably 1 wt% or less, more preferably 0.5 wt% or less with respect to the total basis weight of the laundry aid.

[0067] Preferably, the pH of the binder composition of the dye-capturing laundry aid of the present invention is 7 or less, more preferably 6.5 or less, even more preferably 6 or less.

[0068] Examples of plasticizers that may be included in the binder composition of the laundry aid of the present invention are sorbitol, glycerol, mannitol, maltitol, xylitol, glucose, fructose, hydrogenated hydrolysed starch, sucrose, cyclodextrin, dextrin and mixtures thereof.

[0069] The total amount in dry weight of plasticizers in the dye-capturing laundry aid is preferably 0.1 wt% or more, more preferably 0.3 wt% or more, more preferably 0.5 wt% or more, and preferably 12 wt% or less, more preferably 10 wt% or less, more preferably 8 wt% or less with respect to the total basis weight of the laundry aid.

[0070] The binder composition may further comprise additional components such as defoamers, foaming agents, wetting agents, catalysts, surfactants, emulsifiers, preservatives, crosslinkers, fillers, and rheology modifiers.

Biodegradability of the laundry aid

[0071] In the present invention, the dye-capturing laundry aid is biodegradable according to EN13432.

[0072] In the context of the present invention, the term "biodegradable" is generally defined in line with EN13432. The term "biodegradable" when applied to a material or a product means that the material or the entire product will biodegrade. By "biodegrade" it is meant that the chemical structure or the material breaks down under the action of microorganisms. More specifically, a material or a product is considered "biodegradable" if at least 90 wt% of the material is converted into CO_2 under the action of microorganisms in less than 6 months as measured by the laboratory test method EN 14046, thereby meeting the requirement for biodegradability according to EN 13432.

[0073] The term "compostable" is generally defined in line with EN13432. In the context of the present invention, a material is "compostable" when it comprises a maximum of 10 wt% and preferably of 5 wt% of non-biodegradable components, thereby meeting EN13432. The term "compostable" when applied to a material or a product means that the material, or the entire product, will both biodegrade and disintegrate. By the term "disintegrates" it is meant that the material, or the product made from it, will physically fall apart into fine visually indistinguishable fragments, at the end of a typical composting cycle.

[0074] An "industrial compostable" material may be compostable as described above in an industrial setting: The material may disintegrate and biodegrade at temperatures between 55 °C to 60 °C in less than 6 months. In detail, disintegration in an industrial setup may take less than 3 months, while biodegradation may take less than 6 months. If a material is described as "home compostable," it is compostable as described above under conditions present in a domestic composter setting: The material may disintegrate and biodegrade at temperatures below 55 °C, preferably at temperatures between 10 to 45 °C and most preferably between 25 to 30 °C in less than 12 months. In detail, disintegration may take less than 6 months, while biodegradation may take less than 12 months in a domestic composter setting.

[0075] In a preferred embodiment, the dye-capturing laundry aid is industrially compostable according to EN13432. In a more preferred embodiment, the dye-capturing laundry aid is both industrially and home compostable according to EN13432.

[0076] In a preferred embodiment, the laundry aid comprises 95 wt% or more, preferably 97 wt% or more of

biodegradable components according to EN13432 with respect to the total basis weight of the laundry aid. That is, in a preferred embodiment the amount of non-biodegradable components in the laundry aid is less than 5 wt%, preferably less than 3 wt%.

[0077] In view of the above, it is preferable that components such as the support and the binder in the binder composition of the laundry aid are biodegradable according to EN13432. Thus, in a preferred embodiment, the support and the binder in the binder composition are biodegradable according to EN13432. In a more preferred embodiment, the support and the binder in the binder composition are industrially compostable according to EN13432. In a more preferred embodiment, the support and the binder in the binder composition are both industrially and home compostable according to EN13432.

Wet tensile of the laundry aid

[0078] In a preferred embodiment, a wet tensile in the machine direction of the laundry aid is at least 300 N/m and/or a wet tensile in the cross direction of the laundry aid is at least 150 N/m.

[0079] Preferably, the wet tensile in the machine direction (MD) of the laundry aid is 400 N/m or more, more preferably 500 N/m or more, and 1200 N/m or less, more preferably 1000 N/m or less.

[0080] Preferably, the wet tensile in the cross direction (CD) of the laundry aid is 180 N/m or more, more preferably 200 N/m or more, even more preferably 300 N/m or more, and 1200 N/m or less, preferably 1000 N/m or less.

