A preparation for application onto a cellulosic fabric or textile material includes a blended mixture of wool particles or wool powder, and a binding agent. The functional additive is carried by the wool particles. The wool particles or wool powder is preferably of macrofibril size or below. Such a preparation exhibits exceptional functional additive-carrying and retention ability which enhances the durability of functional enhancements of a cellulosic fabric material. In another embodiment, the preparation includes a mixture of powdered bamboo fibre, carrier agents, and binding agents. Preferably, the non-charcoal fibrous bamboo powder is nano-sized having an ultrafine particle size, e.g., 1 µm or below. Fabric materials treated with ultrafine bamboo fibre powder have good moisture management properties.
Figure 2. Schematic diagram of wool fibre (source from: CSIRO, “The chemical and physical structure of merino wool”, http://www.csiro.au/files/files/p9ti.pdf)

Figure 3. Schematic diagram of a wool fibre showing cuticle and cortical cell (source from: CSIRO, “The chemical and physical structure of merino wool”, http://www.csiro.au/files/files/p9ti.pdf)
Figure 4. UPF of zinc oxide, titanium dioxide, ultrafine bamboo and ultrafine wool treated fabric after 25 washes.

Figure 5. Comparison of wicking for control untreated and treated 100% cotton single jersey fabric.
Figure 6. Wrinkle recovery angle of untreated and treated before and after washing 100% cotton poplin fabrics.
PREPARATION FOR APPLICATION ONTO A CELLULOSIC FABRIC OR TEXTILE MATERIAL AND TEXTILE ARTICLES COMPRISING SAME

FIELD OF THE INVENTION

[0001] The present invention relates to fabrics and textiles, and more particularly to cellulosic fabric or textile materials. More specifically, although not solely limited thereto, this invention relates to preparations for application onto a textile or fabric material comprising cellulosic fabric to enhance utility. More particularly, although not solely limited thereto, the present invention relates to methods of applications of functional utility enhancing preparations onto a cellulosic material, and textile articles comprising cellulosic fabric material applied with such preparations.

BACKGROUND OF THE INVENTION

[0002] Textile articles comprising cellulosic fabric or textile materials such as cotton, linen, or other natural fibers are popular because of their various properties. In many textile goods, it is desirable to add functional additives to enhance the utility of such textile goods. For example, it is desirable to enhance ultraviolet protection, anti-bacterial, odor absorbing properties, or other useful properties to textile goods. However, the stability or performance of known textile articles comprising cellulosic fabric materials with functional additives to enhance functional utility is not very acceptable. For example, known clothing articles made from cellulosic fabric materials with functional additives for enhancing ultraviolet protection or bacteria resistance rapidly lose the added functional enhancement after several washing cycles.

[0003] Therefore, it is desirable if textile articles with improved functional durability could be provided.

SUMMARY OF INVENTION

[0004] According to the present invention, there is provided a preparation for application onto a cellulosic fabric or textile material, wherein the preparation comprises a blended mixture of wool particles or wool powder, and a binding agent, wherein the functional additive is carried by the wool particles. The wool particles or wool powder is preferably of macrofibril size or below.

[0005] A preparation comprising wool particles or wool powder of the macrofibril size as carriers for functional additives has demonstrated an exceptional functional additive carrying and retention ability which enhances the durability of functional enhancements of a cellulosic fabric material.

[0006] Using ultrafine wool fibre in such preparations is both environmentally friendly and economical because wool fibres which are too short and weak to be spun into wool yarns are often scrapped.

[0007] According to another aspect of the present invention, there is provided a preparation for application onto a cellulosic fabric material comprising a mixture of powdered bamboo fibre, carrier agents, and binding agents. Preferably, the non-charcoal fibrous bamboo powder isnano-sized having an ultrafine particle size, say, of 1 μm or below. It is noted that fabric materials treated with ultrafine bamboo fibre powder has good moisture management properties.

[0008] According to another aspect of the present invention, there is provided a method of preparing a preparation for application onto a cellulosic fabric materials comprising wool as functional additive carrier, the method comprising:

[0009] Pulverizing wool to obtain ultrafine wool powder of macrofibril size,

[0010] Forming an ultrafine wool suspension using the ultrafine wool powder.

