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(54) **Method for washing coloured clothes in a domestic washing machine**

(57) A method for washing coloured clothes in a domestic washing machine comprises a preliminary phase in which water and an additive containing a colour protector compound are added to the tub, a tumbling phase

in order to allow wetting of clothes and a spinning phase for removing at least a portion of water and additive from clothes before starting a washing program, the temperature of water and additive being preferably comprised between 5°C and 30°C.

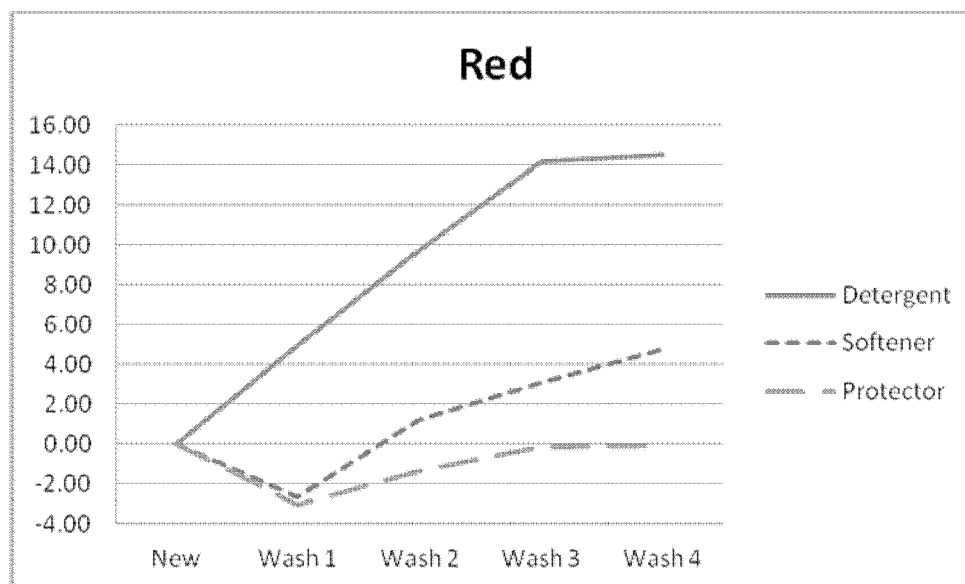


Figure 2

Description

[0001] The present invention relates to a method for washing coloured clothes in a domestic washing machine comprising a washing tub.

[0002] It is well known in the art of domestic appliances that a washing program of a domestic washing machine comprises a first washing phase in which water and detergent are added to the washing tub, followed by a tumbling phase in which the clothes are moved inside a drum rotating in the tub in order to guarantee the proper interaction between detergent and clothes, a rinsing phase during which detergent is removed from clothes and a rinsing agent or conditioner is added to clothes, and a final spinning phase in which rinsing water is mostly removed from clothes. Of course there can be differences in the basic washing program (for instance there can be a pre-washing phase for particularly dirty clothes), but basically the above phases are always present in known washing programs.

[0003] A technical problem encountered in washing machines using traditional washing programs is the colour fading and the colour transfer. These are two well known phenomena that affect negatively the washing process of coloured garments.

[0004] The colour fading is the loss of colour of a coloured garment that in time causes a brilliant tint to become paler with an evident "old" aspect and a significant loss of appeal.

[0005] At the same time the dye that is released in the washing liquor can be absorbed by a white or a light coloured item, changing the original colour in an undesired way. The above issues are among the major concerns for the domestic laundry in the present market.

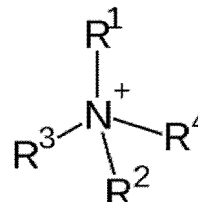
[0006] The textile industries are using a variety of different dyes and a variety of different processes to produce coloured items, depending on different fibres and textiles.

[0007] Among dyes, the kind that gives most of the described issues is a dye category used for cotton and known as 'direct' dyes. These are also the dyes which are most used by textile industries.

[0008] In the recent years, some of the producers of chemicals for domestic use have launched on the market some 'absorbing' sheets that are claimed as capable to prevent the colour transfer and, more recently, also the colour fading. What those sheets do is simply to absorb some of the dyes that are released in solution by the coloured garments, becoming coloured themselves, and giving the user the impression to have captured all of the 'dangerous' dyes that could 'stain' their whites. One of the known solutions of using a dye scavenger sheet comprising a cellulosic substrate material bearing a dye scavenger chemical is disclosed by US 4380453.

[0009] If on one side it is true that those scavenger sheets are capable to capture some of the dyes, it is also true that this kind of action is not enough to prevent safely a colour transfer.