[0081] In a preferred embodiment, a dry tensile in the machine direction of the laundry aid is at least 500 N/m and/or a dry tensile in the cross direction of the laundry aid is at least 500 N/m.

[0082] Preferably, the dry tensile in the machine direction (MD) of the laundry aid is 600 N/m or more, preferably 800 N/m or more, more preferably 1000 N/m or more.

[0083] Preferably, the dry tensile in the cross direction (CD) of the laundry aid is 600 N/m or more, preferably 800 N/m or more, more preferably 1000 N/m or more.

[0084] In a preferred embodiment, a wet/dry tensile ratio of the laundry aid is at least 16%, preferably at least 20%, more preferably at least 24%. Further, a wet/dry tensile ratio of the laundry aid is preferably 60% or less, more preferably 50% or less, even more preferably 40% or less. In this context, the wet/dry tensile ratio is the ratio in percentage between the arithmetic average of the wet tensile in MD and CD and the arithmetic average of the dry tensile in MD and CD.

Basis weight of the laundry aid

[0085] The laundry aid the present invention may have any basis weight and thickness suitable to provide properties desirable for a laundry aid. The term "basis weight" as used herein refers to the area density of the laundry aid including the support and the binder composition. The basis weight of woven, knitted and nonwoven materials is usually expressed in weight per unit area, for example in grams per square meter (g/m^2) . The terms "basis weight" and "grammage" can be used interchangeably for the purposes of the present invention unless otherwise specifically indicated. The basis weight as used herein was measured following the standard ISO 536.

[0086] The laundry aid of the present invention may have a basis weight of at least 18 g/m^2, preferably between 25 and 80 g/m^2, more preferably between 30 and 70 g/m^2 and most preferably between 40 and 65 g/m^2.

Process for producing a dye-capturing laundry aid

[0087] The present invention also relates to a process for producing a dye-capturing laundry aid, the process comprising the steps of: providing a support in the form of a sheet comprising water-insoluble fibers; providing a binder composition comprising a binder, wherein the binder is a polymer containing at least one amino group on its backbone and/or side chains; applying the binder composition to the support; wherein the dye-capturing laundry aid is biodegradable according to EN13432; and wherein the dry add-on weight of the binder composition is at least 1 wt% with respect to the total basis weight of the laundry aid.

Production of the support

[0088] The method of production of the support is not particularly limited and may be selected as appropriate depending on whether the support is, for example, a woven, knitted or non-woven material. For example, the support may be a nonwoven and may be produced by the method described above for nonwoven materials.

[0089] In the method of the present invention, the support is in the form of a sheet and comprises water-insoluble fibers. The preferred characteristics of the support in the method of the present invention are as described above for the support in the laundry aid of the present invention.

[0090] The support of the present invention may have a basis weight of at least 15 g/m^2, preferably between 20 and 70 g/m^2, more preferably between 25 and 65 g/m^2 and most preferably between 30 and 60 g/m^2 before application of the

binder composition. In the context of the present invention, the term "basis weight" is as defined above for the laundry aid of the present invention.

Production of the binder composition

[0091] The method of production of the binder composition is not particularly limited, and the binder composition may be provided by mixing the components in the appropriate amounts in a liquid medium under stirring as necessary. The liquid medium may be medium containing water, or may be water.

[0092] In the method of the present invention, the binder composition to be applied to the support comprises a binder, which is a polymer containing at least one amino group on its backbone and/or side chains. Preferably, the binder composition to be applied to the support further contains water.

[0093] The preferred components of the binder composition of the method of the present invention are as described above for the binder composition in the laundry aid of the present invention.

[0094] The amounts of each component in the binder composition to be applied to the support may be adjusted depending on the final desired amounts in dry weight of each components in the laundry aid.

[0095] For example, the amount in dry weight of binder in the binder composition to be applied to the support is preferably 0.1 wt% or more, more preferably 0.2 wt% or more, 0.5 wt% or more, 0.7 wt% or more, 1 wt% or more, 1.2 wt% or more, 1.5 wt% or more, or 1 wt% or more with respect to the total dry weight of binder composition to be applied to the support. Further, the amount in dry weight of binder in the binder composition to be applied to the support is preferably 15 wt% or less, more preferably 10 wt% or less, more preferably 8 wt% or less, more preferably 5 wt% or less, more preferably 4 wt% or less with respect to the total dry weight of binder composition to be applied to the support.

