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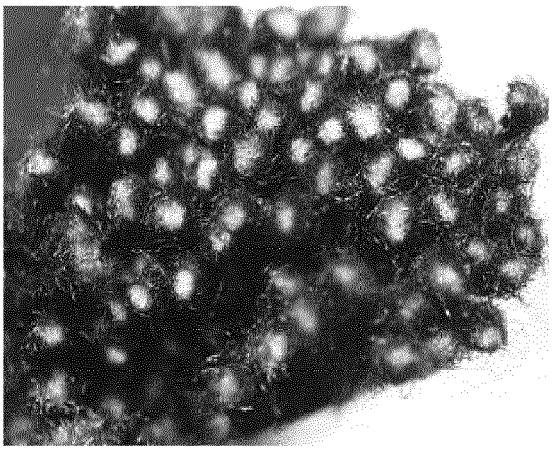
(54) **USE OF POLYELECTROLYTES IN TEXTILE TREATMENT, AND IN THE MERCERIZATION AND/OR DYEING OPERATIVE PHASE**

(57) An aqueous polyelectrolyte composition for (pre-)treating textile material, its preparation and application as well as therefrom produced textiles, as for example denim textiles. It was found that textile material pre-treated with said aqueous polyelectrolyte composition possess improved properties in terms of subsequent steps as for example in mercerization or dyeing since said subsequent steps are more superficial on pre-treated textile material. This allows e.g. a ring-dyeing of pre-treated textile-material and thus more sustainable techniques.

Fig1b



EP 4 464 837 A1

Description

FIELD OF THE INVENTION

[0001] The invention is in the field of textile (pre-)treatment for dyeing applications and the respective compositions thereof as well as the use.

BACKGROUND OF THE INVENTION

[0002] In modern textile industry, many different processes are known to produce textiles for consumer use, as e.g. dyeing, printing or finish. Only rarely, the untreated natural fibers are directly applied in these processes.

[0003] More commonly, textiles are pre-treated to improve properties in these processes and further of the final textiles, as e.g. by scouring, bleaching, desizing, or mercerization.

[0004] Although already many processes for such (pre-)treatments are known, further improvements are still desirable since all of said process bring disadvantages, as for example harsh conditions in bleaching or mercerization, increased number of steps in each case or more waste(-water) production.

[0005] In the Denim industry for example, mainly two steps of the today's processes claim to be improved:

[0006] First is the possibility to obtain an extremely ring dyeing, e.g. when dyestuff as sulfur or vat dyes are used due to their high tendency to penetrate and migrate inside the yarn fiber. This is reasoned by the objective to simplify and render subsequent steps, e.g. a wash-down processes, more sustainable and further allows the use of modern systems, as e.g. laser applications to avoid water pollution and consumption of water.

[0007] The second important stage of the dyeing process that should be improved is the mercerization step during which the yarn is wetted in a highly concentrated caustic soda solution to modify the cotton structure. As a result, a deeper and more intense dyeing is obtained. Further advantageous, the afterwards applied dyes remain superficial, which is often required e.g. in sulfur dyes dyeing. To said superficial dyeing is often referred under the term "ring dyeing".

[0008] Since only the surface of the material is dyed, high dyeing strength is required to obtain desired deep and intense coloration. Therefore, it is often necessary to mercerize the yarn and optimize the dyeing conditions to get a non-penetrated dyeing, especially for sulfur dyes and vat dyeing, e.g indigo dyeing.

[0009] Mercerization is a textile process step that requires the use of highly concentrated Caustic soda solutions (usually > 20ºBé, which is around 170 to 200 g/L). Hence, afterwards all this caustic soda must be washed requiring high amounts of water, and thereby generating a high amount of waste salts at the end of the whole dyeing process. Although parts of the washed caustic soda can be recovered and reused but since this caustic soda already has been in contact with yarn it comprises high amounts of chemical oxygen demands (COD) generated by the cotton impurities. Further, losses cannot be prevented and thus, recovering all the washed caustic soda is not feasible.

[0010] In today's Denim applications, a mercerization step is required when deep coloration is desired. The caustic soda used alters the chemical structure of the fiber but also requires extensive wash-out, recovering and neutralization. Several attempts have been made in the prior art as for example in US 4 051 699 A or in US 4 152 907 A to use ammonia instead of caustic soda but caused by the risk-cost and machinery complexity this alternative was not widely used in the industry.

[0011] On the other hand, the high tendency of said dyes to diffuse and migrate into the yarn increases difficulties to obtain a real ring dyeing. Commonly, in the end a partially penetrated dyeing is obtained which does not allow to get the desired wash-down effects preventing the application of less pollutant methodologies as for example laser.

[0012] Alternatively, several attempts were made to lower the used caustic soda amount but in such cases with an evident worsening on the dyeing performance.

[0013] Textile material being only ring-dyed, so only on the surface of the fibers is dyed, offers several advantages as e.g. less dye consumption during dyeing, easier subsequent wash-off processes for color contrast and application of said less pollutant methodologies as lasers.

[0014] In order to produce ring dyed fibers, a few parameters can be controlled to obtain a ring dyeing to some extent, as e.g., low temperature, minimum contact time between the material to be dyed and the dyeing bath, using a "wet-on-wet" system preventing the dye solution from being absorbed directly into the fiber or decrease the squeezing pressure of dyeing boxes.

[0015] However, by none of said mentioned methods an actual ring-dyeing is obtained since the dyes often possess a high tendency to diffuse into the fiber. Therefore, there the provision of methods for the production of actual ring-dyed material, and thus only superficially sulfur or vat dyed textile materials, is an ongoing need in the industry. In the present application, an improved (pre-)treatment method using polyelectrolytes was found.