[0010] Even if in the professional market colour protectors are used in a pre-treatment, i.e. before an industrial washing cycle, nevertheless this kind of treatment has remained during years confined in the professional washing market. The main component of these known colour protectors belong to a class of organic substances known as quaternary ammonium salts or "quats". They have a general formula $R_4N^+ X^-$ where R represents an organic radical and X^- is a compatible anion:



[0011] R^1 is usually a C_{12} to C_{22} alkyl or alkenyl chain; R^2 , R^3 and R^4 are independently selected from C_1 to C_4 alkyl chains. A usual compound of this type is the quaternary ammonium compound cetyl trimethyl quaternary ammonium bromide.

[0012] But of course there is a number of different quats, with a number of different usages, including disinfection, fabric softening, colour protection and so on.

[0013] It is an object of the present invention to provide a method for washing coloured clothes in a domestic washing machine which can avoid or limit colour fading and/or colour transfer, and without the need of using dye scavenger sheets or similar devices.

[0014] The above object is reached thanks to the features listed in the appended claims.

[0015] The applicant has discovered that with a modification of the normal washing cycle and with the addition of a commercial additive containing a colour protector it is possible to have very good results in terms of low colour fading and colour transfer, surprisingly comparable with the results obtained in professional washing market where specific colour protectors are used. Surprisingly, the applicant has discovered that by using a rinse conditioner (known also as "fabric softener") in a preliminary wetting phase before the usual washing program, the amount of quaternary ammonium compound contained in the commercial rinse conditioner is sufficient for getting good result in terms of colour fading and colour transfer, without any interaction problems with other compounds contained in the rinse conditioner. This has the further advantage of not adding another chemicals to the ones already used during washing cycle.

[0016] According to another feature of the present invention, in order to limit the negative interaction between the quaternary ammonium compound and the anionic surfactants contained in the detergent used in the washing phase, after the preliminary wetting phase with water and additive containing the colour protector compound, the laundry undergoes a spinning phase for removing at least the major quantity of such compound.

[0017] Given the above similarity between the colour protectors compounds and the fabric softener (particularly as far as the common active compound is concerned), the applicant has designed for a domestic washer a specific cycle for the coloured garments that includes a pre treatment before the washing phase. This specifically designed pre-treatment may use both the fabric softener as well as a specific product for the colour protection. The overall result is a washing cycle that cleans the coloured garments but at the same time limits or avoids the two undesired effects of colour fading and colour transfer. The availability of this cycle in a domestic washing machine gives to the user the possibility to wash garments of different colours and also white garments without the need of sorting them.

[0018] Further advantages and features of a method and of a washing machine according to the invention will become clear thanks to the following detailed description, with reference to the attached drawings in which:

- Figure 1 is an experimental chart showing the result of tests on the behaviour of white samples added to a 2 kg cotton load referring to the original reflectance value and variations measured after the first, second, third and fourth washing cycle and by using or not using a method according to the invention;
- Figures 2-4 are experimental charts showing the results of a series of tests carried out using coloured samples (red, blue and black respectively) added to a 2 kg cotton load.

[0019] With reference to the drawings, the tests have been done using coloured test specimens that, if washed in a normal cycle, release the dye. The washing machine used for the test is a commercial Whirlpool washer AWO/D 6188 WP (8 kg) modified in order to carry out the preliminary phase according to the invention. The detergent used for all tests is 60 ml of "Perlana Nero Assoluto" produced and sold by Henkel.

[0020] The specimen are used in the ISO testing for the colour transfer and are coloured using dyes belonging to the group of the so called 'direct dyes', which are the dyes more critical from the point of view of the colour fading and transfer.

[0021] The measurement on these specimens has been done using the same colorimeter used for the measurement of the soil removal.

[0022] The desired effect is that the white remains white (so keeping a high percentage of reflectance) and the intense colour remain intense (so keeping a reflectance value as low as possible).

[0023] The chart of figure 1 shows the behaviour of the white sample referring to the original reflectance value and the variation measured after the first, second, third and fourth washing cycle.

[0024] The comparison is among the use of the detergent only (including a preliminary phase with water only), the pre-treatment done with 30 ml of a commercial fabric

softener Downy (Procter & Gamble - containing about 15% of quaternary ammonium cationic compounds) and about 10 litres of water, and a pre-treatment done with 30 ml of a professional colour protector produced and sold by the company Alberti Angelo in the same amount of water used for the commercial fabric softener.

[0025] The Y axis shows the percentage of variation of the reflectance.

