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71	FULL NAME(S) OF APPLICANT(S)
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The Procter & Gamble Company

72	FULL NAME(S) OF INVENTOR(S)
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MENIF, Rached

STULENS, Marielle Jeannine Coletta

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54	TITLE OF INVENTION
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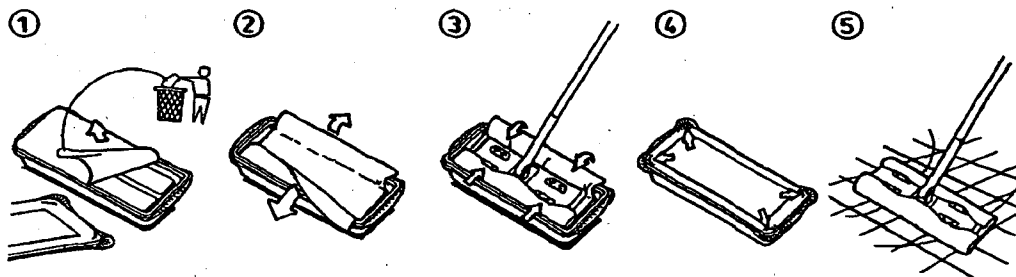
A method of cleaning floors and other large surfaces

57	ABSTRACT (NOT MORE THAN 150 WORDS)
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NUMBER OF SHEETS	63
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The sheet(s) containing the abstract is/are attached.

If no classification is furnished, Form P.9 should accompany this form.  
The figure of the drawing to which the abstract refers is attached.



(57) Abstract: The present invention relates to a method of cleaning floors and other large surfaces with a cleaning device comprising a handle and a mop head attached thereonto, and a disposable mop wetted with a cleaning composition, said mop being initially at least partially folded and packaged into a box containing a stack of said mops, and said mop being releasably fixed onto said mop head before and while cleaning, said method being characterized in that it comprises the steps of: (i) opening said box - said box having width and length dimensions slightly superior to the surface of the mop head -, so as to expose the mop being on top of said stack of mops, then (ii) manually unfolding said top mop so that it presents a first surface having width and length dimensions slightly superior to the surface of the mop head, then (iii) placing the implement mop head into the box so that the lower surface of said mop head contacts said first surface of said top wipe, then (iv) removing the implement with the wipe attached thereonto and closing the box with its cover so as to prevent evaporation of the cleaning composition, then (v) wiping the floor using said device, and then remove the wipe once used.

## A METHOD OF CLEANING FLOORS AND OTHER LARGE SURFACES

### FIELD OF THE INVENTION

This invention relates to a method of cleaning floors and other large surfaces using liquid cleaning compositions, including compositions with the liquid on a substrate and concentrates, optimized substrate designs and implements for use in cleaning hard surfaces and/or maintaining their appearance and hygiene, and articles comprising said compositions, concentrates, substrates, etc. in association with instructions as to how to use them to provide superior performance. The method of cleaning using these compositions, substrate and implement designs along with specific instructions for use is advantageous for cleaning of hard surfaces including bathroom surfaces, glass surfaces, countertops, walls and floors, but is more particularly intended to be a method of cleaning floors and other large surfaces.

### BACKGROUND OF THE INVENTION

The use of detergent compositions comprising organic water-soluble synthetic detergent surfactants, polymers, and cleaning solvents for cleaning hard surfaces in, e.g., bathrooms, is well established. Known liquid detergent compositions for this purpose comprise organic cleaning solvents, detergent surfactant, and optional detergent builders and/or abrasives. The compositions can be acid for improved removal of hard water deposits.

Liquid cleaning compositions are usually preferred, since they have the advantage that they can be applied to hard surfaces in neat or concentrated form so that a relatively high level of, e.g., surfactant material and/or organic solvent is delivered directly to the soil. However, solid compositions can also be used to form a cleaning solution when diluted with water. Concentrated liquid cleaning compositions can also help improve the value equation for consumers by economizing on packaging costs, where the concentrated products are intended to be used in more dilute form. A concentrated, e.g., 10X refill, can also provide additional convenience to the consumer in that it lasts longer, weighs less, and occupies less space than a 1X product. Liquid cleaning compositions in the form of a "wipe" also can provide convenience by allowing the consumer to use the wipe once and dispose of it.

Implements are important in that they can be used to advantageously improve the performance of the liquid compositions. Implements, including wipes, pads, mops and the like, can provide important mechanical cleaning properties to complement the liquid composition choice. Conversely, the liquid compositions can be chosen to suit the choice of implement. Thus, the proper choice of implement allows for a significant reduction in the level of non-volatile surfactants and other adjuvants needed to achieve excellent cleaning results. Also, suitable

combinations of implement, organic cleaning solvent and volatile buffer can work synergistically to provide excellent cleaning results while leaving a low residual level of on the treated surfaces.

Mops (i.e. wipes) to be fixed onto the mop head of a cleaning implement have to be handled carefully by the user. Sometimes, they need to be partially unfolded and fixed onto the implement prior to wiping the surface to clean. This step of handling the mop prior to its use constitute one step of the cleaning process. It has been shown that extensive contacts between the mops, and the hands of the user should be avoided in some cases. This is especially important in case the mops to be attached to a cleaning implement are pre-moistened (i.e. wetted). Indeed, some compounds present into the wetting cleaning composition may have a negative effect (drying, whitening, ...etc.) to the skin of the consumer. Thus, it is an object of the present invention to provide a method of cleaning floors and other large surfaces with a cleaning device (i.e. cleaning implement) that comprises a handle and a mop head attached thereonto, and a disposable mop wetted with a cleaning composition, that minimizes, or even prevents contact between the hands of the user and the surface of the mops.

By pre-moistened, it is meant a wipe or mop that is stored in its package together while being impregnated with the cleaning composition, so that the user does not have to open a bottle of cleaning composition at each use. The wipe can be pre-moistened by adding solution directly on the packaging line during the manufacturing process, or alternatively, the composition can be added once by the user at first use, and then remain impregnated for next uses.

#### SUMMARY OF THE INVENTION

The present invention relates to a method of cleaning floors and other large surfaces with a cleaning device comprising a handle and a mop head attached thereonto, and a disposable mop wetted with a cleaning composition, said mop being initially at least partially folded and packaged into a box containing a stack of said mops, and said mop being releasably fixed onto said mop head before and while cleaning, said method being characterized in that it comprises the steps of:

- (i) opening said box - said box having width and length dimensions slightly superior to the surface of the mop head -, so as to expose the mop being on top of said stack of mops, then
- (ii) manually unfolding said top mop so that it presents a first surface having width and length dimensions slightly superior to the surface of the mop head, then
- (iii) placing the implement mop head into the box so that the lower surface of said mop head contacts said first surface of said top wipe, then

- (iv) removing the implement with the wipe attached thereonto and closing the box with its cover so as to prevent evaporation of the cleaning composition, then
- (v) wiping the floor using said device, and then remove the wipe once used.

### DETAILED DESCRIPTION OF THE INVENTION

In the following, a description of the compositions for use in the method of cleaning of the present invention will first be given, and then the implement as well as the cleaning wipes or mops with which these compositions should be used will be described. Finally, a detailed description of the method of cleaning according to the invention will be made.

### THE COMPOSITIONS

The compositions used in a method of cleaning according to the invention are especially useful for maintaining the appearance of hard surfaces and the buildup of hard-to-remove soils that are commonly encountered on floors and/or in the bathroom. These include hard water stains, fatty acids, triglycerides, lipids, insoluble fatty acid soaps, entrenched particulate matter, encrusted food, and the like. The detergent compositions can be used on many different surface types, such as ceramic, fiber glass, glass, polyurethane, metallic surfaces, plastic surfaces, and laminates of all the above.

#### Hydrophilic Polymer

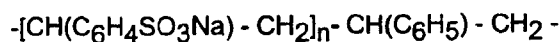
In the context of the present invention, the polymeric material that improves the hydrophilicity of the surface being treated is essential. This increase in hydrophilicity provides improved final appearance by providing "sheeting" of the water from the surface and/or spreading of the water on the surface, and this effect is preferably seen when the surface is rewetted and even when subsequently dried after the rewetting.

In the context of a product intended to be used as a daily shower product, the "sheeting" effect is particularly noticeable because most of the surfaces treated are vertical surfaces. Thus, benefits have been noted on glass, ceramic and even tougher to wet surfaces such as porcelain enamel. When the water "sheets" evenly off the surface and/or spreads on the surface, it minimizes the formation of, e.g., "hard water spots" that form upon drying. For a product intended to be used in the context of a floor cleaner, the polymer improves surface wetting and assists cleaning performance.

Polymer substantivity is beneficial as it prolongs the sheeting and cleaning benefits. Another important feature of preferred polymers is lack of residue upon drying. Compositions

comprising preferred polymers dry more evenly on floors while promoting an end result with little or no haze.

Many materials can provide the sheeting and anti-spotting benefits, but the preferred materials are polymers that contain amine oxide hydrophilic groups. Polymers that contain other hydrophilic groups such as a sulfonate, pyrrolidone, and/or carboxylate groups can also be used. Examples of desirable poly-sulfonate polymers include polyvinylsulfonate, and more preferably polystyrene sulfonate, such as those sold by Monomer-Polymer Dajac (1675 Bustleton Pike, Feasterville, Pennsylvania 19053). A typical formula is as follows.



wherein n is a number to give the appropriate molecular weight as disclosed below.

Typical molecular weights are from about 10,000 to about 1,000,000, preferably from about 200,000 to about 700,000. Preferred polymers containing pyrrolidone functionalities include polyvinyl pyrrolidone, quaternized pyrrolidone derivatives (such as Gafquat 755N from International Specialty Products), and co-polymers containing pyrrolidone, such as polyvinylpyrrolidone /dimethylaminoethylmethacrylate (available from ISP) and polyvinyl pyrrolidone/acrylate (available from BASF). Other materials can also provide substantivity and hydrophilicity including cationic materials that also contain hydrophilic groups and polymers that contain multiple ether linkages. Cationic materials include cationic sugar and/or starch derivatives and the typical block copolymer detergent surfactants based on mixtures of polypropylene oxide and ethylene oxide are representative of the polyether materials. The polyether materials are less substantive, however.

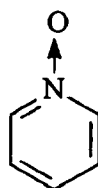
The preferred polymers comprise water soluble amine oxide moieties. It is believed that the partial positive charge of the amine oxide group can act to adhere the polymer to the surface of the surface substrate, thus allowing water to "sheet" more readily. The amine oxide moiety can also hydrogen-bond with hard surface substrates, such as ceramic tile, glass, fiberglass, porcelain enamel, linoleum, no-wax tile, and other hard surfaces commonly encountered in consumer homes. To the extent that polymer anchoring promotes better "sheeting" higher molecular materials are preferred. Increased molecular weight improves efficiency and effectiveness of the amine oxide-based polymer. The preferred polymers of this invention have one or more monomeric units containing at least one N-oxide group. At least about 10%, preferably more than about 50%, more preferably greater than about 90% of said monomers forming said polymers contain an amine oxide group. These polymers can be described by the general formula:



wherein each P is selected from homopolymerizable and copolymerizable moieties which attach to form the polymer backbone, preferably vinyl moieties, e.g.  $\text{C(R)}_2 - \text{C(R)}_2$ , wherein each R is H,  $\text{C}_1 - \text{C}_{12}$  (preferably  $\text{C}_{\text{sub.1}} - \text{C}_{\text{sub.4}}$ ) alkyl(ene),  $\text{C}_6 - \text{C}_{12}$  aryl(ene) and/or B; B is a moiety selected from substituted and unsubstituted, linear and cyclic  $\text{C}_1 - \text{C}_{12}$  alkyl,  $\text{C}_1 - \text{C}_{12}$  alkylene,  $\text{C}_1 - \text{C}_{12}$

heterocyclic, aromatic C<sub>6</sub>-C<sub>12</sub> groups and wherein at least one of said B moieties has at least one amine oxide (—N→O) group present; u is from a number that will provide at least about 10% monomers containing an amine oxide group to about 90%; and t is a number such that the average molecular weight of the polymer is from about 2,000 to about 500,000, preferably from about 5,000 to about 250,000, and more preferably from about 7,500 to about 200,000.