[0016] Polyelectrolytes are known in the prior art and have many applications, mostly related to modifying flow and stability properties of aqueous solutions and gels. For instance, they can be used to destabilize a colloidal suspension and to initiate flocculation (precipitation). Polyelectrolytes can be found used as thickeners, emulsifiers, conditioners, clarifying agents, and even drag reducers and can be used in water treatment and for oil recovery. Many soaps, shampoos, and cosmetics incorporate polyelectrolytes. Furthermore, they are added to many foods and to concrete mixtures (superplasticizer).

OBJECTS OF THE INVENTION

[0017] The problem to be solved by this application was to provide an improved process for the (pre-)treatment of textile material to be further processed, as for example being mercerized or dyed with e.g sulfur or vat dyes, especially indigo.

SUMMARY OF THE INVENTION

[0018] The inventors discovered that the (pre-)treatment of textile material with an aqueous composition according to the invention leads to advantageous properties of textile material in subsequent processing steps. For example, during mercerization less caustic soda is consumed, wash-out processes are simplified due to less alkalinity and thus less waste(water) is produced.

[0019] Additionally, textile material pre-treated with the composition according to the invention show less shrinking under such harsh conditions as applied during mercerization for example.

[0020] Another particular advantage of the (pre-)treatment method according to the invention is that dyeing processes being subsequent to a (pre-)treatment according to the invention lead to more superficial dyeing, i.e. a ring-dyeing. Hence, less dye is consumed and further, more sustainable technologies can be used in after-treatments as for example laser technologies in wash-down processes.

[0021] Accordingly, the object is solved by an aqueous composition for (pre-)treating textile material, preferably in a dyeing process, wherein the composition at least comprises at least one polyelectrolyte, preferably at least one wetting agent, and water.

[0022] Further, in the aqueous composition according to the invention, the at least one polyelectrolyte is selected from polyacrylamide polyelectrolytes; and/or the at least one wetting agent is selected from phosphoric acid esters, preferably di-(2-ethylhexyl)phosphoric acid (DEHPA); or an alkoxylate alcohol, or an alkylphenol or derivatives; or a mixture thereof.

[0023] Further, in the aqueous composition according to the invention, the aqueous composition comprises from 0.01 to 10% by weight of at least one polyelectrolyte, from 0.01 to 10 % by weight of at least one wetting agent, from 75 to 99.9 % by weight water, wherein weight percent are based on total weight of the aqueous composition.

[0024] In addition, the invention relates to a method for manufacturing the aqueous composition according to the invention comprising the following steps a) to c): a) Mixing and homogenizing the at least one polyelectrolyte with water; b) Allowing the polyelectrolyte to swell until a viscous gel is obtained; c) Optionally adding and mixing other additives, preferably at least one wetting agent, to the viscous gel obtained in b).

[0025] Further, the invention relates to a method of (pre-)treating textile material, comprising steps A) and B): A) Providing an aqueous composition according to the invention or as prepared by the method according to the invention; B) Applying the aqueous composition of step A) to textile material and optionally repeating this step.

[0026] Further, in the method according to the invention, the method of (pre-)treating textile material is done at a temperature in the range of from 5 to 90 °C, preferably from 10 to 40 °C or at room temperature.

[0027] Further, in the method according to the invention, the method of (pre-)treating textile material is done for a time in the range of from 2 to 60 s.

[0028] Further, in the method according to the invention, the textile material is treated in a continuous manner.

[0029] Further, in the method according to invention, the method further comprises steps C) and/or D) subsequently to step B): C) Treating the textile material obtained from step B) in a mercerization step; D) Optionally washing the textile material obtained from step C and/or optionally recovering excessive caustic soda remaining on the textile material from step C); optionally, wherein the method further comprises step E) subsequently to step B) or step D): D) Dyeing the textile material obtained from step B) or step D), preferably with a sulfur dye or a vat dye such as indigo.

[0030] Further, in the method according to the invention, the textile material comprises or consists of cellulose, cotton, hemp, linen, jute, viscose, modal, or mixtures thereof.

[0031] Additionally, the invention relates to the use of polyelectrolytes for the (pre-treatment of textile material, preferably in a dyeing process, further preferably in a ring dyeing process.

[0032] Further, during the use of polyelectrolyte according to the invention, the polyelectrolyte is comprised in an aqueous composition according to the invention.

[0033] In addition, the invention relates to dyed or undyed textile material (pre-)treated with the aqueous composition according to the invention or as manufactured according to the invention; or dyed or undyed textile material manufactured according to the invention; wherein the dyed or undyed textile material is preferably yarn, woven, non-woven or knitwear.

[0034] Further, the invention relates to a method of manufacturing a textile, wherein a dyed or undyed textile material according to the invention is used.

[0035] Furthermore, the invention relates to a textile manufactured according to the invention; or textile comprising or consisting of the dyed or undyed textile material according to the invention, preferably wherein the textile is denim textile like trousers, e.g. jeans; jackets; skirts; dresses; t-shirts; or the like; or everyday clothes, work clothes, safety cloths, household textiles such as carpets, bedding, curtains and the like.

DETAILED DESCRIPTION OF THE INVENTION

[0036] The present invention relates to an aqueous

composition for (pre-)treating textile material, preferably in a dyeing process, wherein the composition at least comprises at least one polyelectrolyte, preferably at least one wetting agent, water.

