

**Impregnated textile fabric providing effective delivery of an  
alcoholic impregnant**

The invention relates to an impregnated textile fabric  
5 comprising a carrier material impregnated with an alcoholic  
preparation. The carrier material aside, the alcoholic  
preparation comprises one or more aliphatic C<sub>2</sub> to C<sub>3</sub> alcohols.  
The impregnated textile fabric is suitable in particular for  
10 use on animate surfaces (such as skin) or inanimate surfaces  
(as for disinfection of equipment and areas). The invention  
additionally provides a kit comprising a carrier material and  
an alcoholic preparation for use in the manufacture of such  
impregnated textile fabrics. The invention further provides a  
15 process for disinfecting animate or inanimate surfaces wherein  
the surface is subjected to the action of the impregnated  
textile fabric, and also to the use of the kit or of the  
impregnated fabric to disinfect animate and inanimate  
surfaces.

20 Moist cloths for use on animate or inanimate surfaces are  
known. DE 10 2010 049 113 A1 for instance discloses a textile  
fabric impregnated with an antimicrobial preparation and  
comprising a carrier material based on polyolefin. The  
antimicrobially active preparation comprises a  
25 bispyridinioalkane. The impregnated fabric is suitable in  
particular for use on animate surfaces, for example on human  
skin.

DE 10 2013 226 787 A1 relates to a textile fabric impregnated  
30 with an active antimicrobial and/or cleaning preparation and  
having a carrier comprising a bicomponent-fibre web comprising  
polyolefin. The fabric is suitable in particular for single  
use on inanimate hard surfaces, for example to disinfect or  
clean such surfaces. Specific carrier materials are stressed  
35 there to be advantageous for use in the disinfection and

cleaning of a typical floor area (of about 20 m<sup>2</sup>) in a hospital because the entire amount of the active preparation is released without entailing any loss of active ingredient. Basis weights for the webs preferred there are typically in the range from 70 to 90 g/m<sup>2</sup>. Active preparations having a high content of aliphatic alcohol are not addressed in WO 2013 226 787 A1.

WO 2013/102455 A1 discloses a liquid-impregnated specific nonwoven formed of bicomponent fibres. Again, impregnants having a content of aliphatic alcohol are not addressed in WO2013/102455.

DE 600 13 053 T2 (EP 1 086 648 B1) discloses pre-wetted wipes comprising not less than 1 g gram of liquid composition per gram of dry fibrous tissue, preferably not less than about 1.5 and particularly about 2 grams of liquid composition per gram of dry fibrous tissue. Pre-wetted wipes for cleaning walls are reported by DE 600 13 053 T2 to have a capacity of 2 to about 10 g per gram of dry fibrous tissue (that is, an absorbency of 200% to 1000%). Aqueous solventborne systems disclosed may include up to 5% of a solvent, such as ethanol or 2-propanol.

When alcoholic solutions are applied to an area, evaporation of the C<sub>2</sub> to C<sub>3</sub> alcohol used has an adverse impact on microbicidal efficacy. Tests have shown that microbicidal efficacy on the area in fact decreases significantly if the alcohol is able to evaporate (see Fig. 1 and Fig. 2). There is thus a direct correlation between the amount of active ingredient available on the area and the microbicidal efficacy.

Impregnating solutions for moist cloths have hitherto been tested for efficacy using a procedure described in Gebel, J.,

Werner, H.-P., Kirsch-Altena, A., Bansemir, K. (2001): [in German] Standard Methods of the German Society for Hygiene and Microbiology (DGHM) for Testing Chemical Disinfection Procedures, Method 14: Area Disinfection - A Realistic Test, pp. 40-44, mhp Verlag Wiesbaden. In this test, the efficacy of the disinfectants on artificially contaminated surfaces (OP tiles) is evaluated. The employment of mechanical action is simulated therein by using a spatula.

To make testing even more realistic, a new method for evaluating area disinfectants was developed to simulate their application via a standardized method of wiping defined PVC surfaces (EN 16615:2015; German Disinfectant Commission in the Association (VAH) for Applied Hygiene (2015): Requirements and Methods for VAH Certification of Chemical Disinfection Procedures, chapter 14.2 - Area Disinfection with Mechanical Action - A Realistic Test (4-field test), mhp Verlag Wiesbaden). The realistic EN 16615:2015 test accordingly requires for an adequate microbicidal efficacy that an effective amount of C<sub>2</sub> to C<sub>3</sub> alcohol be provided on the area to achieve microbicidal efficacy.

The present invention accordingly had for its object to provide cloths having a content of C<sub>2</sub> to C<sub>3</sub> alcohols and corresponding kits of carrier material and impregnating solution which are efficacious in the realistic test of EN 16615:2015, i.e. which in particular provide on the area an effective amount of C<sub>2</sub> to C<sub>3</sub> alcohol to achieve adequate microbicidal efficacy as per EN 16615:2015.