The preferred polymers of this invention possess the unexpected property of being substantive without leaving a visible residue that would render the surface substrate unappealing to consumers. The preferred polymers include poly(4-vinylpyridine N-oxide) polymers (PVNO), e.g. those formed by polymerization of monomers that include the following moiety:



wherein the average molecular weight of the polymer is from about 2,000 to about 500,000 preferably from about 5,000 to about 400,000, and more preferably from about 7,500 to about 300,000. In general, higher molecular weight polymers are preferred. Often, higher molecular weight polymers allow for use of lower levels of the wetting polymer, which can provide benefits in floor cleaner applications. The desirable molecular weight range of polymers useful in the present invention stands in contrast to that found in the art relating to polycarboxylate, polystyrene sulfonate, and polyether based additives which prefer molecular weights in the range of 400,000 to 1,500,000. Lower molecular weights for the preferred poly-amine oxide polymers of the present invention are due to greater difficulty in manufacturing these polymers in higher molecular weight.

The level of amine oxide polymer will normally be less than about 0.5%, preferably from about 0.005% to about 0.4%, more preferably from about 0.01% to about 0.3%, by weight of the end use composition/solution.

Some non-limiting examples of homopolymers and copolymers which can be used as water soluble polymers of the present invention are: adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; adipic acid/epoxypropyl diethylenetriamine copolymer; polyvinyl alcohol; methacryloyl ethyl betaine/methacrylates copolymer; ethyl acrylate/methyl methacrylate/methacrylic acid/acrylic acid copolymer; polyamine resins; and polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride). Preferably, said copolymer and/or homopolymers are selected from the group consisting of adipic acid/dimethylaminohydroxypropyl diethylenetriamine copolymer; poly(vinylpyrrolidone/dimethylaminoethyl methacrylate); polyvinyl alcohol; ethyl acrylate/methyl

methacrylate/methacrylic acid/acrylic acid copolymer; methacryloyl ethyl betaine/methacrylates copolymer; polyquaternary amine resins; poly(ethenylformamide); poly(vinylamine) hydrochloride; poly(vinyl alcohol-co-6% vinylamine); poly(vinyl alcohol-co-12% vinylamine); poly(vinyl alcohol-co-6% vinylamine hydrochloride); and poly(vinyl alcohol-co-12% vinylamine hydrochloride).

Polymers useful in the present invention can be selected from the group consisting of copolymers of hydrophilic monomers. The polymer can be linear random or block copolymers, and mixtures thereof. The term "hydrophilic" is used herein consistent with its standard meaning of having affinity for water. As used herein in relation to monomer units and polymeric materials, including the copolymers, "hydrophilic" means substantially water soluble. In this regard, "substantially water soluble" shall refer to a material that is soluble in distilled (or equivalent) water, at 25°C, at a concentration of about 0.2% by weight, and are preferably soluble at about 1% by weight. The terms "soluble", "solubility" and the like, for purposes hereof, correspond to the maximum concentration of monomer or polymer, as applicable, that can dissolve in water or other solvents to form a homogeneous solution, as is well understood to those skilled in the art.

Nonlimiting examples of useful hydrophilic monomers are unsaturated organic mono- and polycarboxylic acids, such as acrylic acid, methacrylic acid, crotonic acid, maleic acid and its half esters, itaconic acid; unsaturated alcohols, such as vinyl alcohol, allyl alcohol; polar vinyl heterocyclics, such as, vinyl caprolactam, vinyl pyridine, vinyl imidazole; vinyl amine; vinyl sulfonate; unsaturated amides, such as acrylamides, e.g., N,N-dimethylacrylamide, N-t-butyl acrylamide; hydroxyethyl methacrylate; dimethylaminoethyl methacrylate; salts of acids and amines listed above; and the like; and mixtures thereof. Some preferred hydrophilic monomers are acrylic acid, methacrylic acid, N,N-dimethyl acrylamide, N,N-dimethyl methacrylamide, N-t-butyl acrylamide, dimethylamino ethyl methacrylate, thereof, and mixtures thereof.

Polycarboxylate polymers are those formed by polymerization of monomers, at least some of which contain carboxylic functionality. Common monomers include acrylic acid, maleic acid, ethylene, vinyl pyrrolidone, methacrylic acid, methacryloylethylbetaine, etc. Preferred polymers for substantivity are those having higher molecular weights. For example, polyacrylic acid having molecular weights below about 10,000 are not particularly substantive and therefore do not normally provide hydrophilicity for three rewetings with all compositions, although with higher levels and/or certain surfactants like amphoteric and/or zwitterionic detergent surfactants, molecular weights down to about 1000 can provide some results. In general, the polymers should have molecular weights of more than about 10,000, preferably more than about 20,000, more preferably more than about 300,000, and even more preferably more than about 400,000. It has also been found that higher molecular weight polymers, e.g., those having molecular weights of more than about 3,000,000, are extremely difficult to formulate and are less effective in providing anti-spotting benefits than lower molecular weight polymers. Accordingly, the molecular weight should normally be, especially for polyacrylates, from about 20,000 to about 3,000,000; preferably



from about 20,000 to about 2,500,000; more preferably from about 300,000 to about 2,000,000; and even more preferably from about 400,000 to about 1,500,000.

An advantage for some polycarboxylate polymers is the detergent builder effectiveness of such polymers. Although such polymers do hurt filming/streaking, like other detergent builders, they provide increased cleaning effectiveness on typical, common "hard-to-remove" soils that contain particulate matter.

Some polymers, especially polycarboxylate polymers, thicken the compositions that are aqueous liquids. This can be desirable. However, when the compositions are placed in containers with trigger spray devices, the compositions are desirably not so thick as to require excessive trigger pressure. Typically, the viscosity under shear should be less than about 200 cp, preferably less than about 100 cp, more preferably less than about 50 cp. It can be desirable, however, to have thick compositions to inhibit the flow of the composition off the surface, especially vertical surfaces.

Non limiting examples of polymers for use in the present invention include the following: poly(vinyl pyrrolidone/acrylic acid) sold under the name "Acrylidone"® by ISP and poly(acrylic acid) sold under the name "Accumer"® by Rohm & Haas. Other suitable materials include sulfonated polystyrene polymers sold under the name Versaflex® sold by National Starch and Chemical Company, especially Versaflex 7000.

The level of polymeric material will normally be less than about 0.5%, preferably from about 0.01% to about 0.4%, more preferably from about 0.01% to about 0.3%. In general, lower molecular weight materials such as lower molecular weight poly(acrylic acid), e.g., those having molecular weights below about 10,000, and especially about 2,000, do not provide good anti-spotting benefits upon rewetting, especially at the lower levels, e.g., about 0.02%. One should use only the more effective materials at the lower levels. In order to use lower molecular weight materials, substantivity should be increased, e.g., by adding groups that provide improved attachment to the surface, such as cationic groups, or the materials should be used at higher levels, e.g., more than about 0.05%.

#### The Surfactant

When the polymer is not present in the compositions herein, the compositions will normally have one of the preferred surfactants present. The preferred surfactants for use herein are the alkylpolysaccharides that are disclosed in U.S. Patents: 5,776,872, Cleansing compositions, issued July 7, 1998, to Giret, Michel Joseph; Langlois, Anne; and Duke, Roland Philip; 5,883,059, Three in one ultra mild lathering antibacterial liquid personal cleansing composition, issued March 16, 1999, to Furman, Christopher Allen; Giret, Michel Joseph; and Dunbar, James Charles; etc.; 5,883,062, Manual dishwashing compositions, issued March 16, 1999, to Addison, Michael Crombie; Foley, Peter Robert; and Allsebrook, Andrew Micheal; and

5,906,973, issued May 25, 1999, Process for cleaning vertical or inclined hard surfaces, by Ouzounis, Dimitrios and Nierhaus, Wolfgang.

Suitable alkylpolysaccharides for use herein are disclosed in U.S. Pat. No. 4,565,647, Llenado, issued Jan. 21, 1986, having a hydrophobic group containing from about 6 to about 30 carbon atoms, preferably from about 10 to about 16 carbon atoms and a polysaccharide, e.g., a polyglycoside, hydrophilic group. For acidic or alkaline cleaning compositions/solutions suitable for use in no-rinse methods, the preferred alkyl polysaccharide preferably comprises a broad distribution of chain lengths, as these provide the best combination of wetting, cleaning, and low residue upon drying. This "broad distribution" is defined by at least about 50% of the chainlength mixture comprising from about 10 carbon atoms to about 16 carbon atoms. Preferably, the alkyl group of the alkyl polysaccharide consists of a mixture of chainlength, preferably from about 6 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and hydrophilic group containing from about one to about 1.5 saccharide, preferably glucoside, groups per molecule. This "broad chainlength distribution" is defined by at least about 50% of the chainlength mixture comprising from about 10 carbon atoms to about 16 carbon atoms. A broad mixture of chain lengths, particularly C<sub>8</sub>-C<sub>16</sub>, is highly desirable relative to narrower range chain length mixtures, and particularly versus lower (i.e., C<sub>8</sub>-C<sub>10</sub> or C<sub>8</sub>-C<sub>12</sub>) chainlength alkyl polyglucoside mixtures. It is also found that the preferred C<sub>8</sub>-C<sub>16</sub> alkyl polyglucoside provides much improved perfume solubility versus lower and narrower chainlength alkyl polyglucosides, as well as other preferred surfactants, including the C<sub>8</sub>-C<sub>14</sub> alkyl ethoxylates. Any reducing saccharide containing 5 or 6 carbon atoms can be used, e.g., glucose, galactose and galactosyl moieties can be substituted for the glucosyl moieties. (optionally the hydrophobic group is attached at the 2-, 3-, 4-, etc. positions thus giving a glucose or galactose as opposed to a glucoside or galactoside.) The intersaccharide bonds can be, e.g., between the one position of the additional saccharide units and the 2-, 3-, 4-, and/or 6- positions on the preceding saccharide units. The glycosyl is preferably derived from glucose.

Optionally, and less desirably, there can be a polyalkyleneoxide chain joining the hydrophobic moiety and the polysaccharide moiety. The preferred alkyleneoxide is ethylene oxide. Typical hydrophobic groups include alkyl groups, either saturated or unsaturated, branched or unbranched containing from 8 to 18, preferably from 10 to 16, carbon atoms. Preferably, the alkyl group is a straight-chain saturated alkyl group. The alkyl group can contain up to about 3 hydroxyl groups and/or the polyalkyleneoxide chain can contain up to about 10, preferably less than 5, alkyleneoxide moieties. Suitable alkyl polysaccharides are octyl, nonyldecyl, undecyldodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexagluosides and/ or galatoses. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentagluosides and tallow alkyl tetra-, penta- and hexagluosides.

To prepare these compounds, the alcohol or alkylpolyethoxy alcohol is formed first and then reacted with glucose, or a source of glucose, to form the glucoside (attachment at the 1-

position). The additional glycosyl units can then be attached between their 1-position and the preceding glycosyl units 2-, 3-, 4- and/or 6-position, preferably predominantly the 2-position.