[0096] The wet strength agent may be included in the binder composition to be applied to the support in an amount in dry weight of preferably 1 wt% or more, more preferably 2 wt% or more, more preferably 5 wt% or more, more preferably 10 wt% or more, more preferably 12 wt% or more, and preferably 30 wt% or less, more preferably 25 wt% or less, more preferably 20 wt% or less with respect to the total dry weight of the binder composition to be applied to the support.

[0097] The dye-capturing agent may be included in the binder composition to be applied to the support in an amount in dry weight of preferably 0.3 wt% or more, more preferably 0.5 wt% or more, more preferably 1 wt% or more, more preferably 3 wt% or more, more preferably 5 wt% or more, and preferably 20 wt% or less, more preferably 15 wt% or less, more preferably 10 wt% or less with respect to the total dry weight of the binder composition to be applied to the support.

[0098] The binder composition to be applied to the support may further contain the other components listed above for the binder composition of the laundry aid, such as plasticizers and acids.

[0099] The total amount in dry weight of acids in the binder composition to be applied to the support is preferably 0.01 wt% or more, 0.02 wt% or more, more preferably 0.05 wt% or more, and preferably 5 wt% or less, more preferably 4 wt% or less, more preferably 3 wt% or less based on the total dry weight of the binder composition to be applied to the support.

[0100] The total amount in dry weight of plasticizers in the binder composition to be applied to the support is preferably 5 wt% or more, more preferably 7 wt% or more, more preferably 10 wt% or more, and preferably 45 wt% or less, more preferably 40 wt% or less, more preferably 35 wt% or less with respect to the total dry weight of the binder composition to be applied to the support.

Application of the binder composition

[0101] The method according to the present invention includes a step of applying the binder composition to the support. The application of the binder composition to the support include coating the support with the binder composition and/or impregnating the support with the binder composition and/or bonding the support with the binder composition.

[0102] Preferably, the step of applying the binder composition to the support includes impregnating and coating the support with the binder composition.

[0103] The method by which the support is coated and/or impregnated and/or bond with the binder composition is not particularly limited and may be any method known in the art which is suitable for coating and/or impregnating and/or binding a fiber-containing support with a liquid composition.

[0104] Preferably, the binder composition is applied to the support by size-press or by spray. More preferably the binder composition is applied to the support by size-press.

[0105] When applied by size-press, the binder composition may be applied on the support at a speed suitable for industrial processes, for example at a speed of 40 m/min or more, preferably 50 m/min or more, and 400 m/min or less, preferably 300 m/min or less.

[0106] After the step of applying the binder composition to the support, the obtained laundry aid may be dried. The drying step can be conducted by exposing the laundry aid to elevated temperatures for a period of time, wherein shorter drying times are generally associated with higher temperatures. As a guide, drying can be conducted in conditions applicable to industrial processes, such as by exposing the laundry aid to temperatures of 100-200°C for 10-120 seconds. Drying can

also be promoted by exposing the laundry aid to a vacuum during drying, wherein drying in a vacuum generally requires lower drying temperatures than when drying at ambient pressure.

[0107] In the method according to the present invention, dry add-on weight of the binder composition is 1 wt% or more with respect to the total basis weight of the laundry aid. Preferably, the dry add-on weight of the binder composition is at 5 wt% or more, more preferably 8 wt% or more, even more preferably 10 wt% or more with respect to the total basis weight of the laundry aid. Further, the dry add-on weight of the binder composition is 30 wt% or less, preferably 25 wt% or less, further preferably 22 wt% or less, even more preferably 20 wt% or less with respect to the total basis weight of the laundry aid.

[0108] In this context, the dry add-on weight of the binder composition refers to the total dry weight of the binder composition excluding the solvent mass with respect to the total basis weight of the laundry aid.

Use of the dye-capturing laundry aid

[0109] The present invention further relates to the use of the dye-capturing laundry aid as described above to scavenge a dye or dyes from an aqueous medium. In one aspect, the present invention also relates to a method of using a dye-capturing laundry aid according to the present invention to scavenge a dye or dyes from an aqueous medium.

[0110] The laundry aid of the present invention is particularly well-suited to capturing direct dyes, which are sometimes termed substantive dyes. These types of dyes do not react with the material to be colored (unlike reactive dyes, for instance) and do not use a mordant, but instead rely upon intermolecular forces in order to adhere to the dyed material. For example, direct dyes are frequently used when dying household fabrics such as cotton. However, the lack of a chemical bond can mean that direct dyes tend to dissociate from the dyed fabric, and so these types of dyes are frequently associated with unwanted color runs during laundering. Typically, dyes used in this context are anionic.