[0037] The term "polyelectrolyte" refers to any modified or unmodified, natural or non-natural polymer bearing one or more negative or one or more positive electrical charge in the main chain or in the side chains (i.e. polyelectrolytes can be also referred to as "polyanions" or "polycations"). Due to the salt character of such molecules (also referred to as "polysalts"), they are usually soluble in water. Polyelectrolytes can be strong, i.e., mostly dissociated in aqueous solution, or weak, i.e., only partially dissociated in aqueous solution. The degree of dissociation of weak polyelectrolytes in aqueous solution can typically be adjusted by controlling the pH-value of said solution. Aqueous solutions of polyelectrolytes are often electrically conductive, and, depending on the degree of polymerization, highly viscous. The term "polyelectrolyte" further includes non-ionic polymers, which partly consist of uncharged hydrophilic moieties, as well as uncharged hydrophobic moieties.

[0038] The term "natural polymer" refers to any polymeric material obtainable from natural sources, such as plants or animals. The term "non-natural polymer" refers to any polymeric material obtainable from non-natural sources, such as chemical or biochemical synthesis.

[0039] In case the polyelectrolyte is a "polycation", the charge of the molecule results from excessive positively charged moieties in the main chain or in the side groups. Said positively charged groups may be selected from the group consisting of ammonia.

[0040] In case the polyelectrolyte is a "polyanion", the charge of the molecule results from excessive negatively charged moieties in the main chain or in the side groups. Said negatively charged groups may be selected from the group consisting of - sulfonates, carboxylates, phosphates, hydrogen phosphates, polyphosphoric acids, or mixtures thereof.

[0041] The term "non-ionic polyelectrolyte" refers to natural and non-natural polymers possessing properties of a polyelectrolyte as for example being soluble in water but not in organic solvents. Non-ionic polymers do not bear actually charged groups but incorporate highly polar moieties as for example ketones, aldehydes, or the like.

[0042] Non-limiting examples for polyelectrolytes are based on natural or non-natural polymers selected from the group consisting of polyacrylamide, alginate, lignin, polyvinyl, pectin, polycarboxylate polysaccharides, as for example Xanthan gum, guar gum and other natural gums, polystyrene, polyethylene, polypeptides, glycosaminoglycans.

[0043] It is further possible that the at least one polyelectrolyte is based on non-natural polymers only selected from the group consisting of polyacrylamides based on acrylic acid and/or acrylonitrile.

[0044] The term "(pre-)treating" is not to be meant limiting the present method to be mandatorily part of another process. Although it is possible to integrate the method according to the present invention into any kind of process for textile treatment, as for example prior to a dyeing step or prior to a mercerization step, it is not mandatorily integrated and can be a stand-alone or final process step.

[0045] The term "textile material" refers to any material to be used in the manufacturing of textiles and may be treated or untreated fiber, yarn, especially yarn to make denim fabric, fabrics, woven, or non-woven, (knit) fabrics and the like. Textile material to be treated with the composition according to the invention comprises or consists of cellulosic fibers which in turn can be selected from but not limited to cotton, linen, jute, viscose, modal, or mixtures thereof. Further materials that can be comprised in a "textile blend" together with cellulose and/or cotton are not restricted but can be selected for example from the group consisting of any material used in the textile industry including polyamide, acrylic, aramide, polyester, keratinous fibers as e.g. wool or hair, or mixtures thereof.

[0046] The term "fabric" refers to any woven or non-woven and is not limited to any specific fabric, and refers to any fabric art produced by the textile industry as for example batiste, brocade, canvas, chiffon, chintz, clydella, corduroy, damask, denim, Donegal, drillich, duchesse, enoa, etamin (screen cloth), chambray, fil-à-fil (end-on-end), flannel, gabardine, gauze, georgette, jacquard, jersey, crêpe, twill, loden, mesh, muslin, natté, nettle, oxford, pinpoint, piqué, plissé, poplin, satin, seersucker, slubyarn, taffeta, cloth, tweed, ventile®, Shirley cloth, viyelly, voile, full twist, woolen fabric, zendaline, zephyr.

[0047] The term "yarn" as used within the context of the present application refers to an agglomeration of fibers. Further, the agglomeration comprises or consists of a fiber blend as defined above, wherein the agglomeration is achieved by spinning methods. This means, that a yarn can contain two or more of the above defined fibers or fiber blends, depending on the desired yarn properties, like strength or thickness.

[0048] For example, it is advantageous for subsequent dyeing steps to use textile material being pre-treated with the composition according to the invention, in particular in case a ring-dyed textile material is desired.

[0049] The prefix "ring-" ,as used herein to more detailly describe methods for textile material (pre-)treatment, refers to the normal meaning of the treatment method but only affecting the treated textile material superficially, i.e. a ring of treated material on the outer surface results while the inner volume remains untreated. Examples are ring-dyeing, i.e. only the surface of the textile material is dyed after the dyeing process, or ring-mercerization, i.e. only the surface of the textile material is mercerized after the mercerization step.

[0050] The at least one polyelectrolyte is present in the composition according to the invention in an amount of at least 0.01 % by weight, or at least 0.03% by weight, or at least 0.05% by weight, or at least 0.1% by weight or at least 0.2% by weight, or at least 0.3% by weight, or

at least 1% by weight, or at most 10% by weight, or at most 5% by weight or at most 2.5% by weight, or at most 1% by weight. Preferably the amount of the at least one polyelectrolyte is in the range of from 0.01% to 10% by weight, or from 0.03% to 5% by weight, or from 0.05% to 2.5% by weight, or from 0.1% to 1% by weight. Amounts in % by weight are in each case based on the total weight of the composition according to the invention.

[0051] It is possible that the at least one polyelectrolyte is Dirsol RD® from Archroma.