[0011] The method may comprise the step of pulverizing the wool powder into a suspension of ultrafine wool particles by ultrasonic crushing.

[0012] According to yet another aspect of the present invention, there is provided a method of preparing a preparation comprising bamboo fibre as a functional additive, the method comprising:

[0013] Pulverizing bamboo fibre to obtain coarse bamboo powder,

[0014] Adding 0.5-2g/l wetting agent and 4-10g/l bamboo powder into water to form a suspension, and

[0015] Pulverising the coarse bamboo powder in the suspension into ultrafine bamboo powder.

[0016] The functional additive may include additives for ultraviolet protection, anti-bacteria, or other clothing functions.

[0017] The wool particles or wool powder may have a size of 200 nm or below.

[0018] The wool particles or wool powder may have a size of 200 nm or below.

[0019] The functional additive may comprise an anti-UV (ultraviolet light) agent, such as zinc oxide, or titanium oxide, bamboo powder.

[0020] The functional additive may comprise one or a combination of anti-bacterial agents such as nano-silver, zinc oxide, titanium oxide, non-charcoal bamboo powder, or other comparable agents.

[0021] The functional additive may be in ultrafine powder form having a nano-sized particle of between 100-200 nm.

[0022] The non-charcoal fibrous bamboo powder may be ultrafine having a particle size of less than 1 μm.

[0023] The binding agent may be acrylic copolymer based, and the acrylic copolymer may be aqueous dispersed.

[0024] The carrier agent may comprise wool particles or wool powder of macrofibril size and below.

[0025] The functional additives may comprise an anti-UV (ultraviolet light) agent, such as zinc oxide, or titanium oxide, or other functional comparable agents.

[0026] The functional additives may comprise anti-bacterial agents such as nano-silver, zinc oxide, titanium oxide, or other functional comparable agents.

[0027] The cellulosic fabric material, such as a fabric material may comprise cotton or linen, which may be applied, bonded, deposited with a preparation of any of the preparation.

[0028] The cellulosic fabric material may comprise pulverized bamboo blended into the fabric material.

[0029] The preparation may be bonded to or deposited onto the cellulosic fabric.

[0030] The bonding or deposition may be by printing, padding or foam application.

[0031] The method may comprise adding 0.5-2g/l wetting agent and 4-10g/l ultrafine wool powder into water to form the suspension.

[0032] The method may comprise homogenizing the suspension.
The pulverizing step converting coarse bamboo powder into ultrafine bamboo powder may comprise ultrasonic pulverizing of the coarse bamboo powder followed by homogenization of the suspension containing the ultrafine bamboo powder.

The duration of the ultrasonic pulverizing of the coarse bamboo powder into ultrafine bamboo powder and the homogenization process respectively may last for 20-40 minutes and 5-15 minutes.

The method may comprise bonding or depositing the preparation to the textile material by printing, padding or foam application.

The preparation may be provided to provide enhanced moisture management, wicking and/or wrinkling resistance properties of the article.

BRIEF DESCRIPTION OF DRAWINGS

Embodiments of the present invention will be explained by way of example and with reference to the accompanying drawings, in which:

FIG. 1 is a T-shirt illustrating an embodiment of the present invention,
FIG. 2 is a schematic diagram of wool fibre structure,
FIG. 3 is a schematic diagram illustrating a wool fibre showing cuticle and cortex cells,
FIG. 4 is a chart showing the UPF of the t-shirt of FIG. 1 with respect to the number of washes,
FIG. 5 is a chart showing wicking performance of the t-shirt of FIG. 1 with respect to number of washes, and
FIG. 6 are bar charts showing recovery angles of fabric materials treated and not treated with the present invention.