It was found that, surprisingly, the problems of the prior art are solved by a textile fabric impregnated with an alcoholic preparation, said fabric comprising

a) a carrier material, and

b) the alcoholic preparation,

wherein

5 - the carrier material

i) comprises one or more nonwovens selected from  
drylaid, airlaid, wetlaid and spunbonded  
nonwovens,

10 ii) has a basis weight, determined as per DIN EN  
29073-1, of 10 to 70 g/m<sup>2</sup>, and

iii) has a cloth absorbency for the alcoholic  
preparation of not less than 400% (wt./wt.),

15 - the percentage impregnation of the carrier material with the  
alcoholic solution (the degree of impregnation) is not more  
than 80%,

and wherein

20 - the alcoholic preparation comprises b1) one or more  
aliphatic C<sub>2</sub>- to C<sub>3</sub> alcohols, wherein the total amount of  
alcohol component b1) is in the range from 10 to 85 wt%,  
based on the weight of alcoholic preparation b).

25 The present invention is based on the finding that an  
effective amount of C<sub>2</sub> to C<sub>3</sub> alcohol to achieve an adequate  
microbicidal efficacy as per EN 16615:2015 can be provided on  
the area from cloths.

30 The provision of alcoholic solution from the impregnated  
textile fabric is ensured by carrier materials having a high  
uptake capacity for the alcoholic preparation being  
impregnated, not to their maximum uptake capacity, but only up  
to a moderate degree of impregnation. This was surprising  
35 because a person skilled in the art would actually suppose

that instead delivery would be particularly good at a very high degree of impregnation. It was further surprising that a particularly effective delivery is not achieved by using impregnatable materials having a high basis weight of more  
5 than 70 g/m<sup>2</sup>, but that instead a moderate basis weight is particularly advantageous, provided the maximum uptake capacity of the carrier material is high.

The delivered quantity of alcoholic solutions out of cloths is  
10 thus significantly improvable by impregnating the nonwoven not, as is frequently customary, maximally, but only partially (to, for example, 50% of the absorbency). The invention thus provides the optimized release from cloths of solutions having a content of C<sub>2</sub> to C<sub>3</sub> alcohols. The evaporation effects of  
15 alcohols (see Figures 1 and 2) are controlled in the process as a result of the optimized release from the cloths.

Particularly the group of active ingredients which are alcohols requires an adequate quantity of delivery in order to  
20 be able to offset the evaporation effects observed and to achieve a high level of microbicidal efficacy. This is achieved according to the present invention by exploiting the surprising effect thereof regarding the ratio between delivery and uptake to impregnate nonwovens having a high uptake  
25 capacity moderately only, while nonetheless making possible a high quantitative delivery of volatile actives to the surfaces to be disinfected (see Table 3).

In the description of the present invention, the term "basis  
30 weight" (or "grammage") designates the value, reported in g/m<sup>2</sup>, determined according to DIN EN 29073-1.

The term "absorbency" (or "maximum uptake") designates the maximum amount of the alcoholic preparation that can be taken  
35 up by the carrier material, based on the weight of the sheet

material (i.e. maximum weight of alcoholic preparation that  
can be taken up by the carrier material/weight of the carrier  
material), reported in per cent. The value is determined in  
accordance with DIN 53923-1, as described in Method 1 in the  
5 examples.

The term "percentage impregnation of the carrier material" (or  
"degree of impregnation") is the quotient formed by dividing  
the absorbency into the amount of alcoholic preparation and  
10 reported in per cent. A 100% degree of impregnation is thus to  
be understood as meaning that the carrier material has been  
impregnated to its maximum absorbency.

a) Carrier material

15 The carrier material i) comprises one or more nonwovens  
selected from drylaid, airlaid, wetlaid and spunbonded  
nonwovens and further has ii) a basis weight, determined as  
per DIN EN 29073-1, of 10 to 70 g/m<sup>2</sup> and iii) an absorbency for  
the alcoholic preparation of not less than 400% (wt./wt).

20

The nonwoven employed according to the invention is thus not a  
meltblown nonwoven. In one preferred embodiment, therefore,  
the carrier material does not consist of meltblown nonwoven.  
In a further preferred embodiment, the carrier material does  
25 not comprise any meltblown nonwoven.

Preferably, the drylaid nonwoven is a carded nonwoven. It is  
further preferable for the nonwoven to be a spunlace nonwoven.

30 In one preferred embodiment, the carrier material a) has a  
basis weight of 15 to 60 g/m<sup>2</sup>, preferably 18 to 55 g/m<sup>2</sup>,  
particularly 20 to 50 g/m<sup>2</sup>, all determined as per DIN EN 29073-  
1.

35 In a further preferred nonwoven, the carrier material a) has  
an absorbency of not less than 450%, preferably not less than

500%, particularly not less than 550%, such as not less than 600%, all (weight/weight).

5 The degree of impregnation of the impregnated textile fabric according to the invention is preferably in the range from 15 to 75%, more preferably 20 to 70%, particularly 25 to 70%, such as 30 to 70%, for example 35 to 65%.

10 Preferred carrier materials comprise one or more polymers selected from polyethylene terephthalate (PET), polyolefin, viscose, cellulose and polylactic acid (PLA). Preferably, the polyolefin is polypropylene (PP).

15 In all embodiments of the invention, the carrier material a) may comprise blend fibres, in which case the blend fibres preferably comprise one or more of viscose/PP and viscose/PET.

20 According to the invention, the carrier material a) preferably consists essentially of polyolefin, particularly polypropylene. The carrier material a) more preferably consists of polyolefin, particularly polypropylene.

25 Carrier material a) aside, the impregnated textile fabrics according to the invention comprise the alcoholic preparation b).

