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(11)

EP 1 621 604 A2

(12)

EUROPEAN PATENT APPLICATION

(43) Date of publication:

01.02.2006 Bulletin 2006/05

(51) Int Cl.:

C11D 3/00 (2006.01)

C11D 3/37 (2006.01)

C11D 17/04 (2006.01)

C11D 3/22 (2006.01)

(21) Application number: **05425530.2**

(22) Date of filing: **22.07.2005**

(84) Designated Contracting States:

**AT BE BG CH CY CZ DE DK EE ES FI FR GB GR
HU IE IS IT LI LT LU LV MC NL PL PT RO SE SI
SK TR**

Designated Extension States:

AL BA HR MK YU

(30) Priority: **29.07.2004 WOPCT/IT20/04000419**

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(54) **Colour scavenger material**

(57) The present invention relates to a dye-scavenger material for the colour released by laundry in washing water comprising a substrate in natural and/or synthetic fabric, non-woven natural and/or synthetic fabric, and paper, and an additive comprising cationic heterocyclic pol-

ymers, proteins, chitin, chitosan, polyvinylamine (PVA), polyethylenimine (PEI), acrylic polymers, vinylic polymers, polyamine-N-oxide and their blends. The invention also relates to a process for obtaining said material.

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Description

[0001] This invention relates to a material for removing excess colour in washing water and a method for its production.

[0002] It is known that the majority of "coloured" garments lose a certain amount of colour in washing water, and must therefore be washed separately from "white" garments, to prevent them from becoming partially or totally coloured.

[0003] This has created a problem for housewives all over the world, and has always been resolved by carefully separating "whites" from "coloureds", using low temperature washing machine programmes, or by trying to make pigments more suitable for the fabrics.

[0004] In all these cases, the desired results are not always obtained, and very often after a machine wash, some of the "whites" are partially or totally coloured.

[0005] This invention faces the problem from another viewpoint, in other words, it provides a material that is able to totally eliminate any colour present in washing water, thus preventing the dyeing of the "white" garments. Consequently, the "coloureds" and "whites" can be washed in the machine at the same time in the presence of the material of the present invention which acts as a "dye scavenger".

[0006] The present invention relates to a material comprising a substrate and a suitable additive that removes the colour.

[0007] The substrate can comprise any type of material that is compatible with normal laundry, and can have any form and size, such as, for example a handkerchief or a piece of cloth. Preferably, the substrate has the form of a handkerchief.

[0008] Typically the substrate is a natural and/or synthetic fabric, a natural and/or synthetic non-woven fabric and/or paper. Preferably the substrate is a natural and/or synthetic non-woven fabric, and more preferably a synthetic non-woven fabric. Non-woven fabrics that can be conveniently used are: spunlaced, spunbonded, thermobonded, and airlaid materials.

[0009] The terms spunlaced, spunbonded, thermobonded, and airlaid refer to both the non-woven fabrics as well as the techniques for obtaining them, well known in the art. The fibres preferably used to obtain these non-woven fabrics are made of: polyester (PE), polypropylene (PP), PLA (polylactics), polyethylensulfone (PES), acrylic polymers, regenerated cellulose, for example, lyocell® (that is regenerated cellulose fibre, obtained using a process of dissolving and spinning in organic solvent) or tencell® (produced in three layers with the fibres on the two external sides and fluff pulp in the middle; or produced in two layers of fibre/fluff pulp), cotton, viscose or their blends. Preferably, the substrate is 100% regenerated cellulose, for example: lyocell® or tencell®. More preferably, the substrate is 100% regenerated cellulose obtained using the spunlaced technique.

[0010] The substrate performs the function of "carrier"

of the additive, which removes the colour.

[0011] The additive can be any type of substance that has a very high affinity for colourants. In fact the principle at the base of this invention is the fact that the colourant released in the washing water by the coloured garments has a greater affinity for the material of the present invention than for the fabric of the "whites".