[0052] The composition of the invention may further comprise at least one wetting agent. Within the context of the present application the term "wetting agent" means a hygroscopic compound. The wetting agent used in the composition according to the invention favors wetting and penetration of polyelectrolyte solution in the textile substrate pre-treated with the composition according to the invention. The wetting agent can be selected from the group consisting of phosphoric acid esters, urea, glycol, polyglycol and salts.

[0053] It is possible the at the at least one wetting agent is a phosphoric acid ester, as for example di-(2-ethylhexyl)phosphoric acid (DEHPA), or an alkoxylate alcohol, or an alkylphenol or derivatives; or a mixture thereof.

[0054] It is further possible that the at least one wetting agent is present in the composition according to the invention in an amount of at least 0.01% by weight, or at least 0.02% by weight, or at least 0.05% by weight, or at least 0.1% by weight, or at least 0.2% by weight, or at most 10% by weight, or at most 5% by weight or at most 2.5% by weight, or at most 1% by weight. Preferably, the amount of the at least one wetting agent is in the range of from 0.01 to 10% by weight, or from 0.1 to 5% by weight, or from 0.2 to 1% by weight. Amounts in % by weight are in each case based on the total weight of the composition according to the invention.

[0055] The composition according to the invention further comprises water, i.e. the composition is an aqueous composition. The water used for the composition can be selected from any water, like tap water, deionized water and distilled water. Water can be present in an amount of at least 70% by weight, or of at least 75% by weight, or of at least 80% by weight, or of at least 90% by weight, or of at most 99.9% by weight, or of at most 99% by weight, or of at most 98% by weight, or of at most 97% by weight, or of at most 95% by weight, or of at most 90% by weight, or of at most 85% by weight. Amounts in % by weight are in each case based on the total weight of the composition according to the invention. In one embodiment, no other solvent but only water is present in the composition according to the invention.

[0056] It is possible that the composition according to the invention comprises or consists of from 0.01 to 10% by weight of at least one polyelectrolyte, and from 90 to 99.9% by weight water.

[0057] It is possible that the composition according to the invention comprises or consists of from 0.01 to 10% by weight of at least one polyelectrolyte, from 0.01 to 10% by weight of at least one wetting agent, from 75 to 99.9% by weight water, wherein weight percent are based on total weight of the composition.

[0058] It is further possible that the composition according to the invention comprises or consists of from 0.02 to 5% by weight of at least one polyelectrolyte, from 0.02 to 5% by weight of at least one wetting agent, from 75 to 99.9% by weight water, wherein weight percent are based on total weight of the composition.

[0059] Further, the herein claimed invention also relates to a method for manufacturing the aqueous composition according to invention. The method comprising the following steps a) to c):

a) Mixing and homogenizing the polyelectrolyte with water;
b) Allowing the polyelectrolyte to swell until a viscous gel is obtained;
c) Optionally adding and mixing other additives, preferably at least one wetting agent, for the composition according to the invention to the gel obtained in b).

[0060] In step a), the at least one polyelectrolyte of the composition according to the invention is mixed with water until a homogenized mixture results.

[0061] It is possible to perform the mixing of step a) of the method for manufacturing the composition according to the invention at a temperature in the range of from 0 to 90 °C, or from 5 to 60 °C, or from 10 to 40°C, or from 15 to 30°C, or at room temperature, preferably at room temperature.

[0062] It is further possible to perform the mixing of step a) of the method for manufacturing the composition according to the invention for at least 0.5 h, or at least 1 h, or at least 2 h, or at least 3 h, or at least 4 h, or at least 6 h or at least 8 h, or at least 12 h, or at most 48 h, or at most, 36 h, or at most 30 h, or at most 24 h, or at most 20 h, or at most 18 h, or at most 16 h.

[0063] In step b), the at least one polyelectrolyte is allowed to swell until a viscous gel is obtained.

[0064] The term "viscous gel" means that a viscosity of between 5 cps and 10000 cps, or from 15 cps to 7500 cps, or from 30 cps to 5000 cps, or from 150 cps to 1000 cps, or from 250 cps to 500 cps is achieved. The viscosity is determined with a Brookfield viscometer with a spindle L2 at 100rpm at 25 °C.

[0065] It is advantageous that the polyelectrolyte composition according to the invention once the swelling process is finished and the viscous gel is obtained, creates a rheological barrier against other aqueous mixtures, although being based on water itself.

[0066] In step c), optionally other additives comprised in the composition according to the invention are added to and mixed with the viscous gel obtained from step b). It is possible that at least one wetting agent is added to and mixed with the composition according to the invention in step c).

[0067] Optionally in step c), other additives of the com-

position according to the invention are added to the viscous gel obtained in step c). Said additives are selected from the same group as disclosed for the composition according to the invention.

[0068] It is possible to perform the mixing of step c) of the method for manufacturing the composition according to the invention at a temperature in the range of from 0 to 90 °C or from 5 to 60 °C, or from 10 to 40°C, or from 15 to 30°C, or at room temperature, preferably room temperature.

[0069] It is further possible to perform the mixing step c) of the method for manufacturing the composition according to the invention for at least 1 min, or at least 2 min, or at least 5 min, or at least 10 min, or at least 15 min, or at most 6 h, or at most 4 h, or at most 3 h, or at most 2 h, or at most 1 h. Preferably, step c) of the method for manufacturing the composition according to the invention is performed in the range of from 2 min to 4 h, or from 5 min to 2 h.

[0070] The claimed invention further relates to a method of (pre-)treating textile material with the composition according to the invention. The method comprising steps A) and B):

A) Providing an aqueous polyelectrolyte composition according to the invention or as prepared by the method for manufacturing the composition according to the invention.