#### b) Alcoholic preparation

30 The alcoholic preparation b) employed according to the invention comprises b1) one or more aliphatic C<sub>2</sub> to C<sub>3</sub> alcohols. Component b1) is thus i) ethanol, ii) 1-propanol or iii) 2-propanol, or iv) a mixture thereof.

35 The alcoholic preparation b) is preferably a single-phase preparation. Alcoholic preparations in the form of a solution, a gel or a foam/mousse are particularly preferable.

The total amount of alcohol component b1) is preferably in the range from 20 to 80 wt%, more preferably 30 to 80 wt%, particularly 40 to 75 wt%, such as 50 to 70 wt%, particularly 55 to 65 wt%, all based on the weight of alcoholic preparation b).

Component b1) is preferably a single aliphatic C<sub>2</sub> to C<sub>3</sub> alcohol, or is a mixture of two aliphatic C<sub>2</sub> to C<sub>3</sub> alcohols. The following b1) components are particularly preferable:

- ethanol,
- 2-propanol,
- a mixture of ethanol and 1-propanol, and
- a mixture of 1-propanol and 2-propanol.

Component b1) aside, the alcoholic preparation employed in a preferred embodiment of the invention comprises one or more of the following optional components:

- b2) one or more antimicrobial actives,
- b3) one or more solvents, and/or
- b4) one or more excipients.

Exemplary antimicrobial actives b2) are described in sections 39 to 62 of Wallhäußer's *Praxis der Sterilisation, Desinfektion, Antiseptik und Konservierung* (eds. A. Kramer and O. Assidian, Georg Thieme-Verlag Stuttgart, New York, 2008). They include aldehydes (such as formaldehyde, glutaraldehyde and succinaldehyde) and aldehyde depot compounds, anorganic acids, their salts and anhydrides, organic acids of carbon (such as aliphatic or aromatic carboxylic acids, their esters (such as parabens) and amide, oxidants (such as, for example, peroxides, particularly hydrogen peroxide and peracetic acid), phenol derivatives, surfactants (such as, in particular, quaternary ammonium salts and bispyridinioalkanes), guanidines and biguanides, alkylamines, nitrogen heterocycles, urea derivatives, aromatic alcohols, acetals and amins,

benzamidines, isothiazolines (such as isothiazolin-3-ones), phthalimide derivatives, quinolinols, benzimidazoles, mercaptobenzothiazoles, nitriles, carbamates (such as 3-iodo-2-propynyl butylcarbamate, IPBC), metals and metal compounds. Accordingly, component b2) may comprise a mixture of surfactants of the type which is typically used for cleaning, or consist of such a mixture of surfactants.

By way of surface-active ingredient b2), the alcoholic preparations according to the invention may comprise cationic, amphoteric and/or nonionic surfactants.

As non-ionic surfactant there may be employed any suitable nonionic surfactant, for example (i) (fatty) alcohol ethoxylates, (ii) sorbitan esters, (iii) alkylglycosides (particularly alkylpolyglucosides), (iv) ethylene oxide/-propylene oxide block copolymers. Alkylpolyglucosides (iii) are particularly preferred nonionic surfactants.

Alcohol polyalkoxylates (i) include fatty alcohol alkoxyates, for example isodecyl ethoxylates having various fractions of ethylene oxide, isotridecyl ethoxylates, polyethylene glycol ethers of stearyl, lauryl, cetyl and oleyl alcohols. The alcohols may have been alkoxyated with ethylene oxide, propylene oxide or any desired mixtures of ethylene oxide and propylene oxide. Alcohol polyalkoxylates are known, inter alia under the designations Lutensol<sup>®</sup>, Marlipal<sup>®</sup>, Marlox<sup>®</sup>, Brij<sup>®</sup> and Plurafac<sup>®</sup>. Lauryl alcohol ethoxylates are particularly preferable for use as nonionic surfactant.

Useful nonionic surfactants (ii) further include sorbitan esters, which are usually in the form of oleates, stearates, laurates and palmitates and are referred to as polysorbates (e.g. Tween<sup>®</sup>).

The nonionic surfactant may further be an alkylglycoside (iii), such as an alkylglucoside (i.e. an alkylglycoside of glucose), more preferably a C<sub>8</sub> to C<sub>20</sub> alkylpolyglucose, particularly a C<sub>8</sub> to C<sub>16</sub> alkylpolyglucose of a fatty alcohol, in which case a laurylpolyglucose, a decylpolyglucose or a mixture thereof is preferable. The carbon chain length is from 8 to 16 atoms in the case of cocoylpolyglucose, from 12 to 16 carbon atoms in the case of laurylpolyglucose and likewise from 8 to 16 carbon atoms in the case of decylpolyglucose.

Useful surfactants further include amphoteric surfactants, for example betaines. Suitable betaines are described in EP 0 560 114 A. Cocamidopropylbetaine is particularly preferable. N- Alkylaminopropylglycine is a further preferred amphoteric surfactant.

Useful surfactants further include cationic surfactants, such as quaternary ammonium salts. Any suitable quaternary ammonium compound is in principle useful in the present invention. The quaternary ammonium compound is preferably a dialkyldimethylammonium salt.