DETAILED DESCRIPTION OF EMBODIMENTS

A cotton tee shirt (“T-shirt”) 100 as an example of a textile article comprising a cellulose fabric or textile material 110 and applied with a preparation 120 comprising ultrafine wool powder is depicted in FIG. 1. The preparation is an aqueous suspension comprising a functional additive, ultrafine wool powder, and an aqueous binder. The ultrafine wool powder is a wool powder of the macrofibril size which has been found to demonstrate exceptional carrying and retention capability for functional additives. The term “functional additive” in the present context means an additive which confers useful function or utility to the article to which it is applied. Examples of useful function in the present context include ultraviolet (“UV”) protection, anti-bacterial properties, etc.

Examples of known functional additives for ultraviolet protection and/or anti-bacterial property include: zinc oxide or ultrafine zinc oxide, titanium dioxide or ultrafine titanium dioxide.

Examples of new functional additives according to the present invention include: ultrafine bamboo powder for improving moisture management properties of the fabrics.

An exemplary preparation of a first embodiment of a preparation will be described below.

A Preparation Comprising Ultrafine Wool Powder as Carrier

Pulverization of Wool Fibre

Firstly, wool fibre is pulverized into ultrafine powder as follows:

1. Cutting the wool fibres into short length of around 1-2 cm
2. Pulverizing the wool fibres into wool powder by means of rotary blade.
3. Adding 0.5-2 g/L wetting agent and 4-10 g/L wool powder into water.
4. Pulverizing the wool powder into ultrafine wool suspension by means of ultrasonic crusher and followed by homogenizer, where the ultrasonic and homogenizing operation duration are 20-40 minutes and 5-15 minutes, respectively.

Addition of Additives

After the wool suspension has been formed, functional additives are added to form the preparation.

In the present invention, wool fibre is pulverized into ultrafine wool particles and then used as a carrier for carrying chemical onto the cellulose fibre or its blends fabric to provide multi-functional properties of cellulose fibre or its blends fabric. The chemicals selected to be carried by ultrafine wool particles include ultrafine titanium dioxide, ultrafine zinc oxide and ultrafine bamboo particles. The ultrafine wool powder is attached onto the cotton fabric by means of aqueous dispersion of acrylic copolymer binder.

Wool Fibre

Wool consists of two types of cell: the internal cells of the cortex and external cuticle cells that form a sheath around the fibre as shown in FIG. 2.

The cuticle cells (or scales) overlap like tiles on the roof, cover the wool fibre surface. The waxy, hydrocarbon coating, chemically bound to the surface of each scale acts as ‘shower-proof’ of the wool fibre providing wool natural water repellency in nature. The cuticle cells represent about 10% weight of wool fibre.

The cortex of wool comprises around 90% of the fibre. It is composed of overlapping, spindle-shaped cells, as shown in FIG. 2. The cell membrane complex (CMC) hold the cortical cells together, also separates them from those of the cuticle. The CMC is a continuous region, containing relatively lightly-crosslinked proteins and waxy lipids, which extend throughout the whole fibre. It represents around 5% of the total fibre mass. As the CMC is only slightly crosslinked, it is also more susceptible to chemical attack. It also provides a channel where dyes and chemicals can diffuse in and out of wool.

Fine wool fibres consist of two major types of cortical cell (ortho- and para-). Coarser types of wool (diameters>>25 μm) tend to have less distinction of segmentation of the two types of cortical cells. The orthocortex is always orientated towards the outside radius of the crimp. This occurs as a result of the two segments rotating around the fibre in phase with the crimp.

There are different structures of the proteins in wool between the various regions of the fibre. Some of the proteins in the microfibrils are helical, like a spring, in structure. For these kinds of proteins, the protein chains of amino acid residues were coiled into a helical structure. In general, there
are 36 amino acid residues in 10 turns of the helix. Present evidence suggests that two α-helices are twisted and coiled together as in a rope. This provides flexibility, elasticity, resilience and good wrinkle recovery properties.