[0012] Preferably, the additive will be selected from: cationic heterocyclic polymers, proteins, chitin, chitosan, polyvinylamine (PVA), polyethylenimine (PEI), acrylic polymers, vinylic polymers, polyamine-N-oxide and their blends. More preferably, the additive is selected from: cationic heterocyclic polymers, acrylic polymers, vinylic polymers and their blends. Even more preferably, the additive is a cationic heterocyclic polymer, for example the COBRAL MM marketed by the company, Lamberti S.p.A..

[0013] The material object of the present invention can be obtained by combining in any manner, one of the substrates listed above with one or more of the additives. The preferred material comprises the non-woven, 100% regenerated cellulose, spunlaced fabric and a cationic heterocyclic polymer. An example of 100% regenerated cellulose is the material lyocell® and an example of the cationic heterocyclic polymer is COBRAL MM.

[0014] The substrate preferably has a weight that ranges between 150 grams/m² and 50 grams/m², more preferably between 100 grams/m² and 60 grams/m². The fibres of the substrate preferably have a size that ranges between 0,5 dtex and 5 dtex, preferably between 1 dtex and 2 dtex.

[0015] The additive is fixed on and/or incorporated into the substrate by means of: impregnation, spraying, printing and/or plating and the relation existing between the additive and the substrate can be: absorption, adsorption, hydrogen bonding, electrostatic force for example ion/ion interaction or ion/dipole interaction, incorporation, chemical or physical bonds, etc.

[0016] Under another aspect, the present invention relates to a process for the production of the dye scavenger.

[0017] Said process comprises the following steps:

- a) Provide a substrate comprising one of the following materials: natural and/or synthetic fabric, natural and/or synthetic non-woven fabric and paper;
- b) Process the substrate with the additive described above;
- c) Pass the processed substrate through two or more rollers in order to remove any excess additive;
- d) Dry the substrate.

[0018] In step b) the substrate is preferably processed by means of impregnation, spraying, printing and/or plating, all of which are techniques known to the art. Preferably, the additive is applied by spraying and/or impregnation, and more preferably by impregnation.

[0019] In the case where impregnation techniques are used, the substrate is passed through a solution of the

additive having a suitable concentration in order to leave on the finished material an amount of additive ranging between 0,5% and 50% in weight on the finished material, preferably between 5% and 25%, more preferably between 10% and 22%.

[0020] The additive solution is preferably an aqueous solution made alkaline by the addition of a base, preferably NaOH. The concentration of the base ranges between 5 and 100 grams/litre, preferably between 8 and 50 grams/litre, more preferably between 10 and 30 grams/litre. The additive concentration generally ranges between 5 grams/litre and 300 grams/litre, preferably between 25 grams/litre and 200 grams/litre, more preferably between 100 grams/litre and 180 grams/litre.

[0021] In step c), the substrate is passed through two or more rollers and pressed in order to eliminate any excess additive and to leave on the substrate the required amount (foulard technique). The pressing pressure will depend on the amount of additive to be left in the finished material and on the concentration of the solution or the additive as applied during stage a).

[0022] The steps a) and b) and c) can be performed at any suitable temperature that does not alter the properties of the substrate and the additive, preferably at room temperature.

[0023] During stage d), the substrate is dried, preferably in an oven, at a temperature ranging between 100°C and 220°C, preferably between 130°C and 180°C, for a period of time that depends on the amount of additive and solvent present, on the temperature and the efficiency of the drying system.

[0024] For example, in order to obtain a material that contains an amount of additive ranging between 5% and 25%, using additive solutions with a concentration between 100 grams/litre and 180 grams/litre, pressing can be applied at a pressure ranging between 0,5 and 5 bar, preferably approximately 2 bar and drying can be performed at a temperature ranging between 130°C and 180°C, for a period of time between 1 and 5 minutes, preferably approximately 3 minutes.

[0025] The aforesaid parameters can be easily modified by those skilled in the art according to the final material that is required (that is with a greater or lesser amount of impregnated additive) and the machines that are available. For example, if a very efficient oven is available, the drying time can be reduced considerably, thus speeding up the whole process; if the foulard technique is used wherein pressing is performed using three cylinders, the applied pressure could be less than that used when pressing with two cylinders, etc.