In the alkyl polyglycosides, the alkyl moieties can be derived from the usual sources like fats, oils or chemically produced alcohols while their sugar moieties are created from hydrolyzed polysaccharides. Alkyl polyglycosides are the condensation product of fatty alcohol and sugars like glucose with the number of glucose units defining the relative hydrophilicity. As discussed above, the sugar units can additionally be alkoxylated either before or after reaction with the fatty alcohols. Such alkyl polyglycosides are described in detail in WO 86/05199 for example. Technical alkyl polyglycosides are generally not molecularly uniform products, but represent mixtures of alkyl groups and mixtures of monosaccharides and different oligosaccharides. Alkyl polyglycosides (also sometimes referred to as "APG's") are preferred for the purposes of the invention since they provide additional improvement in surface appearance relative to other surfactants. The glycoside moieties are preferably glucose moieties. The alkyl substituent is preferably a saturated or unsaturated alkyl moiety containing from about 8 to about 18 carbon atoms, preferably from about 8 to about 10 carbon atoms or a mixture of such alkyl moieties. C<sub>8</sub>-C<sub>16</sub> alkyl polyglucosides are commercially available (e.g., Simusol<sup>®</sup> surfactants from Seppic Corporation, 75 Quai d'Orsay, 75321 Paris, Cedex 7, France, and Glucopon<sup>®</sup>425 available from Henkel. However, it has been found that purity of the alkyl polyglucoside can also impact performance, particularly end result for certain applications, including daily shower product technology. In the present invention, the preferred alkyl polyglucosides are those which have been purified enough for use in personal cleansing. Most preferred are "cosmetic grade" alkyl polyglucosides, particularly C<sub>8</sub> to C<sub>16</sub> alkyl polyglucosides, such as Plantaren 2000<sup>®</sup>, Plantaren 2000 N<sup>®</sup>, and Plantaren 2000 N UP<sup>®</sup>, available from Henkel Corporation (Postfach 101100, D 40191 Dusseldorf, Germany).

In the context of floor, counter, wall, etc. applications, another class of preferred nonionic surfactant is alkyl ethoxylates. The alkyl ethoxylates of the present invention are either linear or branched, and contain from about 8 carbon atoms to about 14 carbon atoms, and from about 4 ethylene oxide units to about 25 ethylene oxide units. Examples of alkyl ethoxylates include Neodol<sup>®</sup> 91-6, Neodol 91-8<sup>®</sup> supplied by the Shell Corporation (P.O. Box 2463, 1 Shell Plaza, Houston, Texas), and Alfonic<sup>®</sup> 810-60 supplied by Vista corporation, (900 Threadneedle P.O. Box 19029, Houston, TX). More preferred surfactants are the alkyl ethoxylates comprising from about 9 to about 12 carbon atoms, and from about 4 to about 8 ethylene oxide units. These surfactants offer excellent cleaning benefits and work synergistically with the required hydrophilic polymers. A most preferred alkyl ethoxylate is C<sub>11</sub>EO<sub>5</sub>, available from the Shell Chemical Company under the trademark Neodol<sup>®</sup> 1-5. This surfactant is found to provide desirable wetting and cleaning properties, and can be advantageously combined with the preferred C<sub>8-16</sub> alkyl polyglucoside in a matrix that includes the wetting polymers of the present invention. While not

wishing to be limited by theory, it is believed that the C<sub>8-16</sub> alkyl polyglucoside can provide a superior end result (i.e., reduce hazing) in compositions that additionally contain the preferred alkyl ethoxylate particularly when the preferred alkyl ethoxylate is required for superior cleaning. The preferred the C<sub>8-16</sub> alkyl polyglucoside is also found to improve perfume solubility of compositions comprising alkyl ethoxylates. Higher levels of perfume can be advantageous for consumer acceptance.

The usage of liquid compositions according to the present invention are prepared with relatively low levels of active. Typically, compositions will comprise sufficient surfactant and optional solvent, as discussed hereinafter, to be effective as hard surface cleaners yet remain economical; accordingly they typically contain from about 0.005% to about 0.5% by weight of the composition of surfactant, preferably alkylpolyglycoside and/or C<sub>8-14</sub> alkylethoxylate surfactant, more preferably from about 0.01% to about 0.4% surfactant, and even more preferably from about 0.01% to about 0.3% surfactant. It has been found that use of low, rather than high levels of surfactant are advantageous to overall end result performance. It is also been found that when the primary surfactant system includes preferred alkyl ethoxylates that end result hazing is mitigated by specific cosurfactants. These preferred cosurfactants are C<sub>8</sub> sulfonate and Poly-Tergent CS-1, and are further described below.

#### The optional organic cleaning solvent

The compositions, optionally, can also contain one, or more, organic cleaning solvents at effective levels, typically no less than about 0.25%, and, at least about, in increasing order of preference, about 0.5% and about 3.0%, and no more than about, in increasing order of preference, about 7% and about 5% by weight of the composition.

The surfactant provides cleaning and/ or wetting even without a hydrophobic cleaning solvent present. However, the cleaning can normally be further improved by the use of the right organic cleaning solvent. By organic cleaning solvent, it is meant an agent which assists the surfactant to remove soils such as those commonly encountered in the bathroom. The organic cleaning solvent also can participate in the building of viscosity, if needed, and in increasing the stability of the composition. The compositions containing C<sub>8-16</sub> alkyl polyglucosides and C<sub>8-14</sub> alkylethoxylates also have lower sudsing when the solvent is present. Thus, the suds profile can be controlled in large part by simply controlling the level of hydrophobic solvent in the formulation.

Such solvents typically have a terminal C<sub>3</sub>-C<sub>6</sub> hydrocarbon attached to from one to three ethylene glycol or propylene glycol moieties to provide the appropriate degree of hydrophobicity and, preferably, surface activity. Examples of commercially available hydrophobic cleaning solvents based on ethylene glycol chemistry include mono-ethylene glycol n-hexyl ether (Hexyl Cellosolve® available from Union Carbide). Examples of commercially available hydrophobic cleaning solvents based on propylene glycol chemistry include the di-, and tri-propylene glycol

derivatives of propyl and butyl alcohol, which are available from Arco Chemical, 3801 West Chester Pike, Newtown Square, PA 19073) and Dow Chemical (1691 N. Swede Road, Midland, Michigan) under the trade names Arcosolv® and Dowanol®.

In the context of the present invention, preferred solvents are selected from the group consisting of mono-propylene glycol mono-propyl ether, di-propylene glycol mono-propyl ether, mono-propylene glycol mono-butyl ether, di-propylene glycol mono-propyl ether, di-propylene glycol mono-butyl ether; tri-propylene glycol mono-butyl ether; ethylene glycol mono-butyl ether; di-ethylene glycol mono-butyl ether, ethylene glycol mono-hexyl ether and di-ethylene glycol mono-hexyl ether, and mixtures thereof. "Butyl" includes both normal butyl, isobutyl and tertiary butyl groups. Mono-propylene glycol and mono-propylene glycol mono-butyl ether are the most preferred cleaning solvent and are available under the tradenames Dowanol DPnP® and Dowanol DPnB®. Di-propylene glycol mono-t-butyl ether is commercially available from Arco Chemical under the tradename Arcosolv PTB®.

The amount of organic cleaning solvent can vary depending on the amount of other ingredients present in the composition. The hydrophobic cleaning solvent is normally helpful in providing good cleaning, such as in floor cleaner applications.

For cleaning in enclosed spaces, the solvent can cause the formation of undesirably small respirable droplets, so compositions/solutions for use in treating such spaces are desirably substantially free, more preferably completely free, of such solvents.

#### The optional additional co-surfactant

The liquid compositions used in a method of cleaning according to the present invention optionally can include a small amount of additional anionic and/or nonionic detergent surfactant. Such anionic surfactants typically comprise a hydrophobic chain containing from about 8 carbon atoms to about 18, preferably from about 8 to about 16, carbon atoms, and typically include a sulfonate or carboxylate hydrophilic head group. In general, the level of optional, e.g., anionic, surfactants in the compositions herein is from about 0.01% to about 0.25%, more preferably from about 0.01% to about 0.2%, most preferably from about 0.01% to about 0.1%, by weight of the composition.

In the context of floor, counter and other surface applications, the choice of cosurfactant can be critical in both selection of type and level. In compositions comprising C<sub>8</sub>-C<sub>14</sub> alkyl ethoxylates, it is found that low levels of C<sub>8</sub> sulfonate can improve end result by providing a "toning" effect. By toning, it is meant an improvement in the visual appearance of the end result, due to less haziness. If present, the C<sub>8</sub> sulfonate is preferably used in from about 1:10 to about 1:1 weight ratio with respect to the primary surfactant(s). C<sub>8</sub> sulfonate is commercially available

from Stepan under the tradename Bio-Terge PAS-8® as well as from the Witco Corporation under the tradename Witconate NAS-8®. Another outstanding "toning" surfactant of benefit to the present invention is Poly-Tergent CS-1 which can be purchased from BASF. If present, the Poly-Tergent CS-1 is preferably used in from about 1:20 to about 1:1 weight ratio with respect to the primary surfactant(s).

Other surfactants which can be used, though less preferably, and typically at very low levels, include C<sub>8</sub>-C<sub>18</sub> alkyl sulfonates (Hostapur SAS® from Hoechst, Aktiengesellschaft, D-6230 Frankfurt, Germany), C<sub>10</sub>-C<sub>14</sub> linear or branched alkyl benzene sulfonates, C<sub>9</sub>-C<sub>15</sub> alkyl ethoxy carboxylates detergent surfactant (Neodox® surfactants available from Shell Chemical Corporation), C<sub>10-14</sub> alkyl sulfates and ethoxysulfates (e.g., Stepanol AM® from Stepan). Alkyl ethoxy carboxylates can be advantageously used at extremely low levels (about 0.01% or lower) to dissolve perfume. This can be an important benefit given the low levels of active needed for the present invention to be most effective.

Alternative nonionic detergent surfactants for use herein are alkoxyated alcohols generally comprising from about 6 to about 16 carbon atoms in the hydrophobic alkyl chain of the alcohol. Typical alkoxylation groups are propoxy groups or propoxy groups in combination with ethoxy groups. Such compounds are commercially available under the tradename Antarox® available from Rhodia (P.O. Box 425 Cranberry, New Jersey 08512) with a wide variety of chain length and alkoxylation degrees. Block copolymers of ethylene oxide and propylene oxide can also be used and are available from BASF under the tradename Pluronic®. Preferred nonionic detergent surfactants for use herein are according to the formula R(X)<sub>n</sub>H, where R is an alkyl chain having from about 6 to about 16 carbon atoms, preferably from about 8 to about 12, X is a propoxy, or a mixture of ethoxy and propoxy groups, n is an integer of from about 4 to about 30, preferably from about 5 to about 8. Other non-ionic surfactants that can be used include those derived from natural sources such as sugars and include C<sub>8</sub>-C<sub>16</sub> N-alkyl glucose amide surfactants. If present, the concentration of alternative nonionic surfactant is from about 0.01% to about 0.2%, more preferably from about 0.01% to about 0.1%, by weight of the composition.

#### The mono- or polycarboxylic acid

For purposes of soap scum and hard water stain removal, the compositions can be made acidic with a pH of from about 2 to about 5, more preferably about 3. Acidity is accomplished, at least in part, through the use of one or more organic acids that have a pKa of less than about 5, preferably less than about 4. Such organic acids also can assist in phase formation for thickening, if needed, as well as provide hard water stain removal properties. It is found that organic acids are very efficient in promoting good hard water removal properties within the

framework of the compositions of the present invention. Lower pH and use of one or more suitable acids is also found to be advantageous for disinfectancy benefits.

Examples of suitable mono-carboxylic acids include acetic acid, glycolic acid or  $\beta$ -hydroxy propionic acid and the like. Examples of suitable polycarboxylic acids include citric acid, tartaric acid, succinic acid, glutaric acid, adipic acid, and mixtures thereof. Such acids are readily available in the trade. Examples of more preferred polycarboxylic acids, especially non-polymeric polycarboxylic acids, include citric acid (available from Aldrich Corporation, 1001 West Saint Paul Avenue, Milwaukee, Wisconsin), a mixture of succinic, glutaric and adipic acids available from DuPont (Wilmington, Delaware) sold as "refined AGS di-basic acids", maleic acid (also available from Aldrich), and mixtures thereof. Citric acid is most preferred, particularly for applications requiring cleaning of soap scum. Glycolic acid and the mixture of adipic, glutaric and succinic acids provide greater benefits for hard water removal. The amount of organic acid in the compositions herein can be from about 0.01% to about 1%, more preferably from about 0.01% to about 0.5%, most preferably from about 0.025% to about 0.25% by weight of the composition.