[0060] Other proteins, especially in the matrix that surrounds the macrofibrils, is more amorphous in structure and it absorbs a relatively large amount of water without feeling wet. The matrix proteins are also used for absorbing and retaining large amount of dyestuffs. (source: The chemical and physical structure of merino wool, http://www.csiro.au/files/files/p9ti.pdf)

[0061] During the pulverization of wool fibre, the roof-like structure of cuticle cells (scales) is damaged. Since the cuticle cells (scales) of the wool acts as a barrier for water and chemicals to enter the wool fibre, the damage of cuticle cells (scales) allows the chemicals and water diffuse into the internal structure of wool more easily and freely. The chemicals and water is then passed through the slightly crosslinked cell membrane complex for entering the cortex cells of the wool fibres. In the cortex cells, the helical structure spring like macrofibril acts as a storage site for carrying chemicals. In addition, the amorphous structure of matrix surround macrofibrils provides space for water absorption. The chemicals suspended in the water, can therefore be present in the matrix region.

[0062] It is appreciated that the above characteristics of wool fibre is beneficial for the present invention.

A Preparation Comprising Ultrafine Bamboo Powder

[0063] In another embodiment, powdered fibrous bamboo, or bamboo powder (not charcoal) is used as a functional additive. Initially, bamboo powder is obtained from fibrous bamboo as contrast to charcoal or bamboo pulp.

Pulverization of Bamboo Powder

[0064] The pulverization process is performed step by step as follows:

[0065] 1. Cutting the bamboo fibres into short length of around 1-2 cm
[0066] 2. Pulverizing the bamboo fibre into bamboo powder by means of rotary blade.
[0067] 3. Adding 0.5-2 g/L wetting agent and 4-15 g/L bamboo powder into water.
[0068] 4. Pulverizing the bamboo powder suspension into ultrafine bamboo suspension by means of ultrasonic crusher and followed by homogenizer, where the ultrasonic and homogenizing operation duration are 20-40 minutes and 5-15 minutes, respectively.
[0069] 5. The ultrafine bamboo suspension is well prepared.

Formation of Bamboo Powder and Wool Solution

[0070] The wool and bamboo are first pulverized into ultrafine powder suspension and they are mixed well to form an ultrafine wool, bamboo suspension, which the volume ratio of ultrafine bamboo to ultrafine wool suspension ranges from 1:1 to 1:2. After the preparation of ultrafine wool and bamboo solution, ultrafine zinc oxide, ultrafine titanium dioxide is added into the suspension and mixed well first. The aqueous dispersion of acrylic copolymer binder is then added into the above suspension to form a finishing paste.

Recipe of Finishing Paste

[0071] Ultrafine wool suspension (with solid content of 4 g-10 g wool powder)—200-400 g/L
[0072] Ultrafine bamboo suspension (with solid content of 4 g-10 g bamboo powder)—200-400 g/L
[0073] Ultrafine zinc oxide—5-20 g/L
[0074] Ultrafine titanium oxide—1-10 g/L
[0075] Aqueous dispersion of acrylic copolymer binder—200-600 g/L
[0076] 0-25 g/L thickener

[0077] The finishing paste is then homogenized and made into finer solution to provide better handfeel through treating with ultrasonic crusher for 10-20 mins. After the ultrasonic crushing, the viscosity of the finishing paste is reduced that the finishing paste turns into solution form. This treatment solution is ready to be applied onto the cellulose fibre or its blends fabric by padding method.

Application of the Preparation to the Article

[0078] Printing is a process wherein the coloring or treating material, usually in the form of a paste, is deposited onto the surface of the fabric which is then typically further treated with steam, heat or chemicals for fixation of the coloring or treating material onto the fabric. The printing process affixes the treating material, to the surface of the yarns or fabrics with the addition of a binder. Binders can be considered as adhesives. Roller printing, flat screen printing and rotary screen printing, are widely used in commercial production. In present invention, both these three kinds of printing methods are suitable to apply the treatment paste onto the cellulose or its blends fabrics.

[0079] In another embodiment, it has been found that certain foam application processes may provide an alternative method to applying treatment paste onto the fabrics. One system, known as the chemical foam system (CFS), is a highly controlled, patented system that has been used to accurately apply foamed, water soluble or water dispersible chemicals at very low moisture levels onto substrates such as textiles, carpets, non-woven, and paper and the like. In the context of the present invention, the treatment paste is for used on knitted or woven fabrics. Applying foam to woven and knitted fabrics use a pressure plenum which provides finite control over the chemical application to the fabrics with respect to uniform, quality and controlled penetration of the fabric. Foam application may be advantageous to the extent that the surface area of the chemical, when foamed, more closely matches the surface area of the fibers or yarns while greatly reducing water usage.