[0111] The laundry aid can be used to capture dyes during the laundering of fabrics, textiles, clothing and so forth by simply placing the laundry aid in the washing apparatus along with the items to be laundered prior to commencing laundering. The laundry aid will then capture dyes liberated by the aqueous wash medium during the laundering cycle and therefore reduce the likelihood of unwanted 'color runs'. Visual inspection of the laundry aid after use will tend to reveal whether dyes have been captured because the laundry aid will discolor. It is therefore helpful if the laundry aid has a pale color, preferably white, because this will enable facile visual detection of dye capture and therefore reassure the user that the laundry aid is functioning properly.

Examples

Materials

[0112] The following examples correspond to a lab scale trial. The following experiment was performed to evaluate effects of a binder according to the present invention compared to known biobinders and other non-biodegradable binders. The binder comprising at least one polymer containing at least one amino group on its backbone and/or side chains is Binder blend A. Moreover, the biobinder used for this example is composed of an aqueous formulation of modified biopolymers and natural plant compounds, such as for example the Lily grade binder from Organoclick. A particulary suitable grade is, for example, Lily 1450. Binder blend B is Resem Y-793, available from Chukyo Yushi, which is a water-based dispersion cationic stabilized polylactic acid (PLA). Binder blend C is Resem Y-796, available from Chukyo Yushi, which is a water-based dispersion cationic stabilized polybutylene succinate (PBSA). Polyvinyl pyrrolidone co-vinyl imidazole dye capturing agent used was Sokalan HP56 available from BASF. Polyvinyl pyrrolidone dye capturing agent used was Albigen A liq available from Archroma. The wet strength agent used was Kymene 725, available from Solenis. Examples 1 to 7 and Comparative Examples 1 to 3 Wetlaid fibrous support sheets were produced on an inclined wire wetlaid machine (Voith headbox), with a dry composition of 60% cellulose fibers (NBSK wood pulp) and 40% of viscose (rayon fibers, 1.7 dtx x 8 mm), and having a weight of 50 g/m^2.

[0113] The sheets were impregnated by using a laboratory size-press (Mathis HVF 350 mm) at 3.1 m/min roll speed and 1.8b roll pressure with a binder composition according to Table 1. In Table 1, the amounts of each component are expressed in dry weight percentage with respect to the total basis weight of the binder composition. The amounts of each component applied to the sheets in weight, as well as the characterization in terms of total weight, pH of the formulation, dry content, viscosity and total mix add-on, are reported in Table 2. The sheets were then dried on a contact hot dryer at 130°C for 5 minutes followed by 5 minutes of curing in oven at 135°C. The reported temperature corresponds to the temperature of the nonwoven sheet in the oven.

Table 1

	Formula composition (dry%)	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative example 1	Comparative example 2	Comparative example 3
Binder	Binder blend A	100	70	70	70	80	90	70			
	Binder blend B								100		
	Binder blend C									100	
Wet strength agent	PAE Resin		30		15	10	5	15			40
Dye-capturing agent	Polyvinyl pyrrolidone co-vinyl imidazole			30	15	10	5				60
	Polyvinyl pyrrolidone							15			

Table 2

	Formula composition (g)	Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3
Medium	Water	235	226	235	231	230	230	231	146.9	139.4	118
Binder	Binder blend A	125	90	90	90	104	117	90			
	Binder blend B								53.0		
	Binder blend C									60.5	
Wet strength agent	PAE Resin	0	43	0	22	15	7	22			48
Dye-capturing agent	Polyvinyl (pyrrolidone co-imidazole)	0	0	35	18	12	6	0			56
	Polyvinyl pyrrolidone	0	0	0	0	0	0	17			
	Total weight	360	360	360	360	360	360	360	200	200	222
	pH	5.0	3.9	6.8	5.9	5.8	5.7	4.0	3.60	6.40	5.9
	Dry content (%)	9.6	10.0	9.7	10.0	10.0	10.0	9.8	15.19	16.18	13.2
	Brookfield viscosity (cp, module s61, 100rpm)	40	28	28	28	35	45	33			22
	Total mix add-on (%dry in final product)	14.3	14.2	15.5	15.3	14.5	15.8	14.7	14.0	14.6	16.0

Characterization

[0114] Each of the laundry aids prepared in the examples and comparative examples were characterized as follows. All samples were tested after conditioning at 23°C and 50%RH for a minimum of 2 hours. The results are reported in Tables 3 to 8.