[0026] The process should be preferably performed continuously, that is, the substrate is subjected to impregnation, pressing and drying without any intermediate stages or pauses (possibly to permit the additive to bond better with the substrate) between one process and another. All this is possible because the additive possesses a very high affinity for the substrate and, therefore the required amount of additive bonds with the substrate al-

most instantly and it is not necessary that the substrate be left to impregnate for a long period of time.

[0027] The dye scavenger material of the present invention is normally introduced into conventional domestic or professional washing machines before the beginning of the washing cycle together with the "white" and "coloured" laundry.

[0028] The term, "whites" refers to a laundry wash comprising white and light coloured fabrics (for example: beige, pale pink, pale blue, grey etc.); preferably light coloured fabrics.

[0029] The term "coloureds" refers to a laundry wash comprising strongly coloured fabrics (for example: red, bordeaux, yellow etc.) or very dark colours (for example: navy blue, black, dark green, denim etc.). These fabrics can be new or can have already been subjected to washing in a washing machine. Preferably, by "coloureds" the term refers to a laundry wash comprising strongly coloured fabrics (for example: red, bordeaux, yellow, orange, etc.); and more preferably this refers to strongly coloured fabrics that have been previously washed 5 or 6 times.

[0030] Ideally, the material of the invention is introduced into the washing machine together with light coloured and strongly coloured fabrics coloured fabrics that have already been previously washed 5 or 6 times. The number of material sheets of the invention that are used for each wash will depend on the weight of laundry and the colours present. Preferably, 2 or more sheets of the material of the invention are introduced into the washing machine in the case of fabrics that loose a large amount of colour, for example cotton fabrics with strong intense colours.

[0031] The material of the invention is resistant to normal washing temperatures and common detergents and additives, including bleach, and can be used repeatedly several times before losing its efficacy.

EXAMPLE I

[0032] A solution is prepared mixing 1 litre of water with 150 grams of COBRALL MM and 20 grams of NaOH 36°be. A piece of 100% lyocell® non-woven fabric with a weight of 70 grams/m² is passed in a continuous manner, through a bath containing the aforesaid solution so that it is well impregnated, then passed through two rollers that press the material at a pressure of 2 bar, and finally through a cylinder oven, where it is dried at 150°C for 3 minutes. The amount of additive present on the substrate is 30% in weight based on the weight of the finished material, if the pk del foulard (that is the % of the liquid that remains in the non-woven fabric after pressing) is equal to 200%.

EXAMPLE II

[0033] The material obtained in example I is placed in a domestic washing machine together with light coloured

garments: beige and pink, and strongly coloured garments already washed 6 times: red and yellow. The garments are washed at 60°C for approximately 2 hours. During the washing cycle the water remains clear all the time, and on completion, it can be seen that there is no partial or total colouring of the light coloured garments; the colour lost by the strongly coloured garments has been retained by the dye scavenger and the material has been subjected to no alteration.

ADVANTAGES

[0034] The material of the invention is far more resistant, especially when it is wet, than the cotton that is normally used as a substrate for this type of product. The combined action of the substrate and the additive which both possess a high affinity for the pigments, provide a very efficient capacity for retaining the colour present in the washing water, for higher than other products known in the art.

[0035] The process of the invention is very rapid in that it can be performed in a continuous manner and has a limited number of stages. This provides a considerable saving in time and energy. In fact, the final material is obtained within a few minutes since the additive is bonded with the substrate almost immediately, and it does not need to be left to rest for hours (to ensure that the additive is absorbed in the substrate) as occurs with the processes known in the art. All this is possible thanks to the use of the additives of the present invention that possess a very high affinity for the substrate and are absorbed in efficacious amounts almost immediately.

[0036] The particular preferred combination between a substrate in 100% regenerated cellulose, for example lyocell®, and a cationic heterocyclic polymer, for example COBRAL MM, is the one that has allowed the best possible results in terms of resistance to conditions of use (and therefore provides the possibility of repeated use) and in terms of efficiency as a scavenger.

[0037] Therefore, the present invention provides a material and a production process higher in quality and efficiency than those described in known state of the art.