[0080] After the treatment by either padding, printing or foam application method, the treated fabric is first dried and curried under high temperature of above 150° C. by using stenter. After curing, in order to enhance handfeel of the treated fabric, the unfixed paste and chemicals are removed by detergent washing, followed by drying with the aid of tumble dryer.
boo, ultrafine wool paste by printing method. The ultraviolet protection property and wicking of untreated control and treated fabrics are compared as shown in FIGS. 4 and 5 respectively.

[0082] The ultraviolet protection ability of the fabrics is evaluated in terms of ultraviolet protection factor (UPF) value, which is determined by following the testing method of AATCC 183 standard. The ultraviolet protection of fabric is classified into different categories by following ASTM D6600 as shown in Table 1. In order to study the washing durability of the treated fabric, the UPF value of untreated and treated fabric for before washing and after 1, 5, 10, 15, 20 and 25 cycles of washing were tested. The fabrics were washed by following the washing condition mentioned in AATCC 135/150-2004 testing method.

<table>
<thead>
<tr>
<th>Ultra violet Protection Category</th>
<th>Effective UVR Transmission</th>
<th>UPP Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>UPF Range</td>
<td>%</td>
<td></td>
</tr>
<tr>
<td>15-24</td>
<td>Good Protection</td>
<td>6.7 to 4.2</td>
</tr>
<tr>
<td>25-39</td>
<td>Very Good Protection</td>
<td>4.1 to 2.6</td>
</tr>
<tr>
<td>40 to 50, 50+</td>
<td>Excellent Protection</td>
<td>≤2.5</td>
</tr>
</tbody>
</table>

[0083] FIG. 4 show that the UPF value of before and after 1, 5, 10, 20 and 25 cycles of washing untreated control single jersey are all under 7. They are not classified into any ultraviolet protection rating. For the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool paste treated single jersey fabric, however, has much more UPF value than untreated fabric. The UPF value of 25 cycle washes treated fabric is 17.03, which is still classified into good ultraviolet protection category. The zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool paste treated single jersey fabric are classified to have excellent ultraviolet protection before washing, very good protection after 1 and 5 cycles of washing and good protection category after 10, 15, 20 and 25 cycles of washing.

[0084] Besides of providing ultraviolet protection, the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool paste treated fabric provides comfort to the weavers. Comfort properties of textiles are very important. Among all of the comfort properties, good absorption and easy drying are probably the major requirements.

[0085] The quick drying capability of textiles (absorption of moisture and perspiration) is usually obtained from the special contour of fibers/fabrics, special weave structure or absorbent finishing. Textiles which transfer moisture and dry quickly mostly depend either on capillary action in their fibers/fabrics or moisture absorbency to quickly absorb moisture on skin surface and wick it away to textile surface. Influenced by diffusion and air convection on textile surface, the moisture quickly evaporates, leaving the textile dry. These textiles are especially to be used in hot climates or during intense workouts. They absorb large amounts of perspiration; promote moisture to outer surface so as to keep the body dry. The capability of a textile to absorb water is called hygroscopicity and is measured by 'wicking height' and 'water diffusion speed'. (source: http://tfts.tffapproved.org.tw/c_tfts/introduction/fits fa-004.asp)

[0086] "The Committee of Conformity Assessment of Accreditation and Certification on Functional and Technical Textiles" supported by the Taiwan Textile Research Institute’s board of directors has developed 18 industrial standards for evaluation of functional clothing and household textiles. “Specified Requirements of Moisture Transferring and Quick Drying Textiles, FTTS-FA-004” is one of the industrial standards for evaluation the moisture management properties of textile materials.

[0087] In present invention, the moisture management of the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treated are evaluated and compared with the untreated fabric in terms of wicking by referring to the FTTS-FA-004 testing method.