Basis weight

[0115] The basis weight was measured according to ISO 536 and reported in grams per square meter (g/m^2) and is reported in Table 3.

Air permeability

[0116] The air permeability was measured according to ISO Standard 9237 at 196 Pa and reported in liter per square meter and second ($l/m^2 \cdot s$) in Table 3.

Thickness

[0117] The thickness at 100 kPa was measured according to ISO Standard 534:1988 and reported in micrometers (μm) in Table 3.

Biodegradability

[0118] The biodegradability of the binder blends used in the laundry aids was determined according to the EN13432 standard and is reported in Table 3. In Table 2, "A" indicates that the binder blend passed both the "industrial compostability" and the "home compostability" test according to EN13432, whereas "B" indicates that the binder blend passed the "industrial compostability" test but not the "home compostability" test according to EN13432, and "C" indicates that the binder blend did not pass either test.

Dry tensile strength

[0119] The tensile strength was measured according to TAPPI Standard T494 om-96 with the following modifications: 50 mm strips were used, the initial jaw distance was 127 mm, and the break force value was recorded as the maximum of the recorded force curve instead of 25 mm strip and reported in Newtons per meter (N/m). The dry tensile strength was measured both in Machine Direction (MD) and Cross Direction (CD). The arithmetic average of machine direction and cross direction was also determined. Results are reported in Table 4.

Elongation

[0120] The elongation was measured according to TAPPI Standard T494 and reported as a percentage (%). The elongation was measured both in MD and CD. Results are reported in Table 4.

Wet tensile strength

[0121] The wet tensile strength was measured according to TAPPI T494 om-96 as described above for the dry tensile. The further modification was that the measure was performed after an immersion of 10 minutes under 2 cm water at 23°C. The wet tensile strength was measured both in MD and CD. Results are reported in Table 4.

Wet/Dry tensile ratio

[0122] The wet/dry tensile ratio was calculated as the percentage ratio between the arithmetic average of the wet tensile in MD and CD and the arithmetic average of the dry tensile in MD and CD and is reported in Table 4.

Tear

[0123] The tear resistance was measured according to ISO 9073-4 standard and reported in cN. The tear resistance was measured both in MD and CD. Results are reported in Table 4.

Water drop

[0124] The water drop corresponds to the time of absorption of a water drop deposited on the surface of the nonwoven. The deposition of the drop was performed with a dropper and falls from a height of 70 mm +/- 5. This time of absorption is reported in seconds. Results are reported in Table 4.

Absorption capacity

[0125] A 100 x 100 mm sample was cut and weighted and immersed under 20 mm of water with help of a metallic scrim 120 x 120 mm (1500 g/m^2 and mesh of 7 wires/cm) . After 60 seconds the sample was removed and let to drain freely and vertically by an upper corner for 60 seconds. After this time the sample was weighted and the amount of absorbed water was calculated and given in percentage of the initial product.

Dye Pick-Up (DPU)

[0126] A 250 x 125 mm (312,5 cm^2) sheet was placed in 750 ml of a vigorously agitated aqueous dye solution heated to 40 °C, wherein the dye solution comprised Direct Red Dye (Direct Fast Red F3B) at a concentration of 50 mg/L in deionized water. Results are reported in Table 6.

[0127] 10 mL aliquot was taken from the dye solution at 0 (initially before placing the sheet into the solution), 1, 2 and 3 minutes respectively and diluted to a total volume of 100 ml in readiness for measurement.

[0128] The absorbance of the diluted aliquot was measured at the maximum absorbency wavelength of Direct Fast Red F3B (526 nm) using a calibrated Perkin Elmer Lambda 20 spectrophotometer.

[0129] Using a standard calibration curve correlating the absorbance at 526 nm to the concentration of dye in solution (Beer-Lambert Law c=A/[$\varepsilon \times$ l]; where c = dye concentration, A = absorbance, ε = molar absorption coefficient, and l = optical path length), the absorbance obtained experimentally was converted into the dye concentration in solution (mg/L).

[0130] The DPU is considered as the amount of dye removed from the solution and adsorbed by the sample sheet and is expressed in mg of dye per sample sheet (area of 312.5 cm^2 for all samples tested).

[0131] The DPU values are reported as the average value obtained by the testing 3 replicates, and are expressed respectively by T1, T2, T3 for the measurements at 1, 2 and 3 minutes.