#### Odor control agents

As used herein, the term "cyclodextrin" includes any of the known cyclodextrins such as unsubstituted cyclodextrins containing from six to twelve glucose units, especially, alpha-cyclodextrin, beta-cyclodextrin, gamma-cyclodextrin and/or their derivatives and/or mixtures thereof. The alpha-cyclodextrin consists of six glucose units, the beta-cyclodextrin consists of seven glucose units, and the gamma-cyclodextrin consists of eight glucose units arranged in donut-shaped rings. The specific coupling and conformation of the glucose units give the cyclodextrins rigid, conical molecular structures with hollow interiors of specific volumes. The "lining" of each internal cavity is formed by hydrogen atoms and glycosidic bridging oxygen atoms; therefore, this surface is fairly hydrophobic. The unique shape and physical-chemical properties of the cavity enable the cyclodextrin molecules to absorb (form inclusion complexes with) organic molecules or parts of organic molecules which can fit into the cavity. Many odorous molecules can fit into the cavity including many malodorous molecules and perfume molecules. Therefore, cyclodextrins, and especially mixtures of cyclodextrins with different size cavities, can be used to control odors caused by a broad spectrum of organic odoriferous materials, which may, or may not, contain reactive functional groups. The complexation between cyclodextrin and odorous molecules occurs rapidly in the presence of water. However, the extent of the complex formation also depends on the polarity of the absorbed molecules. In an aqueous solution, strongly hydrophilic molecules (those which are highly water-soluble) are only partially absorbed, if at all. Therefore, cyclodextrin does not complex effectively with some very low molecular weight organic amines and acids when they are present at low levels on wet surfaces. As the water is

being removed however, e.g., the surface is being dried off, some low molecular weight organic amines and acids have more affinity and will complex with the cyclodextrins more readily.

The cavities within the cyclodextrin in the solution of the present invention should remain essentially unfilled (the cyclodextrin remains uncomplexed) while in solution, in order to allow the cyclodextrin to absorb various odor molecules when the solution is applied to a surface. Non-derivatised (normal) beta-cyclodextrin can be present at a level up to its solubility limit of about 1.85% (about 1.85g in 100 grams of water) at room temperature. Beta-cyclodextrin is not preferred in compositions which call for a level of cyclodextrin higher than its water solubility limit. Non-derivatised beta-cyclodextrin is generally not preferred when the composition contains surfactant since it affects the surface activity of most of the preferred surfactants that are compatible with the derivatised cyclodextrins.

Preferably, the aqueous cleaning solution of the present invention is clear. The term "clear" as defined herein means transparent or translucent, preferably transparent, as in "water clear," when observed through a layer having a thickness of less than about 10 cm.

Preferably, the cyclodextrins used in the present invention are highly water-soluble such as, alpha-cyclodextrin and/or derivatives thereof, gamma-cyclodextrin and/or derivatives thereof, derivatised beta-cyclodextrins, and/or mixtures thereof. The derivatives of cyclodextrin consist mainly of molecules wherein some of the OH groups are converted to OR groups. Cyclodextrin derivatives include, e.g., those with short chain alkyl groups such as methylated cyclodextrins, and ethylated cyclodextrins, wherein R is a methyl or an ethyl group; those with hydroxyalkyl substituted groups, such as hydroxypropyl cyclodextrins and/or hydroxyethyl cyclodextrins, wherein R is a  $-\text{CH}_2\text{-CH}(\text{OH})\text{-CH}_3$  or a  $-\text{CH}_2\text{CH}_2\text{-OH}$  group; branched cyclodextrins such as maltose-bonded cyclodextrins; cationic cyclodextrins such as those containing 2-hydroxy-3-(dimethylamino)propyl ether, wherein R is  $\text{CH}_2\text{-CH}(\text{OH})\text{-CH}_2\text{-N}(\text{CH}_3)_2$  which is cationic at low pH; quaternary ammonium, e.g., 2-hydroxy-3-(trimethylammonio)propyl ether chloride groups, wherein R is  $\text{CH}_2\text{-CH}(\text{OH})\text{-CH}_2\text{-N}^+(\text{CH}_3)_3\text{Cl}^-$ ; anionic cyclodextrins such as carboxymethyl cyclodextrins, cyclodextrin sulfates, and cyclodextrin succinylates; amphoteric cyclodextrins such as carboxymethyl/quaternary ammonium cyclodextrins; cyclodextrins wherein at least one glucopyranose unit has a 3-6-anhydro-cyclomalto structure, e.g., the mono-3-6-anhydrocyclodextrins, as disclosed in "Optimal Performances with Minimal Chemical Modification of Cyclodextrins", F. Diedaini-Pilard and B. Perly, The 7th International Cyclodextrin Symposium Abstracts, April 1994, p. 49, said references being incorporated herein by reference; and mixtures thereof. Other cyclodextrin derivatives are disclosed in U.S. Pat. Nos.: 3,426,011, Parmerter et al., issued Feb. 4, 1969; 3,453,257; 3,453,258; 3,453,259; and 3,453,260, all in the names of Parmerter et al., and all issued July 1, 1969; 3,459,731, Gramera et al., issued Aug. 5, 1969; 3,553,191, Parmerter et al., issued Jan. 5, 1971; 3,565,887, Parmerter et al., issued Feb. 23, 1971; 4,535,152, Szejtli et al., issued Aug. 13, 1985; 4,616,008, Hirai et al., issued Oct. 7, 1986;



4,678,598, Ogino et al., issued Jul. 7, 1987; 4,638,058, Brandt et al., issued Jan. 20, 1987; and 4,746,734, Tsuchiyama et al., issued May 24, 1988; all of said patents being incorporated herein by reference.

Highly water-soluble cyclodextrins are those having water solubility of at least about 10 g in 100 ml of water at room temperature, preferably at least about 20 g in 100 ml of water, more preferably at least about 25 g in 100 ml of water at room temperature. The availability of solubilized, uncomplexed cyclodextrins is essential for effective and efficient odor control performance. Solubilized, water-soluble cyclodextrin can exhibit more efficient odor control performance than non-water-soluble cyclodextrin when deposited onto surfaces.

Examples of preferred water-soluble cyclodextrin derivatives suitable for use herein are hydroxypropyl alpha-cyclodextrin, methylated alpha-cyclodextrin, methylated beta-cyclodextrin, hydroxyethyl beta-cyclodextrin, and hydroxypropyl beta-cyclodextrin. Hydroxyalkyl cyclodextrin derivatives preferably have a degree of substitution of from about 1 to about 14, more preferably from about 1.5 to about 7, wherein the total number of OR groups per cyclodextrin is defined as the degree of substitution. Methylated cyclodextrin derivatives typically have a degree of substitution of from about 1 to about 18, preferably from about 3 to about 16. A known methylated beta-cyclodextrin is heptakis-2,6-di-O-methyl- $\beta$ -cyclodextrin, commonly known as DIMEB, in which each glucose unit has about 2 methyl groups with a degree of substitution of about 14. A preferred, more commercially available, methylated beta-cyclodextrin is a randomly methylated beta-cyclodextrin, commonly known as RAMEB, having different degrees of substitution, normally of about 12.6. RAMEB is more preferred than DIMEB, since DIMEB affects the surface activity of the preferred surfactants more than RAMEB. The preferred cyclodextrins are available, e.g., from Cerestar USA, Inc. and Wacker Chemicals (USA), Inc.

It is also preferable to use a mixture of cyclodextrins. Such mixtures absorb odors more broadly by complexing with a wider range of odoriferous molecules having a wider range of molecular sizes. Preferably at least a portion of the cyclodextrin is alpha-cyclodextrin and/or its derivatives, gamma-cyclodextrin and/or its derivatives, and/or derivatised beta-cyclodextrin, more preferably a mixture of alpha-cyclodextrin, or an alpha-cyclodextrin derivative, and derivatised beta-cyclodextrin, even more preferably a mixture of derivatised alpha-cyclodextrin and derivatised beta-cyclodextrin, most preferably a mixture of hydroxypropyl alpha-cyclodextrin and hydroxypropyl beta-cyclodextrin, and/or a mixture of methylated alpha-cyclodextrin and methylated beta-cyclodextrin.

It is preferable that the compositions used in the context of the present invention contain low levels of cyclodextrin so that no visible residue appears at normal usage levels. Preferably, the solution used to treat the surface under usage conditions is virtually not discernible when dry. Typical levels of cyclodextrin in usage compositions for usage conditions are from about 0.01% to about 1%, preferably from about 0.05% to about 0.75%, more preferably from about 0.1% to

about 0.5% by weight of the composition. Compositions with higher concentrations can leave unacceptable visible residues.

#### Optional source of peroxide

The compositions used in the context of the present invention can contain peroxide such as hydrogen peroxide, or a source of hydrogen peroxide, for further disinfectancy, fungistatic and fungicidal benefits. The components of the present composition are substantially compatible with the use of peroxides. Preferred peroxides include benzoyl peroxide and hydrogen peroxide. These can optionally be present in the compositions herein in levels of from about 0.05% to about 5%, more preferably from about 0.1% to about 3%, most preferably from about 0.2% to about 1.5%.

When peroxide is present, it is desirable to provide a stabilizing system. Suitable stabilizing systems are known. A preferred stabilizing system consists of radical scavengers and/or metal chelants present at levels of from about 0.01% to about 0.5%, more preferably from about 0.01% to about 0.25%, most preferably from about 0.01% to about 0.1%, by weight of the composition. Examples of radical scavengers include anti-oxidants such as propyl gallate, butylated hydroxy toluene (BHT), butylated hydroxy anisole (BHA) and the like. Examples of suitable metal chelants include diethylene triamine penta-acetate, diethylene triamine penta-methylene phosphonate, hydroxyethyl diphosphonate and the like.

#### Optional thickening polymer

Low levels of polymer can also be used to thicken the preferred aqueous compositions used in the context of the present invention. In general, the level of thickening polymer is kept as low as possible so as not to hinder the product's end result properties. Xanthan gum is a particularly preferred thickening agent as it can also enhance end result properties, particularly when used in low concentrations. The thickening polymer agent is present in from about 0.001% to about 0.1%, more preferably from about 0.0025% to about 0.05%, most preferably from about 0.005% to about 0.025% by weight of the composition.

#### The aqueous solvent system

The compositions which are aqueous, comprise at least about 80% aqueous solvent by weight of the composition, more preferably from about 80% to over 99% by weight of the composition. The aqueous compositions are typically in micellar form, and do not incorporate substantial levels of water insoluble components that induce significant micellar swelling.

The aqueous solvent system can also comprise low molecular weight, highly water soluble solvents typically found in detergent compositions, e.g., ethanol, isopropanol, etc. These solvents can be used to provide disinfectancy properties to compositions that are otherwise low in active. Additionally, they can be particularly useful in compositions wherein the total level of perfume is very low. In effect, highly volatile solvents can provide "lift", and enhance the character of the perfume. Highly volatile solvents, if present are typically present in from about 0.25% to about 5%, more preferably from about 0.5% to about 3%, most preferably from about 0.5% to about 2%, by weight of the composition. Examples of such solvents include methanol, ethanol, isopropanol, *n*-butanol, *iso*-butanol, 2-butanol, pentanol, 2-methyl-1-butanol, methoxymethanol, methoxyethanol, methoxy propanol, and mixtures thereof.

The compositions used in the context of the present invention can also include other solvents, and in particular paraffins and isoparaffins, which can substantially reduce the suds created by the composition.