[0026] It is immediately evident from figure 1 that the fabric softener and the color protector are capable to preserve better the white (higher reflectance value) than the detergent only. Some variation in the measurement are normally caused by the measurement noise but, despite of that, the trend is absolutely evident.

[0027] The measurement done on the red samples (figure 2) shows a clear increase of the 'whiteness' of the sample, that means simply a fading of the original color, when the pre-treatment is not used (detergent only).

[0028] It is absolutely evident that the pre-treatment with both chemicals (softener and professional protector) reduces substantially the fading, preserving the brilliance and the sharpness of the color for a longer time. It is also clear that if the garment loses less color, there is less dye in solution that can be transferred to other items.

[0029] The blue specimen (figure 3) behaves in a very similar manner. Once again there is a clear evidence of color protection with both chemicals.

[0030] The black sample (figure 4) shows a quite surprising trend to increase the color intensity. This may be due to a starting value of reflectance that is very low (the absolute magnitude is around 4% of reflected light) and so even small variations due to the noise of the measurement are amplified by the low reference figure. Despite of that, the trend of the protection effect is well visible.

[0031] As shown in the charts, there is evidence of color protection and reduction of colour transfer by using both the fabric softener and professional protector. Very similar results have been obtained by using other commercial fabric softeners, particularly "Fabuloso concentrato" (30 ml) produced and sold by Colgate, W-pro fabric softener produced and sold by the applicant (30 ml), Carrefour softener (25 and 50 ml). The content of ammonium cationic compounds in "Fabuloso concentrato" (as declared by the producer) is higher than 25%, while in the other two softeners it is above 15%.

[0032] In general, good results in terms of colour protection are obtained with a concentration of the commercial fabric softener comprised between 1 and 10 ml of softener per litre of water, i.e. a volume concentration between 0,1 % and 1 %.

[0033] Unfortunately, the behaviour of the two chemicals (softener and colour protector) interferes with the action of the detergent. Cationic surfactants (fabric softener) and in general the quats, react with the anionic surfactant of the detergents forming insoluble compounds. This causes two different, undesired effects:

- the concentration of the available anionic surfactant decreases, decreasing the cleaning power of the washing solution;
- the insoluble compound may precipitate on garments or on washer surfaces; this may cause spots on the garments and, in the long run, deposition of sludge on the washer.

[0034] In order to minimize the interaction between the color protection and the washing action, it is important to reduce as much as possible the amount of quats remaining in the solution after pre-treatment.

[0035] The above is achieved by increasing the spin speed between the pre-treatment and the main wash or even by introducing a rinse step after pre-treatment. The applicant has discovered that the concentration of ammonium compounds on the fabric even after a water rinse step is sufficient for yielding the colour protection effect.

[0036] Temperature, duration, chemical concentration, spin speed, are among the parameters that require tuning to get the optimal performance, depending also on the washing machine used and on the fabric softener used. This tuning can be easily done by a person skilled in the art of designing washing machines.

[0037] The pre-treatment has been preferably structured as follows:

- pre-fill of clean water;
- introduction of the protective chemical by water flow, while tumbling;
- heating to a predetermined temperature, preferably between 5 °C and 30°C, while tumbling;
- tumbling for a predetermined time (usually comprised between 5' and 20') to mix carefully;
- drain of the used liquor;
- spin extraction.

[0038] At the end of the above steps, the normal washing cycle will start, which can be preceded by the already mentioned extra rinse phase.

[0039] In conclusion, there is a clear evidence that the pre-treatment according to the invention works for the color protection and brings a clear advantage for the consumer using a domestic washer. It protects the colors, particularly of cotton garments, maintaining for much longer the original brightness.

[0040] The experiments done so far by the applicant show without any doubt that the theory works and the special cycle according to the invention delivers an unmatched result in a domestic washer as far as colour protection is concerned.

[0041] The modifications of a usual washing machine in order to make it fit for carrying out a method according to the invention are quite limited. In the detergent and additives distributor it is necessary to add a container or drawer which can be flushed by water into the tub and the user interface has to be provided with a button or knob which is related to the special "colour" program,

driven by a control process unit which controls either the amount of water to be added in the preliminary step, the duration of tumbling, the temperature to be reached in such preliminary phase and the final spinning speed and time.