Washing machine test:

[0132] A sheet sample of the laundry aid (125mm x 250mm size) was placed in a washing machine (Bosch brand Classixx 7 VarioPerfect), along with 5 g of a blue-dyed "donor" cotton fabric (Direct Dye Blue 71 dyed 100% cotton fabric supplied from IFTH) and 10 g of a white un-dyed "acceptor" cotton fabric (106 g/m^2 100% cotton fabric ; with Lab measured at L=95,38; a=-0,64 ; b=3,61).

[0133] 30 g of liquid soap (Persil brand sold from Unilever) or 20 g of powder soap (X.Tra brand sold from Henkel) was also added and a long cotton cycle at 60°C and 1200 rpm spin was launched.

[0134] At the end of the cycle, the sheet and fabrics were allowed to dry at room temperature in air.

[0135] The dye-capturing laundry aid and "acceptor" were measured with a colorimeter spectrophotometer to determine their color intensity L, a, b index according to CIE Hunter lab standard (ILL=C /2° angle with XLAV and UV included. The measured L, a and b indexes for the dye-capturing laundry aids are reported in Table 7. The measured L, a and b indexes for the cotton acceptor sample are reported in Table 8.

Table 3

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3	Reference product
Basis weight	g/m^2	55.1	55.3	55.2	55.3	54.7	54.2	54.3	54.5	53.1	57.7	63.2
Thickness	μm	158	163	155	152	166	158	175	184	174	169	176
Air permeability	$L/m^2/s$	311	311	296	309	300	304	334	342	343	324	180
Biodegradability		A	A	A	A	A	A	A	B	A	C	C

Table 4

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3	Reference product
Dry tensile MD	N/m	1892	1784	1754	2109	2139	2153	2032	3263	1885	3122	2873
Dry tensile CD	N/m	1140	1117	1098	1241	1167	1315	1118	1970	1173	1991	1653
CD/MD ratio	%	60.2	62.6	62.6	58.8	54.6	61.1	55.0	60.4	62.2	63.8	57.5
Average tensile	N/m	1516	1450	1426	1675	1653	1734	1575	2616	1529	2556	2263
Elongation MD	%	5.7	5.2	4.6	5.4	5.6	5.5	5.4	6.7	5.5	5.8	3.0
Elongation CD	%	6.0	5.9	5.1	5.6	5.9	6.3	5.1	6.7	4.6	5.7	9.0
Wet tensile MD	N/m	581	520	320	590	633	578	509	447	299	937	628
Wet tensile CD	N/m	351	327	184	347	316	348	264	260	169	548	426
Wet/Dry ratio	%	30.7	29.2	17.7	28.0	28.7	26.7	24.5	13.5	15.3	29.0	23.3
Average wet tensile	N/m	466	423	252	468	474	463	386	353	234	742	527
Tear MD	cN	208	214	222	201	181	156	194	185	196	148	
Tear CD	cN	239	250	226	233	276	254	294	273	309	212	

Table 5

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3	Reference product
Water drop	s	1	1	1	1	1	1	1	999	18	1	2
Absorption capacity	%	330	339	341	332	332	325	354	105	344	324	350

Table 6

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3	Reference product
DPU test	T1 (mg)	4.2	16	9.5	13.2	9.7	14	12	2.9	0.2	20.9	10
	T2 (mg)	6.4	23.9	10.5	19	15.2	11.8	19.6	0.1	1.5	26.9	20
	T3 (mg)	11	28.3	14.3	21.7	19.7	15.2	23.7	1.4	1.4	34.2	23.8

Table 7

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 1	Comparative Example 2	Comparative Example 3	Reference product
Liquid soap	L	79.43	71.61	75.78	68.69	70.72	69.23	71.42	The sample breaks in the washing machine		60.91	57.51
	a	-0.92	-0.83	-0.56	1.5	0.34	0.99	-0.04			2.8	5.93
	b	-12.29	-17.15	-14.06	-20.67	-18.46	-19.38	-17.41			-21.38	-29.38
Solid soap	L	72.95	67.87	71.83	61.66	65.79	64.34	65.65			61.12	59.75
	a	0.78	0.33	0.74	1.69	0.71	1.11	0.41			2.19	5.13
	b	-23.09	-23.14	-19.45	-25.23	-21.74	-22.83	-23.43			-24.3	-27.11