#### Optional suds suppressor

Suitable silicone suds suppressors for use herein include any silicone and silica-silicone mixtures. Silicones can be generally represented by alkylated polysiloxane materials while silica is normally used in finely divided forms exemplified by silica aerogels and xerogels and hydrophobic silicas of various types. In industrial practice, the term "silicone" has become a generic term which encompasses a variety of relatively high-molecular-weight polymers containing siloxane units and hydrocarbyl groups of various types. Indeed, silicone compounds have been extensively described in the art, see for instance United States Patents: US 4,076,648; US 4,021,365; US 4,749,740; US 4,983,316 and European Patents: EP 150,872; EP 217,501; and EP 499,364, all of said patents being incorporated herein by reference. Preferred are polydiorganosiloxanes such as polydimethylsiloxanes having trimethylsilyl end blocking units and having a viscosity at 25°C of from  $5 \times 10^{-5}$  m<sup>2</sup>/s to 0.1 m<sup>2</sup>/s, i.e. a value of *n* in the range 40 to 1500. These are preferred because of their ready availability and their relatively low cost.

A preferred type of silicone compounds useful in the compositions herein comprises a mixture of an alkylated siloxane of the type hereinabove disclosed and solid silica. The solid silica can be a fumed silica, a precipitated silica or a silica made by the gel formation technique. The silica particles can be rendered hydrophobic by treating them with dialkylsilyl groups and/or trialkylsilane groups either bonded directly onto the silica or by means of silicone resin. A preferred silicone compound comprises a hydrophobic silanated, most preferably trimethylsilanated silica having a particle size in the range from 10 nm to 20 nm and a specific surface area above 50 m<sup>2</sup>/g. Silicone compounds employed in the compositions according to the present invention suitably have an amount of silica in the range of 1 to 30% (more preferably 2.0 to 15%) by weight of the total weight of the silicone compounds resulting in silicone

compounds having an average viscosity in the range of from  $2 \times 10^{-4} \text{m}^2/\text{s}$  to  $1 \text{m}^2/\text{s}$ . Preferred silicone compounds can have a viscosity in the range of from  $5 \times 10^{-3} \text{m}^2/\text{s}$  to  $0.1 \text{m}^2/\text{s}$ . Particularly suitable are silicone compounds with a viscosity of  $2 \times 10^{-2} \text{m}^2/\text{s}$  or  $4.5 \times 10^{-2} \text{m}^2/\text{s}$ .

Suitable silicone compounds for use herein are commercially available from various companies including Rhone Poulenc, Fueller and Dow Corning. Examples of silicone compounds for use herein are Silicone DB® 100 and Silicone Emulsion 2-3597® both commercially available from Dow Corning.

#### Optional perfume and/or additional adjuvants

Optional components, such as perfumes and/or other conventional adjuvants can also be present.

#### Perfume

An optional, but highly preferred ingredient, is a perfume, usually a mixture of perfume ingredients. As used herein, perfume includes constituents of a perfume which are added primarily for their olfactory contribution, often complimented by use of a volatile organic solvent such as ethanol.

Most hard surface cleaner products contain some perfume to provide an olfactory aesthetic benefit and to cover any "chemical" odor that the product may have. The main function of a small fraction of the highly volatile, low boiling (having low boiling points), perfume components in these perfumes is to improve the fragrance odor of the product itself, rather than impacting on the subsequent odor of the surface being cleaned. However, some of the less volatile, high boiling perfume ingredients can provide a fresh and clean impression to the surfaces, and it is sometimes desirable that these ingredients be deposited and present on the dry surface.

The perfumes are preferably those that are more water-soluble and/or volatile to minimize spotting and filming. The perfumes useful herein are described in more detail in U.S. Patent 5,108,660, Michael, issued April 28, 1992, at col. 8 lines 48 to 68, and col. 9 lines 1 to 68, and col. 10 lines 1 to 24, said patent, and especially said specific portion, being incorporated by reference.

Perfume components can be natural products such as essential oils, absolutes, resinoids, resins, concretes, etc., and/or synthetic perfume components such as hydrocarbons, alcohols, aldehydes, ketones, ethers, acids, acetals, ketals, nitriles, etc., including saturated and unsaturated compounds, aliphatic, carbocyclic and heterocyclic compounds. Examples of such perfume components are: geraniol, geranyl acetate, linalool, linalyl acetate, tetrahydrolinalool, citronellol, citronellyl acetate, dihydromyrcenol, dihydromyrcenyl acetate,, terpineol, terpinyl acetate, acetate, 2-phenylethanol, 2-phenylethyl acetate, benzyl alcohol, benzyl acetate, benzyl

salicylate, benzyl benzoate, styrallyl acetate, amyl salicylate, dimethylbenzylcarbinol, trichloromethylphenylcarbinyl acetate, p-tert.butyl-cyclohexyl acetate, isononyl acetate, alpha-n-amylocinammic aldehyde, alpha-hexyl-cinammic aldehyde, 2-methyl-3-(p-tert.butylphenyl)propanal, 2-methyl-3(p-isopropylphenyl)propanal, 3-(p-tert.butylphenyl)propanal, tricyclodecenyl acetate, tricyclodecenyl propionate, 4-(4-hydroxy-4-methylpentyl)-3-cyclohexenecarbaldehyde, 4-(4-methyl-3-pentenyl)-3cyclohexenecarbaldehyde, 4-acetoxy-3-pentyl-tetrahydropyran, methyl dihydrojasmonate, 2-n-heptyl-cyclopentanone, 3-methyl-2-pentyl-cyclopentanone, n-decanal, n-dodecanal, 9-decenol-1, phenoxyethyl isobutyrate, phenylacetaldehyde dimethyl acetal, phenylacetaldehyde dicetyl acetal, geranonitrile, citronellonitrile, cedryl acetate, 3-isocamphyl-cyclohexanol, cedryl ether, isolongifolanone, aubepine nitrile, aubepine, heliotropine, coumarin, eugenol, vanillin, diphenyl oxide, hydroxycitronellal, ionones, methyl ionones, isomethyl ionones, irones, cis-3-hexenol and esters thereof, indane musks, tetralin musks, isochroman musks, macrocyclic ketones, macrolactone musks, ethylene brassylate, aromatic nitromusk. Compositions herein typically comprise from 0.1% to 2% by weight of the total composition of a perfume ingredient, or mixtures thereof, preferably from 0.1% to 1%. In the case of the preferred embodiment containing peroxide, the perfumes must be chosen so as to be compatible with the oxidant.

In a preferred execution, the perfume ingredients are hydrophobic and highly volatile, e.g., ingredients having a boiling point of less than about 260°C, preferably less than about 255°C; and more preferably less than about 250°C, and a ClogP of at least about 3, preferably more than about 3.1, and even more preferably more than about 3.2.

The logP of many ingredients has been reported; for example, the Pomona92 database, available from Daylight Chemical Information Systems, Inc. (Daylight CIS), Irvine, California, contains many, along with citations to the original literature. However, the logP values are most conveniently calculated by the "CLOGP" program, also available from Daylight CIS. This program also lists experimental logP values when they are available in the Pomona92 database. The "calculated logP" (ClogP) is determined by the fragment approach of Hansch and Leo (cf., A. Leo, in *Comprehensive Medicinal Chemistry*, Vol. 4, C. Hansch, P. G. Sammens, J. B. Taylor and C. A. Ramsden, Eds., p. 295, Pergamon Press, 1990, incorporated herein by reference). The fragment approach is based on the chemical structure of each ingredient, and takes into account the numbers and types of atoms, the atom connectivity, and chemical bonding. The ClogP values, which are the most reliable and widely used estimates for this physicochemical property, are preferably used instead of the experimental logP values in the selection of the principal solvent ingredients which are useful in the present invention. Other methods that can be used to compute ClogP include, e.g., Crippen's fragmentation method as disclosed in *J. Chem. Inf. Comput. Sci.*, 27, 21 (1987); Viswanadhan's fragmentation method as disclosed in *J. Chem. Inf. Comput. Sci.*, 29, 163 (1989); and Broto's method as disclosed in *Eur. J. Med. Chem. - Chim. Theor.*, 19, 71 (1984).

#### Other Adjuvants

The compositions herein can comprise a variety of other optional ingredients, including further actives and detergent builder, as well as primarily aesthetical ingredients.

In particular the rheology of the compositions herein can be made suitable for suspending particles in the composition, e.g., particles of abrasives.

#### Detergency Builders

Detergent builders that are efficient for hard surface cleaners and have reduced filming/streaking characteristics at the critical levels are another optional ingredient. Preferred detergent builders are the carboxylic acid detergent builders described hereinbefore as part of the polycarboxylic acid disclosure, including citric and tartaric acids. Tartaric acid improves cleaning and can minimize the problem of filming/streaking that usually occurs when detergent builders are added to hard surface cleaners.

The detergent builder is present at levels that provide detergent building, and, those that are not part of the acid pH adjustment described hereinbefore, are typically present at a level of from about 0.01% to about 0.3%, more preferably from about 0.005% to about 0.2%, and most preferably from about 0.05% to about 0.1%.

#### Buffers

The compositions herein can also contain other various adjuncts which are known to the art for detergent compositions. Preferably they are not used at levels that cause unacceptable

filming/streaking. Buffers are an important class of adjuncts in this application. This occurs mainly as a result of the low levels of active employed. An ideal buffer system will maintain pH over a desired narrow range, while not leading to streaking/filming issues. Preferred buffers in the context of the invention are those which are highly volatile, yet can provide cleaning benefits in use. As such, they are advantageous in that they can be used at higher levels than corresponding buffers that are less volatile. Such buffers tend to have low molecular weight, i.e., less than about 150 g/mole and generally contain no more than one hydroxy group. Examples of preferred buffers include ammonia, methanol amine, ethanol amine, 2-amino-2-methyl-1-propanol, 2-dimethylamino-2-methyl-1-propanol, acetic acid, glycolic acid and the like. Most preferred among these are ammonia, 2-dimethylamino-2-methyl-1-propanol and acetic acid. When used, these buffers are present in from about 0.005% to about 0.5%, with the higher levels being more preferred for the more volatile chemicals.

Non-volatile buffers can also be used in this invention. Such buffers must be used at generally lower levels than the preferred levels because of increased streaking/filming tendencies. Examples of such buffers include, but are not limited to, sodium carbonate, potassium carbonate and bicarbonate, 1,3-bis(aminomethyl) cyclohexane, sodium citrate, citric acid, maleic acid, tartaric acid, and the like. Maleic acid is particularly preferred as a buffer because of its tendency not to induce surface damage. Citric acid is also desirable since it provides anti-microbial benefits as a registered EPA active. Additionally, in compositions comprising the hydrophilic polymers of the present invention for daily shower applications, acidity has been found to promote better wetting and provide longer lasting "sheeting" effects. When used, non-volatile buffers are present in from about 0.001% to about 0.05% by weight of the composition.

Non-limiting examples of other adjuncts are: enzymes such as proteases; hydrotropes such as sodium toluene sulfonate, sodium cumene sulfonate and potassium xylene sulfonate; thickeners other than the hydrophilic polymers at a level of from about 0.01% to about 0.5%, preferably from about 0.01% to about 0.1%; and aesthetic-enhancing ingredients such as colorants, providing they do not adversely impact on filming/streaking.