Quaternary ammonium salts preferred for use in the present invention are represented by the formula  $[R^1R^2R^3(CH_3)N]^+[X]^-$ , where R<sup>1</sup> to R<sup>3</sup> may be the same or different and are selected from C<sub>1</sub> to C<sub>30</sub> alkyl, aralkyl, alkenyl and mixed groups, which may have one or more atoms selected from O, S, N and P, wherein R<sup>1</sup> to R<sup>3</sup> are, for example, C<sub>8</sub> to C<sub>18</sub> alkyl, benzyl or methyl, preferably C<sub>9</sub> to C<sub>18</sub> alkyl, benzyl or methyl, such as C<sub>16</sub> alkyl, benzyl or methyl. X is an anion (of an organic acid or of an inorganic acid). This anion as well as the cation of the quaternary ammonium salt may each be a polyvalent ion, resulting in a  $[A^{(n+)}]_m[K^{(m+)}]_n$  stoichiometry.

Useful quaternary ammonium salts for the purposes of the present invention include any prior art quaternary ammonium salts of the abovementioned formula, examples of which are disclosed in WO 00/63337 A, hereby incorporated herein by  
5 reference. Preferably, however, it is dialkyldimethylammonium salts which are used, for example dialkyldimethylammonium chlorides whose alkyl chains are each independently selected from C<sub>8</sub> to C<sub>18</sub> alkyl, preferably C<sub>9</sub> to C<sub>18</sub> alkyl, such as C<sub>16</sub> alkyl. One of the methyl groups in the dialkyldimethylammonium  
10 salt may be an alkoxyated, for example ethoxyated, hydroxymethyl group.

Preferred quaternary ammonium salts for the purposes of the present invention are compounds of the formulae  
15  $[R^1N(CH_3)_3]^+[X]^-$ ,  $[R^1R^2N(CH_3)_2]^+[X]^-$  and  $[R^1R^2R^3(CH_3)N]^+[X]^-$ , where R<sup>1</sup> to R<sup>3</sup> are each independently selected from C<sub>8</sub> to C<sub>18</sub> alkyl and  $-(CH_2-CHR^4O)_n-R^5$ , where n is from 1 to 20, preferably from 1 to 5, and R<sup>4</sup> and R<sup>5</sup>, which may be the same or different, are each H and/or C<sub>1</sub> to C<sub>4</sub> alkyl, preferably H.

20

Exemplary anions and classes of anions for quaternary ammonium salts used according to the present invention are hydroxide, sulphate, hydrogensulphate, methosulphate, ethosulphate, laurylsulphate, lauryl ether sulphate, cellulosesulphate,  
25 sulphamate, halide (fluoride, chloride, bromide, iodide), nitrite, nitrate, carbonate, bicarbonate, phosphate, alkylphosphate, metaphosphate, polyphosphate, thiocyanate (rhodanide), carboxylic acid salt such as benzoate, lactate, acetate, propionate, citrate, succinate, glutarate, adipate,  
30 toluenesulphonate (tosylate) and salicylate. Chloride and propionate are particularly preferred anions.

Particular preference is given to using the quaternary ammonium salts mecetronium etilsulfate

(hexadecyl(ethyl)dimethylammonium ethylsulphate), benzalkonium chloride and didecyldimethylammonium chloride.

The actives b2) preferred for a particularly high disinfecting  
5 effect include (list 1):

- 1) guanidines (preferably biguanidines),
- 2) aldehydes (such as, for example, formaldehyde, glutaraldehyde and succinaldehyde),
- 10 3) formaldehyde depot compounds, i.e. compounds that gradually release chemically bound formaldehyde in use,
- 4) active oxygen compounds such as peroxide compounds, peracetic acid and hydrogen peroxide,
- 5) alkylamines, and
- 15 6) amphosurfactants.

Actives b2) of primary interest for their cleaning effect are  
(list 2):

- 20 1) nonionic surfactants,
- 2) organic acids,
- 3) oxidizing agents, and
- 4) reducing agents.

25 Actives selected from the above lists 1 and 2 may additionally be included for their preservative effect.

#### b3) Solvents

The alcoholic preparation used optionally further comprises  
30 b3) solvents. Preferred solvents are glycols and water and also mixtures thereof. Water is a preferred b3) component in all embodiments of the invention.

#### b4) Excipients

35 Exemplary excipients for optional inclusion in the alcoholic preparations used according to the invention are perfumes,

fragrances, thickeners, buffers, humectants, dyes, complexing agents, solubilizers, corrosion inhibitors and abrasives.

Preferred pH values for the alcoholic preparations used according to the invention range from 1.0 to 12.0, more preferably from 1.5 to 11.5, as from 2.0 to 11.0.

Exemplary alcoholic preparations b) will now be described (alcoholic preparations 1 to 4):

Alcoholic preparation 1

A preferred alcoholic preparation 1 has the following composition (Table 1a, particulars reported in wt%):

Table 1a

| Constituent |                                                          | preferably<br>at | more<br>preferably<br>at | particularly<br>at |
|-------------|----------------------------------------------------------|------------------|--------------------------|--------------------|
| b1          | ethanol                                                  | 10-50            | 15-40                    | 20-30              |
|             | 1-propanol                                               | 20-60            | 25-50                    | 30-40              |
| b2          | surfactant<br>(particularly<br>nonionic<br>surfactant) a | 0.01-0.2         | 0.02-0.1                 | 0.03-0.07          |
| b3          | water                                                    | balance          | balance                  | balance            |
| b4          | perfume                                                  | 0.005-0.1        | 0.008-0.07               | 0.01-0.05          |