Table 8

		Example 1	Example 2	Example 3	Example 4	Example 5	Example 6	Example 7	Comparative Example 3	Reference product
Liquid soap	L	88.95	89.12	88.78	89.1	89.15	87.66	89.64	91.07	89.85
	a	3.79	3.11	2.76	3.11	2.91	3.2	3.07	4.64	3.96
	b	-16.89	-11.68	-10.03	-11.21	-10.12	-12.06	-9.59	-17.19	-17.02
Solid soap	L	77.72	80.39	81.93	81.86	81.3	73.69	83.63	80.24	82.6
	a	5.28	3.38	3.42	4.26	3.35	5.39	3.63	4.97	4.27
	b	-28.47	-22.09	-19.73	-20.09	-19.9	-28.85	-18.57	-26.22	-25.36

[0136] The reference product reported in the tables above is "Decolor stop" commercially available from Henkel France S.A.S. As shown above in Table 3, the binder blends used in the laundry aids prepared according to the present invention were both industrial and home compostable, whereas the blend used for Comparative Example 1 was only industrial compostable. The blend used for Comparative Example 3 and the components of the Reference Product were neither industrial nor home compostable. Given that the laundry aids prepared according to the present invention are based on a support that is also biodegradable and include a binder composition wherein the binder blend is biodegradable, the total amount of non-biodegradable components is low enough (below 5 wt%) that the final laundry aid can be considered biodegradable as well.

[0137] As reported in Table 4, the laundry aids prepared according to the present invention all showed acceptable values in terms of dry tensile, elongation and tear. In particular, they all showed optimal wet tensile in MD and CD and a high wet/dry ratio. Specifically, a comparison between Example 1 and Comparative Examples 1 and 2, which were all prepared using different binders and no wet strength agents in the binder composition, shows that the binder according to the present invention containing at least an amino group allows for higher wet tensile and wet/dry ratio than other biodegradable binders such as PLA and PBSA. This property is an indication of a good resistance of the laundry aid when in use in a washing machine.

[0138] The results in Table 5 show that the laundry aids according to the present invention allow for a good performance in terms of liquid absorption. In particular, the water drop is significantly lower for the laundry aids containing a binder according to the present invention, which is similar or even lower (that is, the absorption is even faster) than that of non-biodegradable standard laundry aids (Comparative Example 3 and Reference Product) and laundry aids prepared with other biodegradable binders (Comparative Examples 1 and 2).

[0139] From the results of the dye pick-up test, it can be seen that the binder used in the present invention allows for a higher dye pick-up as compared to other biodegradable binders, even in the absence of a dye-capturing agent (Example 1 vs. Comparative Examples 1 and 2). When combined with dye-capturing agents, the laundry aids using the binder according to the present invention allow for comparable dye pick-up performances as that of laundry aids prepared with non-biodegradable components (such as those of Comparative Example 3 and the Reference Product).

[0140] As shown in Table 7, laundry aids prepared with the binder according to the present invention withstand the washing machine cycle without breaking even in the absence of a wet strength agent (Example 1), whereas the laundry aids prepared with other biodegradable binders break in the washing machine (Comparative Example 1 and 2). The laundry aids of Examples 4 to 7, which are prepared including also wet strength agent and a dye-capturing agent similarly to the laundry aids of Comparative Example 3 and the Reference Product, allow for similar results in terms of color intensity of the dye-capturing laundry aid and of the cotton acceptor. That is, the L values of the laundry aids of Examples 4 to 7 are comparable to those of the Reference Product, indicating that they are able to scavenge a similar amount of dye from the washing liquor and thus are darkened during the process. At the same time, the cotton acceptor, i.e. the white cloth washed in the same washing cycle, of these examples maintains a high L value similar to that of the Reference Product, which indicates a similar whiteness of the cloth after the washing cycle.

[0141] All in all, these results indicate that using the biodegradable binder of the present invention, laundry aids with an optimal mechanical strength can be obtained, which are biodegradable and do not break in the washing machine, without hindering their dye-capturing ability as compared to standard commercial products which are not biodegradable.

Claims

1. A dye-capturing laundry aid comprising:

a support in the form of a sheet comprising water-insoluble fibers, and
a binder composition comprising a binder,
wherein the support is impregnated and/or bond and/or coated with the binder composition;
wherein the binder in the binder composition is a polymer containing at least one amino group on its backbone and/or side chains; and
wherein the dye-capturing laundry aid is biodegradable according to EN13432.

2. The dye-capturing laundry aid according to claim 1, wherein the polymer containing at least one amino group on its backbone and/or side chains is a polysaccharide.

3. The dye-capturing laundry aid according to claim 1 or 2, wherein the polymer containing at least one amino group on its backbone and/or side chains is chitosan or a derivative thereof.