#### Preservatives and Antibacterial agents

Preservatives can also be used, and may be required in many of the compositions of the present invention, since these contain high levels of water. Examples of preservatives include bronopol, hexitidine sold by Angus chemical (211 Sanders Road, Northbrook, Illinois, USA). Other preservatives include Kathon, 2-((hydroxymethyl) (amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate, formaldehyde and glutaraldehyde, dichloro-s-triazinetrione, trichloro-s-triazinetrione, and quaternary ammonium salts including dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C<sub>12</sub>, C<sub>14</sub> and C<sub>16</sub> dimethyl benzyl. Preferred preservatives include 1,2-benzisothiazolin-3-one and polyhexamethylene biguanide sold by

Avicia Chemicals (Wilmington, Delaware 19897) and chlorhexidine diacetate sold by Aldrich-Sigma (1001 West Saint Paul Avenue, Milwaukee, WI 53233), sodium pyrithione sold by Arch Chemicals (501 Merritt Seven, P.O. Box 5204, Norwalk CT 06856) sold by Arch Chemicals. When used, preservatives are preferentially present at concentrations of from about 0.0001% to about 0.01%. These same preservatives can function to provide antibacterial control on the surfaces, but typically will require use at higher levels from about 0.005 to about 0.1%. Other antibacterial agents, including quaternary ammonium salts, can be present, but are not preferred in the context of the present invention at high levels, i.e., at levels greater than about 0.05%. Such compounds have been found to often interfere with the benefits of the preferred polymers. In particular, quaternary ammonium surfactants tend to hydrophobically modify hard surfaces. Thus, the preferred polymers are found to be ineffective in compositions comprising significant concentrations of quaternary ammonium surfactants. Similar results have been found using amphoteric surfactants, including lauryl betaines and coco amido betaines. When present, the level of cationic or amphoteric surfactant should be at levels below about 0.1%, preferably below about 0.05%. More hydrophobic antibacterial/germicidal agents, like orthobenzyl-para-chlorophenol, are avoided. If present, such materials should be kept at levels below about 0.05%.

#### EXAMPLES OF COMPOSITIONS, INCLUDING BATHROOM, FLOOR, COUNTER, WALL CLEANING, AND GLASS COMPOSITIONS

The present invention relates to a method of cleaning floors and other large surfaces such as counters, walls, and other surfaces for which no, or minimal, rinsing is required. Examples of compositions to use in such a method include ready to use aqueous cleaners and dilutable aqueous, multipurpose cleaners. In the context of the present invention, these compositions are to be used to prepare pre-moistened wipes or mops, which are to be attached onto the mop head of a cleaning implement, as described hereafter. By pre-moistened, it is meant a wipe or mop that is stored in its package together while being impregnated with the cleaning composition, so that the user does not have to open a bottle of cleaning composition at each use. The wipe can be pre-moistened by adding solution directly on the packaging line during the manufacturing process, or alternatively, the composition can be added once by the user at first use, and then remain impregnated for next uses.

#### "Daily Shower" Compositions



Compositions for use in the bathroom and/or shower on a regular basis provide the benefit of maintaining cleanliness and appearance rather than having to remove large amounts of built-up soil. Such compositions are used after each shower, bath, wash-up, etc., and left on to protect the surface and make the removal of any subsequent soil easier. Such compositions are essentially dilute "usage" compositions.

These compositions typically comprise:

- a. an effective amount to reduce the contact angle and/or increase surface hydrophilicity, up to about 0.5%, preferably from about 0.005% to about 0.4%, more preferably from about 0.0125% to about 0.3%, of preferably relatively substantive hydrophilic polymer that renders the treated surface hydrophilic, e.g., polymer selected from the group consisting of: polystyrene sulfonate; polyvinyl pyrrolidone; polyvinyl pyrrolidone acrylic acid copolymer; polyvinyl pyrrolidone acrylic acid copolymer sodium salt; polyvinyl pyrrolidone acrylic acid copolymer potassium salt; polyvinyl pyrrolidone- vinyl imidazoline; polyvinyl pyridine; polyvinyl pyridine n-oxide; and mixtures thereof, preferably polyvinyl pyridine n-oxide;
- b. optionally, but preferably, an effective amount of detergent surfactant, preferably from about 0.005% to about 0.5%, more preferably from about 0.01% to about 0.4%, most preferably from about 0.025% to about 0.3%, by weight of the composition, said detergent surfactant preferably comprising alkyl polysaccharide detergent surfactant having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and from about one to about four, preferably from about one to about 1.5 saccharide moieties per molecule and/or a combination consisting of alkyl polysaccharide detergent surfactant having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and from about one to about four, preferably from about one to about 1.5 saccharide moieties per molecule together with an alkyl ethoxylate comprising from about 8 to about 16 carbon atoms and from about 4 to about 25 oxyethylene units;
- c. optionally, an effective amount to provide increased cleaning, e.g., from about 0.5% to about 5%, preferably from about 0.5% to about 4%, more preferably from about 0.5% to about 3%, of one, or more, organic cleaning solvents, preferably selected from the group consisting of: mono-propylene glycol mono-propyl ether, mono-propylene glycol mono-butyl ether, di-propylene glycol mono-propyl ether di-propylene glycol mono-butyl ether, di-propylene glycol mono-butyl ether; tri-propylene glycol mono-butyl ether; ethylene glycol mono-butyl ether; diethylene glycol mono-butyl ether, ethylene glycol mono-hexyl ether and diethylene glycol mono-hexyl ether, and mixtures thereof;

- d. optionally, a minor amount that is less than the amount of primary surfactant b., e.g., from about 0.005% to about 0.5%, preferably from about 0.01% to about 0.4%, more preferably from about 0.025% to about 0.3%, of cosurfactant, preferably anionic and/or nonionic detergent surfactant, e.g., preferably selected from the group consisting of: C<sub>8</sub>-C<sub>12</sub> linear sulfonates, C<sub>8</sub>-C<sub>18</sub> alkylbenzene sulfonates; C<sub>8</sub>-C<sub>18</sub> alkyl sulfates; C<sub>8</sub>-C<sub>18</sub> alkylpolyethoxy sulfates; and mixtures thereof;
- e. optionally, an effective amount to improve cleaning and/or antimicrobial action, e.g., from about 0.01% to about 1%, preferably from about 0.01% to about 0.5%, more preferably from about 0.01% to about 0.25%, of water soluble mono- or polycarboxylic acid;
- f. optionally, an effective amount, up to 1%, preferably from about 0.01% to about 0.5%, more preferably from about 0.025% to about 0.25%, of either an unsubstituted or substituted cyclodextrin, either alpha, beta, or gamma cyclodextrin substituted, optionally, with short chain (1-4 carbon atoms) alkyl or hydroxyalkyl groups, preferably beta-cyclodextrin, hydroxypropyl cyclodextrin or mixtures thereof;
- g. optionally, an effective amount to provide bleaching, cleaning, and/or antibacterial action, up to about 5%, preferably from about 0.1% to about 4%, more preferably from about 1% to about 3%, of hydrogen peroxide;
- h. optionally, from about 0.005% to about 1%, preferably from about 0.005% to about 0.5%, more preferably from about 0.01% to about 0.1%, of a thickening polymer selected from the group consisting of polyacrylates, gums and mixtures thereof;
- i. optionally, an effective amount of perfume to provide odor effects and/or additional adjuvants; and
- j. optionally, an effective amount, from about 0.0001% to about 0.1%, more preferably from about 0.00025 to about 0.05%, most preferably from about 0.001% to about 0.01% of suds suppressor, preferably silicone suds suppressor, and optionally, but preferably, the balance being an aqueous solvent system, comprising water, and optional water soluble solvent, and wherein said composition has a pH under usage conditions of from about 2 to about 12, preferably from about 3 to about 11.5, with acidic compositions having a pH of from about 2 to about 6, preferably from about 3 to about 5.

The ingredients in these compositions are selected so as to avoid the appearance of spots/films on the treated surface, even when the surface is not rinsed, or wiped completely to a dry state. For stress conditions, the selection of both a polyvinylpyridine amine oxide, or polyvinylpyridine polymer and an alkyl polysaccharide detergent surfactant are required for optimum appearance.

#### Glass Cleaner Compositions

These compositions contain less materials than other compositions, since glass compositions residues are more easily seen. For these compositions, only the best polymers and surfactants, and methods which provide at least some rubbing action, are required.

Glass cleaner compositions comprise:

- a. an effective amount to reduce the contact angle and/or increase surface hydrophilicity, up to about 0.5%, preferably from about 0.001% to about 0.4%, more preferably from about 0.005% to about 0.25%, of preferably relatively substantive hydrophilic polymer that renders the treated surface hydrophilic selected from the group consisting of: polystyrene sulfonate; polyvinyl pyrrolidone; polyvinyl pyrrolidone acrylic acid copolymer; polyvinyl pyrrolidone acrylic acid copolymer sodium salt; polyvinyl pyrrolidone acrylic acid copolymer potassium salt; polyvinyl pyrrolidone-vinyl imidazoline; polyvinyl pyridine; polyvinyl pyridine n-oxide; and mixtures thereof, preferably polyvinyl pyridine n-oxide;
- b. an effective amount of detergent surfactant, preferably from about 0.001% to about 0.5%, more preferably from about 0.005% to about 0.3%, most preferably from about 0.025% to about 0.3%, by weight of the composition, said detergent surfactant preferably comprising as the primary surfactant, alkyl polysaccharide detergent surfactant having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, the alkyl distribution wherein at least about 50% of the chainlength mixture comprises from about 10 carbon atoms to about 16 carbon atoms, optionally, as the primary surfactant, but preferably as the cosurfactant, a minor amount that is less than the amount of primary surfactant, e.g., from about 0.0001% to about 0.3%, preferably from about 0.001% to about 0.2%, more preferably from about 0.05% to about 0.2%, of cosurfactant;
- c. optionally, an effective amount to provide increased cleaning, e.g., from about 0.5% to about 7%, preferably from about 0.5% to about 5%, more preferably from about 0.5% to about 3%, of one, or more, organic cleaning solvents, preferably selected from the group consisting of: mono-propylene glycol mono-propyl ether, mono-propylene glycol mono-butyl ether, di-propylene glycol mono-propyl ether di-propylene glycol mono-butyl ether, di-propylene glycol mono-butyl ether; tri-propylene glycol mono-butyl ether; ethylene glycol mono-butyl ether; diethylene glycol mono-butyl ether, ethylene glycol mono-hexyl ether and diethylene glycol mono-hexyl ether, and mixtures thereof;
- d. optionally, an effective amount to provide bleaching, cleaning, and/or antibacterial action, up to about 5%, preferably from about 0.1% to about 4%, more preferably from about 1% to about 3%, of hydrogen peroxide;
- e. optionally, an effective amount of perfume to provide odor effects and/or additional adjuvants; and

the balance being an aqueous solvent system, comprising water, and optional water soluble solvent, and wherein said treatment solution has a pH under usage conditions of from about 3 to about 11.5, preferably from about 4 to about 10.

Glass cleaning compositions as described above can be in different manners, but in the context of the present invention, they are to be used for preparing pre-moistened wipes or mops, said mops to be attached to the mop head of a cleaning implement. In such a context, it has been found that some of the preferred polymers, such as polyvinyl amine oxides provide anti-fog benefits. It is believed that the hygroscopic properties of the preferred polymers are responsible for the benefits.