Alcoholic preparation 2

A preferred alcoholic preparation 2 has the following composition (Table 1b, particulars reported in wt%):

Table 1b

| Constituent |                                                             | preferably<br>at | more<br>preferably<br>at | particularly<br>at |
|-------------|-------------------------------------------------------------|------------------|--------------------------|--------------------|
| b1          | ethanol                                                     | 30-80            | 50-70                    | 55-65              |
| b2          | surfactant<br>(particularly an<br>amphoteric<br>surfactant) | 0.005-0.1        | 0.01-0.08                | 0.02-0.04          |
| b3          | water                                                       | balance          | balance                  | balance            |
| b4          | perfume                                                     | 0.002-0.05       | 0.004-0.02               | 0.006-0.01         |

### Alcoholic preparation 3

A preferred alcoholic preparation 3 has the following  
5 composition (Table 1c, particulars reported in wt%).

Table 1c

| Constituent |                                                                                        | preferably<br>at | more<br>preferably<br>at | particularly<br>at |
|-------------|----------------------------------------------------------------------------------------|------------------|--------------------------|--------------------|
| b1          | 2-propanol                                                                             | 10-50            | 15-45                    | 20-40              |
|             | 1-propanol                                                                             | 10-50            | 15-45                    | 20-40              |
| b2          | organic acid<br>(particularly<br>benzoic acid, lactic<br>acid or a mixture<br>thereof) | 0.3-4            | 0.6-3                    | 1-2                |
| b3          | water                                                                                  | balance          | balance                  | balance            |
| b4          | base (pH adjustment)                                                                   | 0.05-1           | 0.1-0.5                  | 0.15-0.35          |
|             | perfume                                                                                | 0.03-0.3         | 0.06-0.2                 | 0.08-0.15          |

A preferred alcoholic preparation 4 is an aqueous 2-propanol  
10 solution having a 2-propanol content of 40 to 80 wt%,  
preferably 50 to 75 wt%, more preferably 60 to 70 wt%.

The constituents reported for alcoholic preparations 1 to 4 are the constituents which are typically present. Further constituents may be present in these preparations.

5 Alternatively, the textile fabric may be provided from a) a carrier material and b) an alcoholic preparation in the form of a kit. This embodiment is preferable when, for example, the preparation comprises constituents which on prolonged contact with carrier material a) are not compatible therewith, as may  
10 possibly be the case with peroxide actives.

In a second aspect, therefore, the present invention provides a kit for the manufacture of textile fabrics impregnated with an alcoholic preparation, said kit comprising a) a carrier  
15 material and b) the alcoholic preparation,

wherein the carrier material

20 i) comprises one or more nonwovens selected from drylaid, airlaid, wetlaid and spunbonded nonwovens,  
ii) has a basis weight, determined as per DIN EN 29073-1, of 10 to 70 g/m<sup>2</sup>, and  
iii) has an absorbency for the alcoholic preparation of  
25 not less than 400% (wt./wt.),

wherein the amount of the alcoholic preparation b) is such that the percentage impregnation of the carrier material is not more than 80%,

30

and wherein the alcoholic preparation comprises b1) one or more aliphatic C<sub>2</sub>- to C<sub>3</sub> alcohols, wherein the total amount of alcohol component b1) is in the range from 10 to 85 wt%, based on the weight of alcoholic preparation b).

35

In a third aspect, the present invention provides for the use of the impregnated fabric or of the kit in the disinfection of animate surfaces or inanimate surfaces.

- 5 In a fourth aspect, the present invention provides a process for disinfecting animate or inanimate surfaces, wherein the surface is subjected to the action of the impregnated fabric.

10 The present invention additionally provides a process for disinfecting and cleaning inanimate surfaces (hard surfaces in particular) with the impregnated textile fabric or the kit.

The advantages of the present invention are apparent from the following examples in particular. Percentages unless otherwise  
15 stated are by weight (wt%).

### **Examples**

**Method 1** - Determination of absorbency for the alcoholic  
20 preparation

The absorbency of the carrier material for the alcoholic preparation is determined in accordance with DIN 53923-1. To this end, in each case, a piece of the carrier material (10 x 10 cm) is weighed and secured with 4 paperclips to a  
25 metal grid (13.5 x 13.5 cm). The metal grid plus carrier material is immersed in 1 litre of the alcoholic preparation. After 1 min the grid plus the impregnated carrier material is removed and 3 of the paperclips are taken off. The impregnated carrier material is then inclined relative to the horizontal  
30 so as to hang freely and is let drip for 2 min. Thereafter, the impregnated carrier material is reweighed.

**Method 2** - Antimicrobial efficacy in the four-field test of  
EN 16615:2015

*Enterococcus hirae* was chosen as the challenge organism and the experiments were performed under clean conditions (0.03% bovine serum albumin), unless otherwise stated. The treatment time was 5 min. Different volumes of the test substance 70% (v/v) 2-propanol were applied to the standard test cloth defined in EN 16615:2015 (Tork cloth) at 8 ml, 16 ml or 24 ml, and the test was carried out as described in EN 16615:2015.

### **Method 3 - Delivery characteristics**

The delivered quantity is simulated with the four-field test of Method 2. To this end, the four-field test was carried out without admixture of challenge organisms to determine the delivered quantity.