Claims

1. Method for washing coloured clothes in a domestic washing machine comprising a washign tub, **characterized in that** before a wahsing program, it comprises a phase in which water and an additive containing a colour protector compound are added to the tub, a tumbling phase in order to allow wetting of clothes and a spinning phase for removing at least a portion of water and additive from clothes.
2. Method according to claim 1, wherein during tumbling the temperature of water and additive is comprised between 5°C and 30°C.
3. Method according to claim 1 or 2, wherein after the spinning phase the clothes are rinsed with water.
4. Method according to any of the preceding claims, wherein the color protector compound is a quaternary ammonium compound.
5. Method according to claim 4, wherein the additive is a commercial rinse conditioner.
6. Method according to claim 4, wherein the concentration of rinse conditioner in water is between 1 ml/l and 10 ml/l.
7. Domestic washing machine comprising a washing tub in wich it is rotatably mounted a drum, a control process unit and a user interface, **characterised in that** the control process unit, upon a specific choice of the user through the user interface, is adapted to carry out a preliminary step in which water and an additive containing a colour protector compound are added to the tub, the load is tumbled for a predetermined period and then the load is spun at a pretermined spinning speed before starting the washing cycle.
8. Domestic washing machine according to claim 7, comprising a distributor device for charging the additive to be used in said preliminary step.