B) Applying the aqueous composition of step A) to textile material, and optionally repeating this step.

[0071] The composition according to the invention provided in step A) can be heated or cooled prior to step B).

[0072] In step B), the composition according to the invention is applied to textile material as defined before by any means known to the prior art. Non-limiting examples are spraying, dipping, padding, coating, brushing, impregnating.

[0073] It is further possible that the textile material obtained from step B) is (pre-)treated with the composition according to the invention to a different extent. For example, the range of textile material obtained from step B) may vary between being slightly wetted with the composition according to the invention and being completely soaked with the composition according to the invention.

[0074] Further, it is possible to combine any other methods known in the art for treating textile material with step B) including but not being limited to dyeing, mercerization, padding, draining, (pre-)wetting, washing.

[0075] It is also possible to repeat step B) in order to fully ensure contacting all textile material with the composition according to the invention. Step B) may be repeated once, twice or trice.

[0076] It is advantageous for subsequent dyeing steps in order to obtain a ring-dyeing, when the inside of the textile material is completely contacted with the composition according to the invention.

[0077] Further advantageous, in case a mercerization as known in the art is performed subsequent to the (pre-)treatment with the aqueous composition according to the invention, it was found that the amount of caustic soda required for textile material treated with the composition according to the invention was reduced in a minimum of 60% to 70% compared with untreated textile material. Further, it was surprisingly found that the textile material suffers less shrinkage compared to untreated textile material (see Fig. 3). This also indicates less damage to the chemical structure of the fiber itself.

[0078] It is possible to perform the method of (pre-)treating textile material with the composition according to the invention at a temperature in the range of from 0 to 90 °C, or from 5 to 60 °C, or from 10 to 40°C, or from 15 to 30°C, or at room temperature, preferably room temperature.

[0079] It is further possible to perform the method of (pre-)treating textile material with the composition according to the invention for a time sufficient to contact the textile material completely with the composition according to the invention. A time sufficient can be in the range of from 1 to 180 s, or from 1 to 120 s, or from 1 to 90 s, or from 2 to 75 s, or from 2 to 60 s, or from 5 to 45 s.

[0080] It is further possible to process textile material using the method of (pre-)treating textile material according to the invention in a continuous or a noncontinuous manner, e.g. batch-wise or exhaustion.

[0081] The method of (pre-)treating textile material with the composition according to the invention may further comprise steps C) and/or D) subsequently to step B):

C) Treating the textile material obtained from step B) in a mercerization step;

D) Optionally washing the textile material obtained from step C and/or optionally recovering excessive caustic soda remaining on the textile material from step C)

[0082] In step C), the textile material being (pre-)treated with the composition according to the invention is mercerized according to procedures known in the art. The received textile material can be considered ring-mercerized, i.e. the mercerization only affected the textile material superficially.

[0083] It is possible to perform the mercerization of step C) according to the method of (pre-)treating textile material with the composition according to the invention at temperatures of from 0 to 100 °C, or from 5 to 90 °C or from 10 to 80 °C or from 15 to 70 °C, or from 20 to 60 °C.

[0084] It is possible to perform the mercerization of step C) according to the method of (pre-)treating textile material with the composition according to the invention at caustic soda concentrations of at least 10°Bé, or at least at least 15°Bé, at least 20°Bé, at least 25°Bé, or at most 30 °Bé, or at most 25°Bé, or at most 20°Bé.

[0085] The resulting only superficial ring-mercerization is advantageous since the textile material is chemically less damage resulting firstly in less shrinkage and sec-

ondly in less caustic soda consumption during the mercerization.

[0086] In step D), the textile material being ring-mercerized according to the invention is optionally washed with water to remove excessive caustic soda. Further, the removed excessive caustic soda can be recovered and recycled to be re-used in the mercerization step.

[0087] This optional recovering is further advantageous in terms of sustainability since the amount of caustic soda required for the method of (pre-)treating textile material with the composition according to the invention comprising steps A) to D) is 60 to 70% lower compared to standard mercerization of textile materials being not (pre-)treated with the composition according to the invention.

[0088] The method of (pre-)treating textile material with the composition according to the invention may further comprise step E) subsequently to step B) or step D):
E) Dyeing the textile material obtained from step B) or step D).

[0089] In step E) the textile material being (pre-)treated with the composition according to the invention obtained from step B), or the textile material being ring-mercerized after the (pre-)treatment with the composition according to the invention obtained from step D) can be applied in any common dyeing process.

[0090] It is possible to use dyes commonly used in the textile dyeing industry to obtain a dyeing, in particular a ring dyeing.

[0091] Preferred dyes are sulfur dyes, vat dyes, especially indigo, reactive dyes, direct dyes, pigments and other dyes having similar properties.

[0092] It is possible to perform the method of (pre-)treating textile material with the composition according to the invention including only steps A) and B), or including steps A), B), C) and D), or A), B), C), D) and E), or A), B) and E).

[0093] Any textile material according to the herein used definition may be (pre-)treated in the method of (pre-)treating textile material with the composition according to the invention.

[0094] The method of (pre-)treating textile material with the composition is advantageous with textile material comprising or consisting of cellulose, cotton, hemp, linen, jute, viscose, modal, or mixtures thereof.

[0095] The claimed invention further relates to the use of polyelectrolytes as defined above for the (pre-)treatment of textile material, preferably in a dyeing process, further preferably in a ring dyeing process.

[0096] It is possible that the polyelectrolytes are comprised in an aqueous composition according to the invention.