Since it is not unambiguously quantifiable how much product is actually applied to the area (the rest ending up on the block, the hands, the Petri dish, etc.), the experimental set-up was supplemented. What is described hereinbelow is the EN 16615:2015 test as modified to demonstrate the advantages of the invention. The data obtained are more meaningful as a result of this modification:

- The size of the web was conformed to the standard block (a carrier material 7 x 11 cm in size is tested for good reproducibility).
- The nonwoven is impregnated on the block.
- The standard wiping procedure is carried out using the block.
- The delivery determined corresponds to the quantity applied to the area.

The standard block is provided the specific carrier material tested and Parafilm and placed on the scales. The alcoholic preparation is then applied until the defined amount of preparation is reached. Thereafter, the definition of the area

is simulated in line with the four-field test. The block plus the carrier material (and alcoholic preparation remaining thereon) is then reweighed and the difference from the original overall weight is used to compute the preparation  
5 quantity applied to the test area.

### **Example 1 - Influence of evaporation**

#### Procedure:

10 The efficacy of 70% (v/v) 2-propanol was evaluated in accordance with DGHM methodology (Gebel, J., Werner, H.-P., Kirsch-Altena, A., Bansemir, K. (2001): [in German] Standard Methods of the German Society for Hygiene and Microbiology (DGHM) for Testing Chemical Disinfection Procedures, Method  
15 14: Area Disinfection - A Realistic Test, pp. 40-44, mhp Verlag Wiesbaden).

PVC test areas were evaluated in addition to the OP tiles. These PVC test areas were cut out in a size 5 x 5 cm from the  
20 test area DLW - Solid Pur 521 - 029 (as obtained from VAH). The test areas (OP tiles and PVC) were each contaminated with 50 µl of bacterial suspension (*Staphylococcus aureus* or *Enterococcus hirae*) under clean conditions (0.03% bovine serum albumin) and dried in ambient air for max. 60 min.

25 After drying the inoculums, the test areas were each disinfected with 3 different volumes (50, 100 or 200 µl each) of 70% (v/v) 2-propanol. The applied disinfectant was distributed with a spatula as per DGHM Method 14.1.5 a Area  
30 Disinfection - A Realistic Test of Wipe Disinfection. To evaluate the influence of the evaporation of the alcohol on microbiological efficacy, one test area (PVC or OP tile) per applied volume (50, 100 or 200 µl of 2-propanol) was evaluated at room temperature without cover. In addition, for  
35 comparison, one test area in each case was stored under

identical conditions in a sealed Petri dish in order to minimize the flash-off effect of the 2-propanol.

The particular drying times were observed and recorded. After the treatment time of 5 min, the microorganisms were recovered from the test areas by means of glass beads on a horizontal shaker (DGHM Method No. 14.1.6 a). The data were analyzed as per DGHM Method 14.1.8. The lg RF values are depicted as means of three experiments (Fig. 1 and Fig. 2).

#### Example 2: 2-Propanol

(Method 2, *E. hirae*, clean conditions, 0.03% BSA)

Table 2 shows that the application of increasing amounts of 2-propanol (70%, v/v) has an advantageous effect on the efficacy obtained in the course of a treatment time of 5 min:

Table 2

|                                         | 8 ml | 16 ml | 24 ml |
|-----------------------------------------|------|-------|-------|
| test field 1, lg                        | 3.15 | 7.58  | 7.42  |
| test fields 2-4, CFU/25 cm <sup>2</sup> | 0    | 0     | 0     |
| drying time, sec                        | 23   | 70    | 225   |
| solution transferred                    | 1.1  | 1.65  | 2.92  |

An amount of 8 ml does not lead to adequate microbial efficacy in relation to the test organism in the EN 16615:2015 test, whereas an impregnation volume of 16 ml or 24 ml on the standard cloth used for disinfection leads to adequate efficacy as per EN 16615:2015 (RF  $\geq 5$  on test field 1;  $\emptyset \leq 50$  CFU / 25 cm<sup>2</sup> on test fields 2-4).

#### Example 3 (Method 3)

Nineteen (19) nonwovens were evaluated under controlled environmental conditions (22°C, about 25% relative humidity) in order to capture the influence of grammage, raw material, fibre production, consolidation and finish. To this end, the particular carrier material was tested as described in Method 3 in combination with an alcoholic preparation (consisting of about 25 wt% of ethanol, 35 wt% of 1-propanol, 0.05 wt% of nonionic surfactant, 0.02 wt% of perfume, balance water), in that the particular carrier material was impregnated to 50%, 75% and 100%, all based on the maximum absorbency. All the values were determined in 3-plicate. Table 3 reports the data for i) maximum uptake and ii) delivery/uptake in terms of the respective means. Reproducibility was very good, in that the deviations from the mean were merely 8.1% in the maximum uptake test (i.e. as per Method 1) and 14.9% in the test for specific delivery.