4. The dye-capturing laundry aid according to any one of claims 1 to 3, wherein the binder composition comprises a wet

strength agent.

5. The dye-capturing laundry aid according to claim 4, wherein the wet strength agent is a polyamide-epichlorohydrin resin.

6. The dye-capturing laundry aid according to any one of claims 1 to 5, wherein the binder composition comprises a dye-capturing agent.

7. The dye-capturing laundry aid according to claim 6, wherein the dye-capturing agent is a vinylpyrrolidone/vinylimidazole copolymer.

8. The dye-capturing laundry aid according to any one of claims 1 to 7, wherein the support is a nonwoven material.

9. The dye-capturing laundry aid according to any one of claims 1 to 8, wherein water-insoluble fibers comprise cellulose fibers.

10. The dye-capturing laundry aid according to any one of claims 1 to 9, wherein
the binder is present in an amount in dry weight of at least 0.01 wt% with respect to the total basis weight of the laundry aid.

11. The dye-capturing laundry aid according to any one of claims 1 to 10, wherein the laundry aid comprises 95 wt% or more of biodegradable components according to EN13432 with respect to the total basis weight of the laundry aid.

12. The dye-capturing laundry aid according to any one of claims 1 to 11, wherein a wet tensile in the machine direction of the laundry aid is at least 300 N/m and/or a wet tensile in the cross direction of the laundry aid is at least 150 N/m as determined as described in the description.

13. The dye-capturing laundry aid according to any one of claims 1 to 12, wherein a wet/dry tensile ratio between the arithmetic average of the wet tensile in the machine direction and in the cross direction and the arithmetic average of the dry tensile in the machine direction and in the cross direction of the laundry aid is at least 16%, preferably at least 20%, most preferably at least 24%, the wet tensile and the dry tensile being determined as described in the description.

14. A process for producing a dye-capturing laundry aid, the process comprising the steps of:

providing a support in the form of a sheet comprising water-insoluble fibers;
providing a binder composition comprising a binder, wherein the binder is a polymer containing at least one amino group on its backbone and/or side chains;
applying the binder composition to the support;
wherein the dye-capturing laundry aid is biodegradable according to EN13432; and
wherein the dry add-on weight of the binder composition is at least 1 wt% with respect to the total basis weight of the laundry aid.

15. Use of the dye-capturing laundry aid according to any one of claims 1 to 14 to scavenge a dye or dyes from an aqueous medium.

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EUROPEAN SEARCH REPORT

Application Number
EP 23 19 3271

DOCUMENTS CONSIDERED TO BE RELEVANT

Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (IPC)
X Y	US 5 308 663 A (NAKAGAWA MUTUO [JP] ET AL) 3 May 1994 (1994-05-03) * Example 1, claim 1, Figures 1-3 and 9 * -----	1-3,6, 8-14 1-3,6-15	INV. C11D3/00 C11D3/22 C11D3/37
X Y	WO 2022/235189 A1 (ORGANOCLICK AB [SE]) 10 November 2022 (2022-11-10) * paragraphs [0053]-[0058], Tables 2 to 5 * -----	1,3,6,8, 9,11-13 1-3,6-15	C11D17/06
X Y	US 5 698 476 A (JOHNSON KAJ A [US] ET AL) 16 December 1997 (1997-12-16) * Example Set II, Steps A and B, Example II-12; column 7, lines 8 to 13; column 8, lines 11 to 19; column 11, lines 64 to 67; claim 1 * -----	1-3,6,9, 11,15 1-15	
Y	WO 2020/068151 A1 (GEORGIA PACIFIC NONWOVENS LLC [US]) 2 April 2020 (2020-04-02) * paragraph [0078] * -----	4,5	
Y	EP 0 515 750 A2 (BORDEN INC [US]) 2 December 1992 (1992-12-02) * the whole document * -----	4,5	TECHNICAL FIELDS SEARCHED (IPC) C11D
Y	WO 2022/139670 A1 (ORGANOCLICK AB [SE]) 30 June 2022 (2022-06-30) * Examples * -----	1-3,6-15	
T	ANONYMOUS: "European standard NF EN 13432", AFNOR, 1 November 2000 (2000-11-01), XP055768744, * the whole document * -----		

The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
The Hague	9 February 2024	Engelskirchen, S

CATEGORY OF CITED DOCUMENTS

X : particularly relevant if taken alone
Y : particularly relevant if combined with another document of the same category
A : technological background
O : non-written disclosure
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