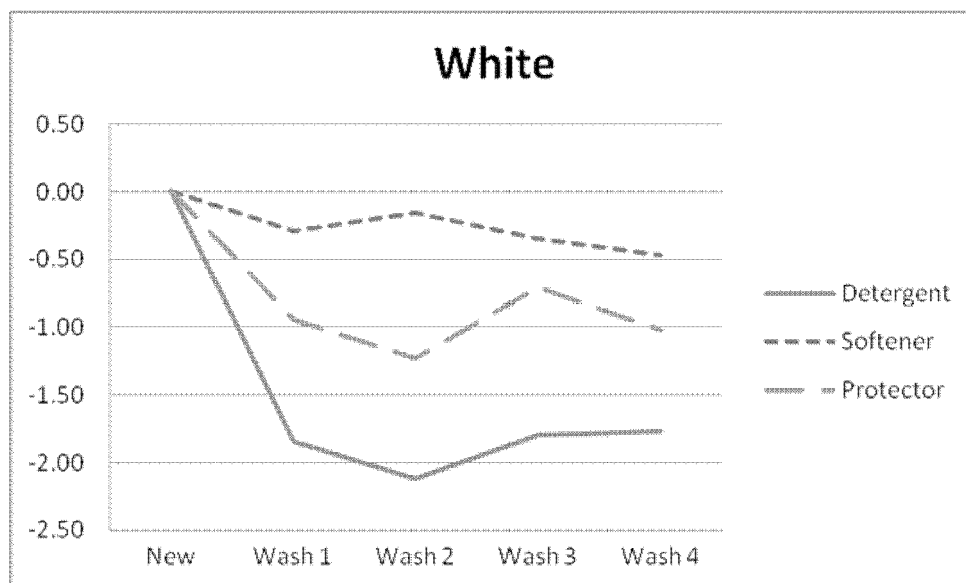


Figure 1

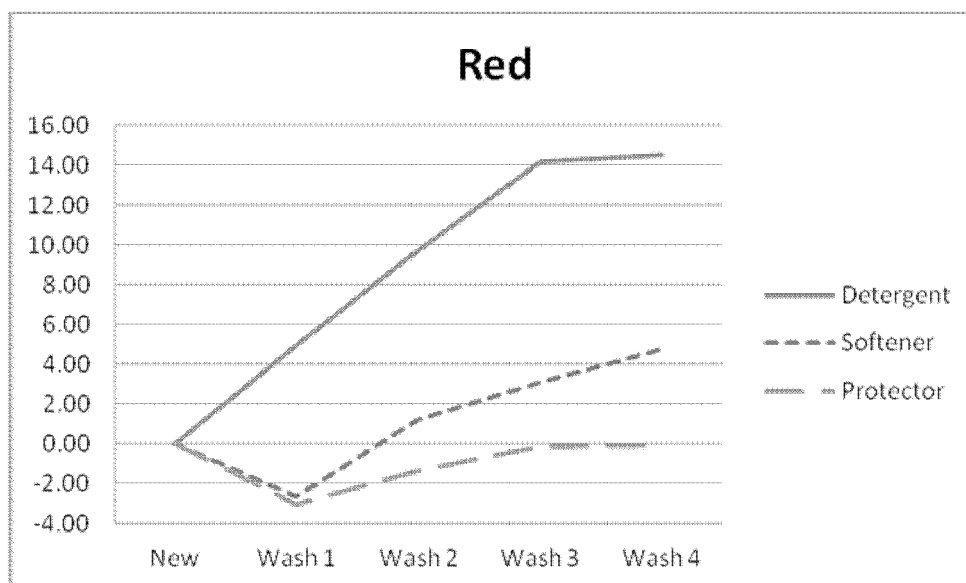


Figure 2

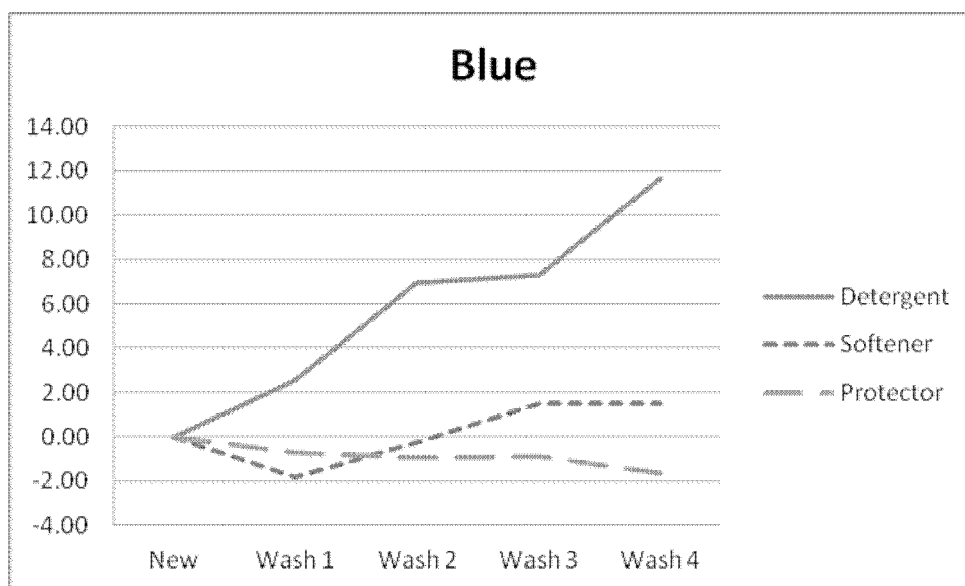


Figure 3

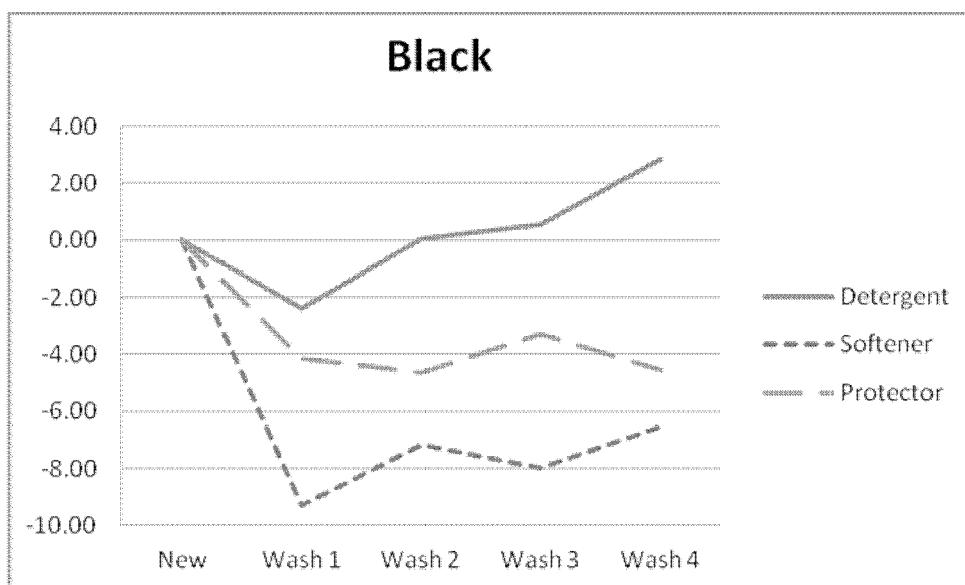


Figure 4



EUROPEAN SEARCH REPORT

Application Number
EP 12 17 8331

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The present search report has been drawn up for all claims			TECHNICAL FIELDS SEARCHED (IPC) D06F
Place of search Munich		Date of completion of the search 23 January 2013	Examiner Clivio, Eugenio
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 P : intermediate document T : theory or principle underlying the invention E : earlier patent document, but published on, or after the filing date D : document cited in the application L : document cited for other reasons & : member of the same patent family, corresponding document			

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EPO FORM 1503 03.82 (P04C01)

**ANNEX TO THE EUROPEAN SEARCH REPORT
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The members are as contained in the European Patent Office EDP file on
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