|     |                     |               |             |               |           |                          | 50% <sup>2</sup> | 75% <sup>2</sup> | 100% <sup>2</sup> |
|-----|---------------------|---------------|-------------|---------------|-----------|--------------------------|------------------|------------------|-------------------|
|     |                     |               |             |               | Thickness | Max. uptake <sup>1</sup> | Delivery/uptake  |                  |                   |
|     | Grammage            | Material      | Technology  | Consolidation | [mm]      | [%]                      | [%]              | [%]              | [%]               |
| 1   | 20 g/m <sup>2</sup> | PP            | spinbonding | spunlace      | 0.327     | 769                      | 56.9             | 52.7             | 47.5              |
| 2   | 40 g/m <sup>2</sup> | PP            | spinbonding | spunlace      | 0.455     | 553                      | 42.1             | 36.0             | 33.8              |
| 3*  | 75 g/m <sup>2</sup> | PP            | spinbonding | spunlace      | 0.570     | 458                      | 26.2             | 22.7             | 24.4              |
| 4*  | 75 g/m <sup>2</sup> | PP            | spinbonding | spunlace      | 0.525     | 350                      | 21.5             | 23.8             | 26.1              |
| 5   | 24 g/m <sup>2</sup> | PP            | carding     |               | 0.467     | 947                      | 50.9             | 44.1             | 39.4              |
| 6   | 40 g/m <sup>2</sup> | PP            | carding     |               | 0.460     | 557                      | 40.2             | 36.5             | 35.0              |
| 7*  | 75 g/m <sup>2</sup> | cellulose/PET | drylaid     |               | 0.447     | 456                      | 18.1             | 21.9             | 23.0              |
| 8   | 40 g/m <sup>2</sup> | PET           | drylaid     | spunlace      | 0.620     | 893                      | 39.7             | 29.2             | 29.5              |
| 9   | 26 g/m <sup>2</sup> | PET           | drylaid     | spunlace      | 0.600     | 1212                     | 48.3             | 39.7             | 35.3              |
| 10* | 40 g/m <sup>2</sup> | PP            | meltblown   |               | 0.360     | 473                      | 17.3             | 19.5             | 26.1              |
| 11  | 48 g/m <sup>2</sup> | PET           | drylaid     | spunlace      | 0.528     | 701                      | 32.4             | 28.6             | 27.4              |
| 12* | 22 g/m <sup>2</sup> | cellulose/PET | wetlaid     |               | 0.102     | 362                      | 36.3             | 36.0             | 37.9              |
| 13  | 19 g/m <sup>2</sup> | PP            | spinbonding |               | 0.200     | 537                      | 53.2             | 47.5             | 39.2              |
| 14  | 20 g/m <sup>2</sup> | cellulose/PET | drylaid     | spunbond      | 0.120     | 497                      | 40.2             | 42.7             | 41.6              |
| 16  | 50 g/m <sup>2</sup> | lyocell fibre | Tencel      |               | 0.565     | 840                      | 25.9             | 22.8             | 23.0              |
| 17* | 80 g/m <sup>2</sup> | lyocell fibre | Tencel      |               | 2.957     | 1041                     | 28.4             | 21.0             | 15.8              |
| 18  | 20 g/m <sup>2</sup> | PP            | drylaid     | spunbond      | 0.287     | 600                      | 51.6             | 47.4             | 58.3              |
| 19  | 20 g/m <sup>2</sup> | PP            | drylaid     | spunbond      | 0.190     | 449                      | 53.7             | 51.2             | 49.0              |

Table 3

\* = comparison

<sup>1</sup> wt/wt<sup>2</sup> degree of impregnation

The data in Table 3 show clearly that, for example, PP spunbondeds with spunlace consolidation even in the case of a high basis weight, a high maximum uptake (a high absorbency) and a high degree of impregnation do not necessarily lead to a high delivery (Comparative Examples 3 and 4). Delivery is very good, by contrast, in the case of a lower basis weight and high absorbency (Inventive Examples 1, 2 and 13). Good results regarding delivery are also achieved with carded PP webs (Inventive Examples 5 and 6). This also holds for Inventive Examples 18 and 19 involving drylaid PP webs with spunbond consolidation.

Example 7, featuring a high basis weight for the carrier material, is for comparison and shows inadequate delivery, even at a 100% degree of impregnation. Examples 8, 9 and 11 evidence that even PET webs are employable for the purposes of the invention. Example 10 is for comparison and shows that meltblown webs do not evince the effect exploited according to the invention. Example 12 (cellulose/PET) is for comparison and shows that when absorbency is low, even a high degree of impregnation does not lead to high delivery, while Example 14 (likewise cellulose/PET) is in accordance with the present invention and evidences, by contrast, the advantages of high absorbency.

Examples 16 and 17, featuring a lyocell fibre, show that with these fibres (which have a high level of dry strength, wet strength and softness), delivery is inadequate even at a high degree of impregnation, on employing a web having a high grammage of 80 g/m<sup>2</sup> (even when coupled with a very high absorbency of 1041%, Comparative Example 17). Using by contrast, in accordance with the present invention, a web having a lower grammage of just 40 g/m<sup>2</sup>, then delivery is adequate across a wide range of degrees of impregnation (Example 16).