Wicking

[0088] Wicking is the spontaneous flow of a liquid in a porous substrate, driven by capillary force. (source: http://www.ftts.org.tw/e/aboutus.aspx) In present invention, the wicking of the ultraviolet protection, the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool paste treated fabric is tested and compared with the control fabric by slightly modifying the standard method—Specified Requirements of Moisture Transferring and Quick Drying Textiles FTTS-FA-004. This testing is a method to determine the water absorption rate that showing the capillary ability of a strip of fabric against gravity. According to the FTTS-FA-004 testing method, when knitted fabrics are tested, five specimens with the size of 200 mm×25 mm in wide and course direction are taken respectively. The specimens are fixed onto the horizontal bar supported over the water surface of water bath with temperature 20±2°C. The horizontal bar is adjusted to lower position so that the lower ends of the specimens are immersed with 0.5 cm depth into the water for 10 minutes. The wicking length is recorded by capillarity to 1 mm. The test result is expressed by the mean value of five measurements of the height of water raised in wide and course directions respectively. (source: http://www.tftapproved.org.tw/eng/cons/ E04/download/FTTS-FA-004.doc) In present invention, this testing method is modified by not only recording the wicking height at immersing in water for 10 minutes, but recording the wicking height for immersing in water for 1, 3, 5, 10, 15, 20, 25 and 30 minutes so as to collect enough data for the wicking curve as shown in FIG. 5.

[0089] By comparing the wicking curve of untreated and treated cotton single jersey fabric, the wicking of zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treated fabric is much higher than the untreated cotton fabric in both warp and weft directions. This shows that the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treatment enhances the water absorption and capillary ability of the fabric.

Wrinkle Recovery

[0090] By having helical spring like structure macrofibrils, wool has good flexibility, elasticity, resilience and good wrinkle recovery properties. In present invention, the ultrafine wool powder not only works as a carrier for carrying chemicals, but also helps in enhancing the wrinkle recovery of cotton fabrics. In present invention, 100% cotton poplin woven fabrics are undergone zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treatment by following the preparation procedure same as that of single jersey. The
wrinkle recovery of those before washes and after 5, 10, 15, 20 and 25 washes zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treated 100% cotton poplin fabrics are tested and compared with that of control untreated fabric by following the AATCC 66-1998 testing method. The washing conditions for the times of washing follows the AATCC 135/150-2004. During the testing, the test specimen is folded and compressed under controlled conditions of time and force to create a folded wrinkle. The test specimen is then suspended in a test instrument for a controlled recovery period after which the recovery angle is recorded. FIG. 6 demonstrates that the wrinkle recovery angle of the treated fabric is more than double that of the control untreated fabric even after 25 times of washing. The enhancement in wrinkle recovery of the fabric after treatment is due to the presence of ultrafine wool powder which intrinsically exhibits wrinkle resistant properties of wool. When ultrafine wool powder is applied onto cotton fabric, the two ends of helical macrofibrils of wool are attached to the cotton fabrics to act like a spring to provide wrinkle resistance to the cotton fabrics.

Anti-Bacterial

[0091] Ultrafine zinc oxide and titanium dioxide are carried by ultrafine wool powder to be applied onto the fabric. Ultrafine zinc oxide and titanium dioxide not only enhance the ultraviolet protection of the fabric, they can provide anti-bacterial properties to the fabrics. In present invention, the anti-bacterial properties and its safety are tested according to FZ/T 73023-2006 standard.

[0092] When comparing the bacteria inhibition effectiveness of a single cotton-jersey fabric materials untreated and treated with the functional additives as indicated by a reference inhibition percentage, it is noted that the antimicrobial activity of the cotton fabric treated with zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treated fabric in ultrafine powder form is much higher than that of the untreated cotton fabric. For example, experiments show that the inhibition percentage of antimicrobial activities of treated and untreated cotton single jersey fabric after 10 washes are greater than 90% and 13.95% respectively. It is understood that a higher inhibition percentage of antimicrobial activity means a higher anti-bacterial properties of the fabrics. Accordingly, the results confirm that the zinc oxide, titanium dioxide, ultrafine bamboo, ultrafine wool treatment enhances the anti-bacterial properties of the fabric effectively.