[0097] It is further possible that the polyelectrolytes according to the invention may be used for (pre-)treating any textile material according to the herein used definitions.

[0098] It is advantageous to use the polyelectrolytes according to the invention in a dyeing process, e.g. to obtain a ring-dyeing.

[0099] The invention further relates to dyed or undyed textile material (pre-)treated with the polyelectrolyte composition according to invention or as manufactured by the method according to the invention; or dyed or undyed textile material manufactured according to the method of (pre-)treating textile material with the composition according to the invention.

[0100] The invention further relates to a method of manufacturing a textile produced from a dyed or undyed textile material according to the invention.

[0101] The invention further relates to a textile manufactured according to the method of manufacturing a textile; or textile comprising or consisting of the dyed or undyed textile material according to the invention comprising the composition according to the invention or (pre-)treated by the method according to the invention.

[0102] The textile according to the invention can be any textile known to the prior art. In particular, the term "textile" refers to finalized textile goods, i.e. goods which are ready to wear or to use. The term textile includes but is not limited to everyday clothes, work clothes, safety cloths, household textiles such as carpets, bedding, curtains and the like; denim textile like trousers, e.g. jeans; jackets; skirts; dresses; t-shirts; or the like.

Brief description of the figures

[0103]

Fig. 1a: shows textile material samples dyed with a black sulfur dye (Diresul Black RDT-K) being not (pre-)treated with the composition according to the invention or according to the method for (pre-)treating textile material with the composition according to the invention.

Fig. 1b: shows textile material samples dyed with a black sulfur dye (Diresul Black RDT-K) being (pre-)treated with the composition according to the invention or according to the method for (pre-)treating textile material with the composition according to the invention.

Fig. 2a: shows textile material samples dyed with a vat dye (leucoindigo) being not (pre-)treated with the composition according to the invention or according to the method for (pre-)treating textile material with the composition according to the invention.

Fig. 2b: shows textile material samples dyed with a vat dye (leucoindigo) being not (pre-)treated with the composition according to the invention or according to the method for (pre-)treating textile material with the composition according to the invention.

Fig.3: shows a comparison of three dyed textile material samples (dyeing with a black sulfur dye; Diresul Black RDT-K), from which the left was treated according to standard mercerization procedures prior to dyeing, the sample in the middle was (pre-)treated according to the invention and then standard mer-

cerized prior to dyeing and the textile material on the right was not (pre-)treated according to the invention and not mercerized at all prior to dyeing.

EXAMPLES

Example 1

[0104] 0.2 g of Dirsol RD® from Archroma, a polyacrylamide polyelectrolyte, is dissolved over 4 h of stirring in 100 g of water. A highly viscous, clear solution is obtained, once the polyelectrolyte solubilization is finished. Then, 1 g of di-(2-ethylhexyl)phosphoric acid (DEHPA) is added.

[0105] Meanwhile a piece of crude cotton yarn is prepared.

[0106] Also, a mercerization bath containing 170 g/L of caustic soda, and another separated dyeing bath containing 150g/L of a Diresul Black RDT-K, a commercial Sulphur Black dye produced by Archroma, are also prepared, no additional caustic soda is added. The process is done as follows:

A) First, the piece of cotton yarn is well wetted in the polyelectrolyte mixture at room temperature, ensuring that the inside of the fiber is completely soaked with said solution, then the fiber is padded and partially drained.

B) The cotton yarn obtained from A) is then passed through said mercerization bath where the caustic soda interacts with the surface of the yarn. The inside of the fiber is prevented from being altered by the mercerization bath since the caustic soda solution is not capable to substitute and remove the polyelectrolyte solution inside the fiber. After mercerization treatment, the pre-treated cotton yarn is ring-mercerized meaning only superficially altered under the influence of caustic soda. Said ring-mercerized cotton yarn is padded again and subjected to a short wash-out step using water.

C) In the washing box, the remaining excess of caustic soda is eliminated from the surface of the yarn and collected as a clean and clear caustic soda solution. After said wash-out step, the pre-treated cotton yarn is padded again and ready to be used in a subsequent dyeing step.

D) The ring-mercerized and washed-out yarn is moved at 20 to 90 °C and passed through the dyeing solution containing the black dye. Due to the ring-mercerization, the dye interacts only with the surface of the cotton yarn. Thus, the water and chemicals dissolved in this dyeing bath cannot replace the polyelectrolyte solution inside the cotton yarn and can act only in the surface.

E) The final yarn is washed, finally oxidized and dried according to already in the prior art known process to yield the final ring-dyed yarn.

[0107] This procedure was repeated with another crude cotton yarn but skipping step A) to obtain a fiber as comparison being treated according to a standard mercerization (pre-)treatment. The obtained comparative fiber can be seen in Fig. 1a.

[0108] The result of fibers treated according to the invention can be seen in Fig. 1b. The ring-dyeing achieved by the (pre-)treatment with the composition according to the invention is clearly visible.

[0109] Said ring-dyed yarn shows a dark black dyeing, at similar level when is compared with the result obtained using a conventional mercerization process, but much more superficial.

[0110] Further, the amount of caustic soda consumed in the mercerization process was reduced by 65-75% (including recovery and depending on the washing efficiency).

[0111] Surprisingly it was found that the shrinkage of a yarn pre-treated with the composition according to the invention is practically null in comparison to yarn mercerized without the pre-treatment (Fig. 3) commonly suffers from a shrinkage of around 4-10%. Further, Fig. 3 comprises a comparison with a non-mercerized textile material in which beside the less coloration due to the missing mercerization a comparable remaining length was measured as was measured for the sample pre-treated according to the invention and mercerized. Hence, an advantage can clearly be seen since deep colorations and at the same time less shrinkage can be reached.