**Example 4** - Possible ways to optimize the efficiency of cloth systems (cloth size 200 x 270 mm)

According to the invention, the delivery of alcoholic preparations out of impregnated textile fabrics can be made more effective:

|                                           | Comparison<br>(cellulose/PET, wetlaid,<br>chemical bonding) | Invention (PP) |
|-------------------------------------------|-------------------------------------------------------------|----------------|
| grammage, g/m <sup>2</sup>                | 22                                                          | 20             |
| cloth size, mm                            | 200 x 270                                                   | 200 x 270      |
| number of cloths per<br>roll, pieces off  | 200                                                         | 200            |
| weight of nonwoven<br>roll, g             | 237.6                                                       | 216            |
| impregnation quantity<br>per pack unit, g | 680                                                         | 680            |
| max. uptake, %                            | 362                                                         | 769            |
| max. uptake, g                            | 860.1                                                       | 1661           |
| impregnation quantity<br>per pack unit, g | 680                                                         | 680            |
| degree of<br>impregnation, %              | 79.1                                                        | 40.9           |
| delivery/uptake, %                        | 37                                                          | 59             |
| delivered quantity, g                     | 251                                                         | 400            |

Table 4

The data in Table 4 show that the invention achieves the higher delivered quantity with a carrier material of high maximum uptake capacity because - for the same quantity of impregnation - the degree of impregnation is lower in the invention, so the relative delivery, i.e. the delivery/uptake ratio, in %, is distinctly higher in the invention than in the comparative test.

**Claims**

1. Textile fabric impregnated with an alcoholic preparation, said fabric comprising

- a) a carrier material, and
- b) the alcoholic preparation,

wherein

- the carrier material
  - i) comprises one or more nonwovens selected from drylaid, airlaid, wetlaid and spunbonded nonwovens,
  - ii) has a basis weight, determined as per DIN EN 29073-1, of 10 to 70 g/m<sup>2</sup>, and
  - iii) has an absorbency for the alcoholic preparation of not less than 400% (wt./wt.),
- the percentage impregnation of the carrier material is not more than 80%,

and wherein

- the alcoholic preparation comprises b1) one or more aliphatic C<sub>2</sub>- to C<sub>3</sub> alcohols, wherein the total amount of alcohol component b1) is in the range from 10 to 85 wt%, based on the weight of alcoholic preparation b).

2. Impregnated fabric according to Claim 1, **characterized in that** the drylaid nonwoven is a carded nonwoven.

3. Impregnated fabric according to Claim 1 or 2,  
**characterized in that** the nonwoven is a spunlace nonwoven.
4. Impregnated fabric according to any preceding claim,  
**characterized in that** the carrier material a) has a basis weight of 15 to 60 g/m<sup>2</sup>, preferably 18 to 55 g/m<sup>2</sup>, particularly 20 to 50 g/m<sup>2</sup>.
5. Impregnated fabric according to any preceding claim,  
**characterized in that** the carrier material a) has an absorbency of not less than 450%, preferably not less than 500%, particularly not less than 550%, such as not less than 600% (all (weight/weight)).
6. Fabric according to any preceding claim, **characterized in that** the percentage impregnation of the carrier material is in the range from 15 to 75%, more preferably 20 to 70%, particularly 25 to 70%, such as 30 to 70%, for example 35 to 65 %.
7. Impregnated fabric according to any preceding claim,  
**characterized in that** the carrier material a) comprises one or more polymers selected from polyethylene terephthalate (PET), polyolefin, viscose, cellulose and polylactic acid (PLA),  
  
wherein the polyolefin is preferably polypropylene (PP).
8. Impregnated fabric according to any preceding claim,  
**characterized in that** the carrier material a) comprises blend fibres,  
  
wherein the blend fibres preferably comprise one or more of viscose/PP and viscose/PET.

9. Impregnated fabric according to any of Claims 1 to 7, **characterized in that** the carrier material a) consists of polyolefin, preferably polypropylene.
10. Impregnated fabric according to any preceding claim, **characterized in that** the total amount of alcohol component b1) is in the range from 20 to 80 wt%, preferably 30 to 80 wt%, particularly 40 to 75 wt%, such as 50 to 70 wt%, particularly 55 to 65 wt%, all based on the weight of alcoholic preparation b).
11. Impregnated fabric according to any preceding claim, **characterized in that** component b1) is a single aliphatic C<sub>2</sub> to C<sub>3</sub> alcohol or a mixture of two aliphatic C<sub>2</sub> to C<sub>3</sub> alcohols.
12. Impregnated fabric according to any preceding claim, **characterized in that** the alcoholic preparation b) further comprises
- b2) one or more antimicrobial actives,
  - b3) one or more solvents, and/or
  - b4) one or more excipients.
13. Kit for the manufacture of textile fabrics impregnated with an alcoholic preparation, said kit comprising
- a) a carrier material, and
  - b) the alcoholic preparation,
- wherein
- the carrier material
    - i) comprises one or more nonwovens selected from drylaid, airlaid, wetlaid and spunbonded nonwovens,

- ii) has a basis weight, determined as per DIN EN 29073-1, of 10 to 70 g/m<sup>2</sup>, and
- iii) has an absorbency for the alcoholic preparation of not less than 400% (wt./wt.),

- the amount of the alcoholic preparation b) is such that the percentage impregnation of the carrier material is not more than 80%,

and wherein

- the alcoholic preparation comprises b1) one or more aliphatic C<sub>2</sub>- to C<sub>3</sub> alcohols, wherein the total amount of alcohol component b1) is in the range from 10 to 85 wt%, based on the weight of alcoholic preparation b).

14. Use of the impregnated fabric according to any of Claims 1 to 12 or of the kit according to Claim 13 in the disinfection of animate surfaces or inanimate surfaces.

15. Process for disinfecting animate or inanimate surfaces, wherein the surface is subjected to the action of the impregnated fabric according to any of Claims 1 to 12.