[0093] While the present invention has been explained with reference to the exemplary embodiments, it would be understood that the embodiments are only non-limiting examples for illustrating the invention and should not be construed as the only ways to practice the invention. For example, while reference has been made to textile or fabric materials, it will be understood by persons skilled in the art that blended (as contrast to non-blended) textile materials are included without loss of generality. Furthermore, it will be understood that the term macrofibril is used as an abbreviation to refer to wool particles of a size which demonstrates functional additive carrying capability as described herein. Actual dimensions of a macrofibril may refer to, but not limited by, that illustrated in FIG. 2 herein.

1. A preparation for application onto a cellulose fabric or textile material, wherein the preparation comprises a blended mixture of wool particles or wool powder, at least one functional additive, and a binding agent, wherein the functional additive is carried by the wool particles.

2. A preparation according to claim 1, wherein the wool particles or wool powder are of macrofibril size or below

3. A preparation according to claim 1, wherein the functional additive includes additives for ultraviolet protection, anti-bacteria, or other clothing functions.

4. A preparation according to claim 1, wherein the wool particles or wool powder has a size of 200 nm or below.

5. A preparation according to claim 1, wherein the wool particles or wool powder has a helix or helical structure capable of carrying the functional additives.

6. A preparation according to claim 1, wherein the functional additive comprises an anti-UV (ultraviolet light) agents, such as zinc oxide, or titanium oxide, bamboo powder.

7. A preparation according to claim 1, wherein the functional additive comprises one or a combination of anti-bacterial agents such as nano-silver, zinc oxide, titanium oxide, non-charcoal bamboo powder, or other comparable agents.

8. A preparation according to claim 1, wherein the functional additive is in ultrafine powder form having a nano-sized particle of between 100-200 nm.

9. A preparation according to claim 6, wherein the non-charcoal fibrous bamboo powder is ultrafine having a particle size of less than 1 μm.

10. A preparation according to claim 1, wherein the binding agent is acrylic copolymer based.

11. A preparation according to claim 1, wherein the acrylic copolymer is aqueous dispersed.

12. A cellulose fabric material, such as a fabric material comprising cotton or linen, which is applied, bonded, deposited with a preparation according to claim 1.

13. A method of preparing a preparation comprising wool as functional additive carrier, the method comprising:

- Pulverizing wool to obtain ultrafine wool powder of macrofibril size.
- Forming an ultrafine wool suspension using the ultrafine wool powder.

14. A method according to claim 13, wherein the method comprises:

- Adding 0.5-2g/l wetting agent and 4-10g/l ultrafine wool powder into water to form the suspension.

15. A method according to claim 13, wherein the method comprises:

- Pulverizing the wool powder into a suspension of ultrafine wool particles by ultrasonic crushing.

16. A method according to claim 13, wherein the method comprises:

- Homogenizing the suspension.

17. A method of preparing a preparation comprising powdered bamboo fibre as a functional additive, the method comprising:

- Pulverizing bamboo fibre to obtain coarse bamboo powder,
- Adding 0.5-2g/l wetting agent and 4-10g/l bamboo powder into water to form a suspension, and
- Pulverising the coarse bamboo powder in the suspension into ultrafine bamboo powder.

18. A method according to claim 17, wherein the pulverizing step converting coarse bamboo powder into ultrafine bamboo powder comprises:

- Ultrasonic pulverizing of the coarse bamboo powder followed by homogenization of the suspension containing the ultrafine bamboo powder.

19. A method according to claim 18, wherein the duration of the ultrasonic pulverizing of the coarse bamboo powder
into ultrafine bamboo powder and the homogenization process respectively lasts for 20-40 minutes and 5-15 minutes.

20. A method of applying a preparation according to claim 1 to a textile material, wherein the method comprises bonding or depositing the preparation to the textile material by printing, padding or foam application.

21. A textile article made by the method of claim 20, wherein the preparation is provided to provide enhanced moisture management, wicking and/or wrinkling resistance properties of the article.