Example 2

[0112] In this example, a cotton yarn will be dyed with a leucoindigo solution without a mercerization step. Again, two different samples were prepared, one according to the invention one according to processes known in the art.

[0113] The difference between the standard dyeing process and the process according to the invention is that in the standard process the crude cotton yarn will be contacted with the dye after being pre-scoured with water comprising only auxiliary agents in a wet-on-wet process.

[0114] The crude cotton yarn to be dyed in a process according to the invention has been soaked and pre-wetted with the polyelectrolyte solution prepared in Example 1. Both processes can therefore be considered wet-on-wet processes as well.

[0115] In Fig. 2a, the yarn dyed according to processes known in the art can be seen. In Fig. 2b, the yarn dyed according to the invention is shown.

[0116] Similar to example 1, the advantageous superficial dyeing, i.e. the ring-dyeing, is clearly visible in Fig. 2b due to the (pre-)treatment with polyelectrolytes.

[0117] This difference can for example highly influence the required conditions for the later wash-down processes as result.

Claims

1. An aqueous composition for (pre-)treating textile material, preferably in a dyeing process, wherein the composition at least comprises

   at least one polyelectrolyte,
   preferably at least one wetting agent, and
   water.

2. The aqueous composition according to claim 1, wherein the at least one polyelectrolyte is selected from polyacrylamide polyelectrolytes; and/or wherein the at least one wetting agent is selected from phosphoric acid esters, preferably di-(2-ethylhexyl)phosphoric acid (DEHPA); or an alkoxylate alcohol, or an alkylphenol or derivatives; or a mixture thereof.

3. The composition according to at least one of claims 1 to 2, wherein the aqueous composition comprises

   from 0.01 to 10% by weight of at least one polyelectrolyte,
   from 0.01 to 10 % by weight of at least one wetting agent,
   from 75 to 99.9 % by weight water,

   wherein weight percent are based on total weight of the aqueous composition.

4. Method for manufacturing the aqueous composition according to at least one of claims 1 to 3 comprising the following steps a) to c):

   a) Mixing and homogenizing the at least one polyelectrolyte with water;
   b) Allowing the polyelectrolyte to swell until a viscous gel is obtained;
   c) Optionally adding and mixing other additives, preferably at least one wetting agent, to the viscous gel obtained in b).

5. Method of (pre-)treating textile material, comprising steps A) and B):

   A) Providing an aqueous composition according to at least one of claims 1 to 3 or as prepared by the method according to claim 4;
   B) Applying the aqueous composition of step A) to textile material and optionally repeating this step.

6. Method according to claim 5, wherein the method of (pre-)treating textile material is done at a temperature in the range of from 5 to 90 °C, preferably from 10 to 40 °C or at room temperature.

7. Method according to at least one of claims 5 or 6, wherein the method of (pre-)treating textile material is done for a time in the range of from 2 to 60 s.

8. Method according to at least one of claims 5 to 7, wherein the textile material is treated in a continuous manner.

9. Method according to at least one of claims 5 to 8, wherein the method further comprises steps C) and/or D) subsequently to step B):

   C) Treating the textile material obtained from step B) in a mercerization step;
   D) Optionally washing the textile material obtained from step C and/or optionally recovering excessive caustic soda remaining on the textile material from step C);

   optionally, wherein the method further comprises step E) subsequently to step B) or step D):

   E) Dyeing the textile material obtained from step B) or step D), preferably with a sulfur dye or a vat dye such as indigo.

10. Method according to at least one of claims 5 to 9, wherein the textile material comprises or consists of cellulose, cotton, hemp, linen, jute, viscose, modal, or mixtures thereof.

11. Use of polyelectrolyte for the (pre-)treatment of textile material, preferably in a dyeing process, further preferably in a ring dyeing process.

12. Use of polyelectrolyte according to claim 11, wherein the polyelectrolyte is comprised in an aqueous composition according to at least one of claims 1 to 3.

13. Dyed or undyed textile material (pre-)treated with the aqueous composition according to at least one of claims 1 to 3 or as manufactured according to claim 4; or dyed or undyed textile material manufactured according to at least one of claims 5 to 10; wherein the dyed or undyed textile material is preferably yarn, woven, non-woven or knitwear.

14. Method of manufacturing a textile, wherein a dyed or undyed textile material according to claim 13 is used.

15. Textile manufactured according to claim 14; or textile comprising or consisting of the dyed or undyed textile material according to claim 13, preferably wherein the textile is denim textile like trousers, e.g. jeans; jackets; skirts; dresses; t-shirts; or the like; or everyday clothes, work clothes, safety cloths, household textiles such as carpets, bedding, curtains and the like.