#### General purpose and Conventional Floor Cleaners

The general purpose and conventional floor cleaners can be either liquid or solid and can be used diluted, or, for the liquid, full strength. These compositions comprise:

- a. an effective amount to reduce the contact angle and/or increase surface hydrophilicity, up to about 0.5%, preferably from about 0.005% to about 0.2%, more preferably from about 0.0125% to about 0.1%, of preferably relatively substantive hydrophilic polymer that renders the treated surface hydrophilic, e.g., polymer selected from the group consisting of: polystyrene sulfonate; polyvinyl pyrrolidone; polyvinyl pyrrolidone acrylic acid copolymer; polyvinyl pyrrolidone acrylic acid copolymer sodium salt; polyvinyl pyrrolidone acrylic acid copolymer potassium salt; polyvinyl pyrrolidone- vinyl imidazoline; polyvinyl pyridine; polyvinyl pyridine n-oxide; and mixtures thereof, preferably polyvinyl pyridine n-oxide;
- b. an effective amount of detergent surfactant, preferably from about 0.005% to about 10%, more preferably from about 0.01% to about 8%, most preferably from about 0.025% to about 4%, by weight of the composition, said detergent surfactant preferably comprising alkyl polysaccharide detergent surfactant having an alkyl group containing from about 8 to about 18 carbon atoms, more preferably from about 8 to about 16 carbon atoms, and from about one to about four, preferably from about one to about 1.5 saccharide moieties per molecule, preferably having a broad alkyl distribution, and, optionally, cosurfactant, preferably anionic and/or nonionic detergent surfactant, e.g., preferably selected from the group consisting of: C<sub>8</sub>-C<sub>12</sub> linear sulfonates, C<sub>8</sub>-C<sub>18</sub> alkylbenzene sulfonates; C<sub>8</sub>-C<sub>18</sub> alkyl sulfates; C<sub>8</sub>-C<sub>18</sub> alkylpolyethoxy sulfates; and mixtures thereof;
- c. optionally, an effective amount to provide increased cleaning, e.g., from about 0.5% to about 10%, preferably from about 0.5% to about 6%, more preferably from about 0.5% to about 5%, of one, or more, organic cleaning solvents, preferably selected from the group consisting of: mono-propylene glycol mono-propyl ether, mono-

propylene glycol mono-butyl ether, di-propylene glycol mono-propyl ether di-propylene glycol mono-butyl ether, di-propylene glycol mono-butyl ether; tri-propylene glycol mono-butyl ether; ethylene glycol mono-butyl ether; diethylene glycol mono-butyl ether, ethylene glycol mono-hexyl ether and diethylene glycol mono-hexyl ether, and mixtures thereof;

- d. optionally, an effective amount to improve cleaning and/or antimicrobial action, e.g., from about 0.01% to about 1%, preferably from about 0.01% to about 0.5%, more preferably from about 0.01% to about 0.25%, of water soluble mono- or polycarboxylic acid;
- e. optionally, an effective amount, up to 1%, preferably from about 0.01% to about 0.5%, more preferably from about 0.025% to about 0.25%, of either an unsubstituted or substituted cyclodextrin, either alpha, beta, or gamma cyclodextrin substituted, optionally, with short chain (1-4 carbon atoms) alkyl or hydroxyalkyl groups, preferably beta-cyclodextrin, hydroxypropyl cyclodextrin or mixtures thereof;
- f. optionally, an effective amount to provide bleaching, cleaning, and/or antibacterial action, up to about 5%, preferably from about 0.1% to about 4%, more preferably from about 1% to about 3%, of hydrogen peroxide;
- g. optionally, from about 0.005% to about 1%, preferably from about 0.005% to about 0.5%, more preferably from about 0.01% to about 0.1%, of a thickening polymer selected from the group consisting of polyacrylates, gums and mixtures thereof;
- h. optionally, an effective amount of perfume to provide odor effects and/or additional adjuvants; and
- i. optionally, an effective amount, from about 0.0001% to about 0.1%, more preferably from about 0.00025 to about 0.05%, most preferably from about 0.001% to about 0.01% of suds suppressor, preferably silicone suds suppressor, and

the balance being an aqueous solvent system, comprising water, and optional water soluble solvent, or, less preferably, the balance comprising water and inorganic salts including detergent builders and/or inert salts and/or abrasives, and wherein said composition has a pH under usage conditions of from about 2 to about 12, preferably from about 3 to about 11.5, with acidic compositions having a pH of from about 2 to about 6, preferably from about 3 to about 5.

#### Wet Wipes for Glass and Shiny Surfaces, Floor, Counter Walls and Other Surfaces

The glass cleaning compositions and General Purpose and Floor compositions described above are to be used in a pre-moistened wipe. By pre-moistened, it is meant a wipe or mop that is stored in its package together while being impregnated with the cleaning composition, so that the user does not have to open a bottle of cleaning composition at each use. The wipe can be pre-moistened by adding solution directly on the packaging line during the manufacturing

process, or alternatively, the composition can be added once by the user at first use, and then remain impregnated for next uses. The wipe substrate can be composed of suitable unmodified and/or modified naturally occurring fibers including cotton, Esparto grass, bagasse, hemp, flax, silk, wool, wood pulp, chemically modified wood pulp, jute, ethyl cellulose, and/or cellulose acetate. Suitable synthetic fibers can comprise fibers of one, or more, of polyvinyl chloride, polyvinyl fluoride, polytetrafluoroethylene, polyvinylidene chloride, polyacrylics such as ORLON®, polyvinyl acetate, Rayon®, polyethylvinyl acetate, non-soluble or soluble polyvinyl alcohol, polyolefins such as polyethylene (e.g., PULPEX®) and polypropylene, polyamides such as nylon, polyesters such as DACRON® or KODEL®, polyurethanes, polystyrenes, and the like, including fibers comprising polymers containing more than one monomer. The absorbent layer can comprise solely naturally occurring fibers, solely synthetic fibers, or any compatible combination of naturally occurring and synthetic fibers.

The fibers useful herein can be hydrophilic, hydrophobic or can be a combination of both hydrophilic and hydrophobic fibers. As indicated above, the particular selection of hydrophilic or hydrophobic fibers depends upon the other materials included in the absorbent (and to some degree) the scrubbing layer described hereinafter.. Suitable hydrophilic fibers for use in the present invention include cellulosic fibers, modified cellulosic fibers, rayon, cotton, polyester fibers such as hydrophilic nylon (HYDROFIL®). Suitable hydrophilic fibers can also be obtained by hydrophilizing hydrophobic fibers, such as surfactant-treated or silica-treated thermoplastic fibers derived from, for example, polyolefins such as polyethylene or polypropylene, polyacrylics, polyamides, polystyrenes, polyurethanes and the like.

Suitable wood pulp fibers can be obtained from well-known chemical processes such as the Kraft and sulfite processes. It is especially preferred to derive these wood pulp fibers from southern soft woods due to their premium absorbency characteristics. These wood pulp fibers can also be obtained from mechanical processes, such as ground wood, refiner mechanical, thermomechanical, chemimechanical, and chemi-thermomechanical pulp processes. Recycled or secondary wood pulp fibers, as well as bleached and unbleached wood pulp fibers, can be used.

Another type of hydrophilic fiber for use in the present invention is chemically stiffened cellulosic fibers. As used herein, the term "chemically stiffened cellulosic fibers" means cellulosic fibers that have been stiffened by chemical means to increase the stiffness of the fibers under both dry and aqueous conditions. Such means can include the addition of a chemical stiffening agent that, for example, coats and/or impregnates the fibers. Such means can also include the stiffening of the fibers by altering the chemical structure, e.g., by crosslinking polymer chains.

Where fibers are used as the absorbent layer (or a constituent component thereof), the fibers can optionally be combined with a thermoplastic material. Upon melting, at least a portion of this thermoplastic material migrates to the intersections of the fibers, typically due to interfiber capillary gradients. These intersections become bond sites for the thermoplastic material. When

cooled, the thermoplastic materials at these intersections solidify to form the bond sites that hold the matrix or web of fibers together in each of the respective layers. This can be beneficial in providing additional overall integrity to the cleaning wipe.

Amongst its various effects, bonding at the fiber intersections increases the overall compressive modulus and strength of the resulting thermally bonded member. In the case of the chemically stiffened cellulosic fibers, the melting and migration of the thermoplastic material also has the effect of increasing the average pore size of the resultant web, while maintaining the density and basis weight of the web as originally formed. This can improve the fluid acquisition properties of the thermally bonded web upon initial exposure to fluid, due to improved fluid permeability, and upon subsequent exposure, due to the combined ability of the stiffened fibers to retain their stiffness upon wetting and the ability of the thermoplastic material to remain bonded at the fiber intersections upon wetting and upon wet compression. In net, thermally bonded webs of stiffened fibers retain their original overall volume, but with the volumetric regions previously occupied by the thermoplastic material becoming open to thus increase the average interfiber capillary pore size.

Thermoplastic materials useful in the present invention can be in any of a variety of forms including particulates, fibers, or combinations of particulates and fibers. Thermoplastic fibers are a particularly preferred form because of their ability to form numerous interfiber bond sites. Suitable thermoplastic materials can be made from any thermoplastic polymer that can be melted at temperatures that will not extensively damage the fibers that comprise the primary web or matrix of each layer. Preferably, the melting point of this thermoplastic material will be less than about 190°C, and preferably between about 75°C and about 175°C. In any event, the melting point of this thermoplastic material should be no lower than the temperature at which the thermally bonded absorbent structures, when used in the cleaning pads, are likely to be stored. The melting point of the thermoplastic material is typically no lower than about 50°C.

The thermoplastic materials, and in particular the thermoplastic fibers, can be made from a variety of thermoplastic polymers, including polyolefins such as polyethylene (e.g., PULPEX®) and polypropylene, polyesters, copolyesters, polyvinyl acetate, polyethylvinyl acetate, polyvinyl chloride, polyvinylidene chloride, polyacrylics, polyamides, copolyamides, polystyrenes, polyurethanes and copolymers of any of the foregoing such as vinyl chloride/vinyl acetate, and the like. Depending upon the desired characteristics for the resulting thermally bonded absorbent member, suitable thermoplastic materials include hydrophobic fibers that have been made hydrophilic, such as surfactant-treated or silica-treated thermoplastic fibers derived from, for example, polyolefins such as polyethylene or polypropylene, polyacrylics, polyamides, polystyrenes, polyurethanes and the like. The surface of the hydrophobic thermoplastic fiber can be rendered hydrophilic by treatment with a surfactant, such as a nonionic or anionic surfactant, e.g., by spraying the fiber with a surfactant, by dipping the fiber into a surfactant or by including the surfactant as part of the polymer melt in producing the thermoplastic fiber. Upon melting and

resolidification, the surfactant will tend to remain at the surfaces of the thermoplastic fiber. Suitable surfactants include nonionic surfactants such as Brij<sup>®</sup> 76 manufactured by ICI Americas, Inc. of Wilmington, Delaware, and various surfactants sold under the Pegosperse<sup>®</sup> trademark by Glyco Chemical, Inc. of Greenwich, Connecticut. Besides nonionic surfactants, anionic surfactants can also be used. These surfactants can be applied to the thermoplastic fibers at levels of, for example, from about 0.2 to about 1 g. per square centimeter of thermoplastic fiber.

Suitable thermoplastic fibers can be made from a single polymer (monocomponent fibers), or can be made from more than one polymer (e.g., bicomponent fibers). As used herein, "bicomponent fibers" refers to thermoplastic fibers that comprise a core fiber made from one polymer that is encased within a thermoplastic sheath made from a different polymer. The polymer comprising the sheath often melts at a different, typically lower, temperature than the polymer comprising the core. As a result, these bicomponent fibers provide thermal bonding due to melting of the sheath polymer, while retaining the desirable strength characteristics of the core polymer.

Suitable bicomponent fibers for use in the present invention can include sheath/core fibers having the following polymer combinations: polyethylene/ polypropylene, polyethylvinyl acetate/polypropylene, polyethylene/polyester, polypropylene/polyester, copolyester/polyester, and the like. Particularly suitable bicomponent thermoplastic fibers for use herein are those having a polypropylene or polyester core, and a lower melting copolyester, polyethylvinyl acetate or polyethylene sheath (e.g., those available from Danaklon a/s, Chisso Corp., and CELBOND<sup>®</sup>, available from Hercules). These bicomponent fibers can be concentric or eccentric. As used herein, the terms "concentric" and "eccentric" refer to whether the sheath has a thickness that is even, or uneven, through the cross-sectional area of the bicomponent fiber. Eccentric bicomponent fibers can be desirable in providing more compressive strength at lower fiber thicknesses.

Methods for preparing thermally bonded fibrous materials are described in U.S. application Serial No. 08/479,096 (Richards et al.), filed July 3, 1995 (see especially pages 16-20) and U.S. Patent 5,549,589 (Horney et al.), issued August 27, 1996 (see especially Columns 9 to 10). The disclosures of both of these references are incorporated by reference herein.

The absorbent layer can also comprise a HIPE-derived hydrophilic, polymeric foam. uch foams and methods for their preparation are described in U.S. Patent 5,550,167 (DesMarais), issued August 27, 1996; and commonly assigned U.S. patent application Serial No. 08/370,695 (Stone et al.), filed January 10, 1995 (both of which are incorporated by reference herein).