Claims

1. Dye-scavenger material for the colour released by laundry in washing water comprising a substrate and an additive **characterised in that** said substrate is selected from a group composed of : natural and/or synthetic fabric, natural and/or synthetic non-woven fabric, and paper, and that said additive comprises one of the following compounds: cationic heterocyclic polymers, proteins, chitin, chitosan, polyvinylamine (PVA), polyethylenimine (PEI), acrylic polymers, vinylic polymers, polyamine-N-oxide and their blends.

2. Material according to claim 1 wherein said substrate is a non-woven spunlaced, spunbonded, thermobonded, airlaid fabric.

3. Material according to claim 1 or 2 wherein said substrate is a non-woven synthetic spunlaced, spunbonded, thermobonded, airlaid fabric.

4. Material according to any one of the claims from 1 to 3 wherein said substrate is a non-woven, 100% regenerated cellulose spunlaced fabric.

5. Material according to any one of the claims from 1 to 4 wherein said substrate is spunlaced lyocell.

6. Material according to any one of the claims from 1 to 5 wherein said substrate has a weight that ranges between 150 grams/m² and 50 grams/m², preferably between 100 grams/m² and 60 grams/m².

7. Material according to any one of the claims from 1 to 6 wherein said additive is a cationic heterocyclic polymer.

8. Material according to any one of the claims from 1 to 6 wherein said additive is COBRAL MM.

9. Production process for dye scavenger material comprising the following steps:

a) Provide a substrate selected from the group composed of: natural and/or synthetic fabric, non-woven natural and/or synthetic fabric, and paper;

b) Process the substrate with an additive according to any one of the claims from 1 to 8;

c) Eliminate any excess additive;

d) Dry the substrate.

10. Process according to claim 9 wherein, during step b), the substrate is processed by means of impregnation, spraying, printing and/or plating.

11. Process according to claim 9 or 10 wherein, during step b), the substrate is processed by impregnation.

12. Process according to claim 11 wherein, during step b) in the case where the impregnation technique is used, the substrate is passed through a solution of the additive.

13. Process according to claim 12 wherein said solution of the additive is an aqueous solution made alkaline through the addition of a base, preferably NaOH.

14. Process according to claim 12 or 13 wherein the amount of the base used ranges between 5 and 100 grams/litre.

15. Process according to any one of the claims from 12 to 14 wherein the amount of base used ranges between 8 and 50 grams/litre, preferably between 10 and 30 grams/litre. 5
16. Process according to any one of the claims from 12 to 15 wherein the concentration of the additive ranges between 5 and 300 grams/litre.
17. Process according to any one of the claims from 12 to 16 wherein the concentration of the additive ranges between 25 and 200 grams/litre, preferably between 100 and 180 grams/litre. 10
18. Process according to any one of the claims from 9 to 17 wherein during stage c) any excess additive is removed by passing the substrate through two or more rollers. 15
19. Process according to any one of the claims from 9 to 18 wherein, during step d), the substrate is dried in an oven at a temperature ranging between 100 and 220°C preferably between 130 and 180°C. 20
20. Process according to any one of the claims from 9 to 19 wherein, during step d), the substrate is dried for a period of time ranging between 1 and 5 minutes, preferably approximately 3 minutes. 25
21. Process according to any one of the claims from 9 to 20 that is performed in a continuous manner. 30
22. Material obtainable by means of the process according to any one of the claims from 9 to 21. 35
23. Use of the material according to any one of the claims from 1 to 8 to remove the colour present in the washing water of a laundry wash.
24. Method for removing colour from washing water of a laundry wash using the material according to any one of the claims from 1 to 8 comprising the following steps: 40
 - Provide an aqueous bath containing laundry of various colours; 45
 - Include in said bath the material according to any one of the claims from 1 to 8;
 - Leave said material in said bath for a total wash cycle in a washing machine after which said material and said laundry are separated, with the result that said material has captured all the colour present in the washing water. 50
25. Method according to claim 24 wherein the steps are repeated many times in the presence of the same material. 55