Fig. 1a

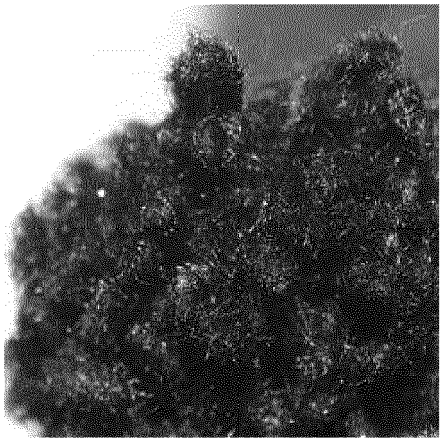


Fig1b

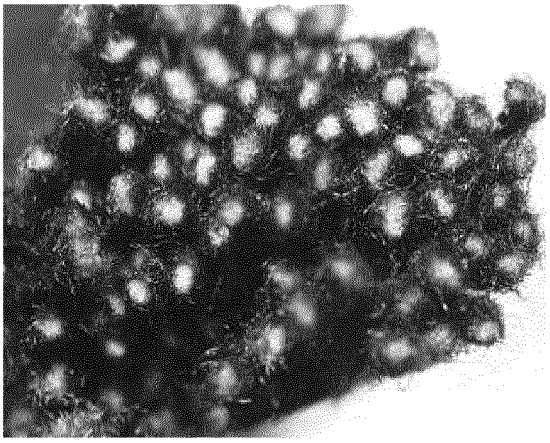


Fig. 2a

Fig. 2b

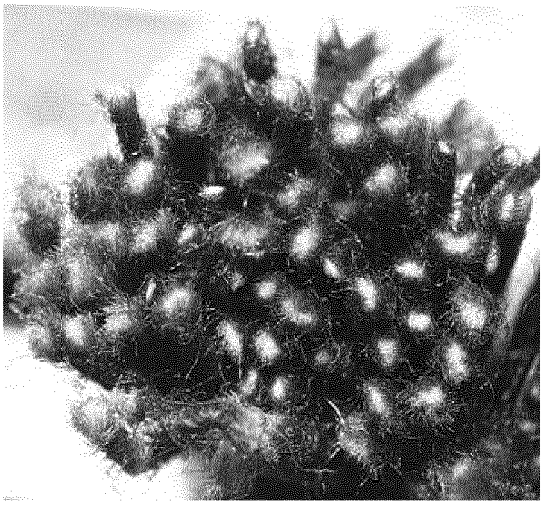
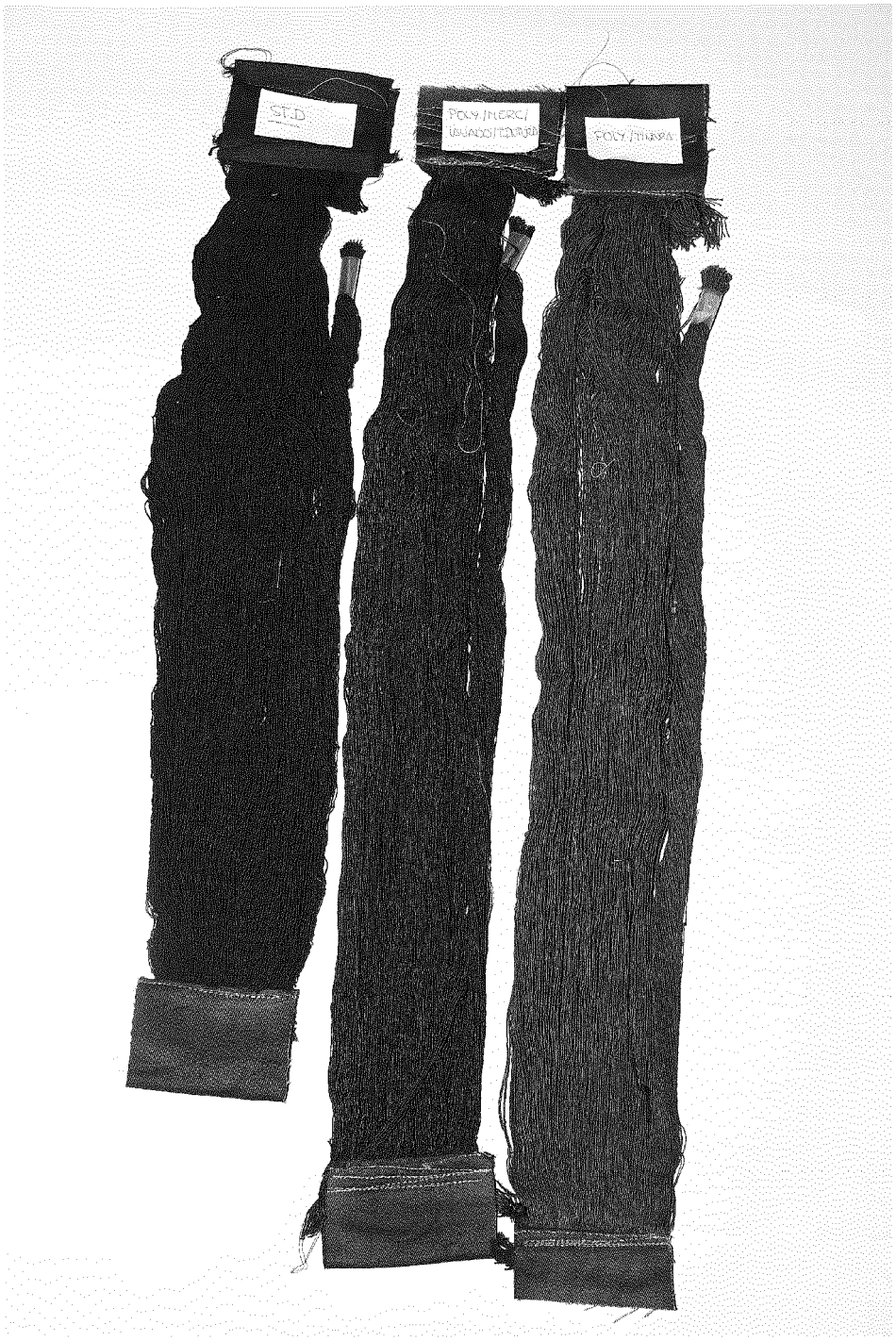


Fig. 3



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EUROPEAN SEARCH REPORT

Application Number
EP 23 38 2460

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The Hague	1 November 2023	Rella, Giulia

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