The wipe can consist of one or more layers including optionally a scrub layer for maximum cleaning efficiency. For pre-moistened wipes that use a single substrate, the substrate preferably consists of fibers comprising of some combination of hydrophilic and hydrophobic fibers, and more preferably a composition consisting of at least about 30% hydrophobic fibers and even more preferably at least about 50% of hydrophobic fibers in a hydroentangled web. By hydrophobic



fibers, it is meant polyester as well as those derived from polyolefins such as polyethylene, polypropylene and the like. The combination of a hydrophobic and absorbent hydrophilic fibers represents a particularly preferred embodiment for the single sheet pre-moistened wipe since the absorbent component, typically cellulose, aids in the sequestering and removal of dust and other soils present on the surface. The hydrophobic fibers are particularly useful in cleaning greasy soils, in improving the pre-moistened wipe and in lowering the friction between substrate and hard surface (glide). In terms of rank ordering of fiber chemical composition for improved glide, the inventors have found polyester, particularly polyester, along with polypropylene to be most effective in providing excellent glide, followed by polyethylene. Cellulose (or rayon) based pre-moistened wipes, though highly absorbent lead to significant friction between substrate and surface to be cleaned. Fiber blends are more difficult to rank order from a glide perspective, though the inventors have found that even low levels of polyester or polypropylene content can significantly improve the glide performance in virtually all cases. Fiber compositions that typically have a coefficient of friction with glass can be improved, as needed, by impregnating or chemically bonding the wipe with low levels of silicone or other chemicals that are known to reduce friction. Silicones are preferred since they also reduce composition sudsing, leading to improved result.

Various forming methods can be used to form a suitable fibrous web. For instance, the web can be made by nonwoven dry forming techniques, such as air-laying, or alternatively by wet laying, such as on a paper making machine. Other non-woven manufacturing techniques, including but not limited to techniques such as melt blown, spunbonded, needle punched, and hydroentanglement methods can also be used.

In one embodiment, the dry fibrous web can be an airlaid nonwoven web comprising a combination of natural fibers, staple length synthetic fibers and a latex binder. The dry fibrous web can be about 20-80 percent by weight wood pulp fibers, 10-60 percent by weight staple length polyester fibers, and about 10-25 percent by weight binder.

The dry, fibrous web can have a basis weight of between about 30 and about 100 grams per square meter. The density of the dry web can be measured after evaporating the liquid from the premoistened wipe, and the density can be less than about 0.15 grams per cubic centimeter. The density is the basis weight of the dry web divided by the thickness of the dry web, measured in consistent units, and the thickness of the dry web is measured using a circular load foot having an area of about 2 square inches and which provides a confining pressure of about 95 grams per square inch. In one embodiment, the dry web can have a basis weight of about 64 grams per square meter, a thickness of about 0.06 cm, and a density of about 0.11 grams per cubic centimeter.

In one embodiment, the dry fibrous web can comprise at least 50 percent by weight wood pulp fibers, and more preferably at least about 70 percent by weight wood pulp fibers. One particular airlaid nonwoven web which is suitable for use in the present invention comprises about

73.5 percent by weight cellulosic fibers (Southern softwood Kraft having an average fiber length of about 2.6 mm); about 10.5 percent by weight polyester fibers having a denier of about 1.35 gram/9000 meter of fiber length and a staple length of about 0.85 inch; and about 16 percent by weight of a binder composition comprising a styrene butadiene copolymer. The binder composition can be made using a latex adhesive commercially available as Rovene 5550 (49 percent solids styrene butadiene) available from Mallard Creek Polymers of Charlotte, N.C.

One suitable airlaid non-woven web for use in the present invention is the airlaid nonwoven web employed in PAMPERS BABY FRESH brand baby wipes marketed by The Procter & Gamble Co. of Cincinnati, Ohio.

The following patents are incorporated herein by reference for their disclosure related to webs: U.S. Patent 3,862,472 issued Jan 28, 1975; U.S. Patent 3,982,302 issued Sept. 28, 1976; U.S. Patent 4,004,323 issued Jan. 25, 1977; U.S. Patent 4,057,669 issued Nov. 8, 1977; U.S. Patent 4,097,965 issued July 4, 1978; U.S. Patent 4,176,427 issued Dec. 4, 1979; U.S. Patent 4,130,915 issued Dec. 26, 1978; U.S. Patent 4,135,024 issued Jan. 16, 1979; U.S. Patent 4,189,896 issued Feb. 26, 1980; U.S. Patent 4,207,367 issued June 10, 1980; U.S. Patent 4,296,161 issued Oct. 20, 1981; U.S. Patent 4,309,469 issued Jan 25, 1982; U.S. Patent 4,682,942 issued July 28, 1987.- and U.S. Patents 4,637,859; 5,223,096; 5,240,562; 5,556,509; and 5,580,423.

The art recognizes the use of dusting sheets such as those in U.S. Patent 3,629,047, U.S. Patent 3,494,421, U.S. Patent 4,144,370, U.S. Patent 4,808,467, U.S. Patent 5,144,729, and U.S. Patent 5,525,397, all of which are incorporated herein by reference, as effective for picking up and retaining particulate dirt. These sheets require a structure that provides reinforcement yet free fibers in order to be effective. The applicants herein have found that similar structures used dry for dusting can also be advantageously used when pre-moistened with liquid at levels from about 0.5 gram of chemical solution per gram dry substrate or greater. These levels are significantly higher than the levels used for chemical additives such as mineral oils, waxes etc. often applied to conventional dusting sheets to enhance performance. In particular, the wipes of this invention are specifically intended to be used pre-moistened with aqueous compositions.

In one preferred embodiment, the cleaning sheet has at least two regions where the regions are distinguished by basis weight. The measure for basis weight is described in US Provisional Applications 60/055,330 and 60/047,619. Briefly, the measurement is achieved photographically, by differentiating dark (low basis weight) and light (high basis) network regions. In particular, the cleaning sheet comprises one or more low basis weight regions, wherein the low basis region(s) have a basis weight that is not more than about 80% of the basis weight of the high basis weight regions. In one preferred aspect, the first region is relatively high basis weight and comprises an essentially continuous network. The second region comprises a plurality of mutually discrete regions of relatively low basis weight and which are circumscribed by the high basis weight first region. In particular, a preferred cleaning sheet comprises a continuous region

having a basis weight of from about 30 to about 120 grams per square meter and a plurality of discontinuous regions circumscribed by the high basis weight region, wherein the discontinuous regions are disposed in a random, repeating pattern and having a basis weight of not more than about 80% of the basis weight of the continuous region.

In one embodiment, the cleaning sheet will have, in addition to regions which differ with regard to basis weight, substantial macroscopic three-dimensionality. The term "macroscopic three-dimensionality", when used to describe three dimensional cleaning sheets means a three dimensional pattern is readily visible to the naked eye when the perpendicular distance between the viewer's eye and the plane of the sheet is about 12 inches. In other words, the three dimensional structures of the pre-moistened sheets of the present invention are cleaning sheets that are non-planar, in that one or both surfaces of the sheets exist in multiple planes. By way of contrast, the term "planar", refers to sheets having fine-scale surface aberrations on one or both sides, the surface aberrations not being readily visible to the naked eye when the perpendicular distance between the viewer's eye and the plane of the sheet is about 12 inches. In other words, on a macro scale the observer will not observe that one or both surfaces of the sheet will exist in multiple planes so as to be three-dimensional.

The measure for three-dimensionality is described in US Provisional Applications 60/055,330 and 60/047,619. Briefly, macroscopic three-dimensionality is described in terms of average height differential, which is defined as the average distance between adjacent peaks and valleys of a given surface of a sheet, as well as the average peak to peak distance, which is the average distance between adjacent peaks of a given surface. Macroscopic three dimensionality is also described in terms of surface topography index of the outward surface of a cleaning sheet; surface topography index is the ratio obtained by dividing the average height differential of a surface by the average peak to peak distance of that surface. In a preferred embodiment, a macroscopically three-dimensional cleaning sheet has a first outward surface and a second outward surface wherein at least one of the outward surfaces has a peak to peak distance of at least about 1 mm and a surface topography index from about 0.01mm to about 10 mm. The macroscopically three-dimensional structures of the pre-moistened wipes of the present invention optionally comprise a scrim, which when heated and the cooled, contract so as to provide further macroscopic three-dimensional structure.

In another alternative embodiment, the substrate can comprise a laminate of two outer hydroentangled webs, such as nonwoven webs of polyester, rayon fibers or blends thereof having a basis weight of about 10 to about 60 grams per square meter, joined to an inner constraining layer, which can be in the form of net like scrim material which contracts upon heating to provide surface texture in the outer layers..

The pre-moistened wipe is made by wetting the dry substrate with at least about 1.0 gram of liquid composition per gram of dry fibrous web. Preferably, the dry substrate is wetted with at least about 1.5, and more preferably at least about 2.0 grams of liquid composition per gram of

the dry fibrous web. The exact amount of solution impregnated on the wipe will depend on the product's intended use. For pre-moistened wipes intended to be used for cleaning counter tops, stove tops, glass etc., optimum wetness is from about 1 gram of solution to about 5 grams of solution per gram of wipe. In the context of a floor cleaning wipe, the pre-moistened substrate can preferably include an absorbent core reservoir with a large capacity to absorb and retain fluid. Preferably, the absorbent reservoir has a fluid capacity of from about 5 grams to about 15 grams per gram of absorptive material.. Pre-moistened wipes intended to be used for the cleaning of walls, exterior surfaces, etc. will have a capacity of from about 2 grams to about 10 grams of dry fibrous web.

#### Glass Wipes

Pre-moistened wipes for use on glass can either be mono-layer or multi-laminate. In the context of mono-laminates, since the surface is not wiped to dryness in the context of a pre-moistened wipe, it is essential that the non-volatile content be kept to a minimum. Thus, the actives described above are preferably used at even lower levels for best end result. Also, it has been found that compositions consisting solely of organic hydrophobic cleaning solvents can deliver an excellent end result along with good cleaning in a pre-moistened wipe. These solvents, as opposed to the aqueous hydrophilic solvents such as ethanol, isopropanol and the like, have been found to provide better and more even surface wetting. This is important as it leads to a more uniform drying, which provides reassurance to consumers that streaks are not going to form. Additionally, while not wishing to be limited by theory, it is believed that in a soiled environment, the hydrophobic organic cleaning solvents will dry with less streaking. For example, in the context of glass wipes current mono-layer glass wipes, e.g., Glassmates manufactured by Reckitt & Colman, which use hydrophilic solvents only (i.e., they lack hydrophobic organic cleaning solvent) dry in spots. In the context of a pre-moistened wipe, the cleaning solvents are employed in a level of from about 0.5% to about 10%, more preferably from about 1% to about 5%. Preferred hydrophobic organic cleaning solvents include mono-propylene glycol propyl ether, mono-propylene glycol butyl ether, mono-ethylene glycol butyl ether and mixtures thereof. Other aqueous hydrophilic solvents such as ethanol, isopropanol, isobutanol, 2-butanol, methoxypropanol and the like, can be used to provide perfume lift. Buffers with molecular weights of less than about 150 g/mole as described above, can be used advantageously to improve cleaning without harming end result performance. Examples of preferred buffers include ammonia, methanol amine, ethanol amine, 2-amino-2-methyl-1-propanol, 2-dimethylamino-2-methyl-1-propanol, acetic acid, glycolic acid and the like. Most preferred among these are ammonia, 2-dimethylamino-2-methyl-1-propanol and acetic acid. When used, these buffers are present in from about 0.005% to about 0.5%, with the higher levels being more preferred for the more volatile chemicals. In the context of glass wipes, simple compositions using low levels of

non-volatile surfactant with preferably high levels of the preferred organic cleaning solvent are sufficient to provide excellent cleaning and wetting performance even in the absence of the hydrophilic polymer. However, the addition of polymer can advantageously be used to provide other benefits such as anti-spotting, antifogging and easier next-time-cleaning.

The art recognizes the use of pre-moistened wipes. For example, US Patent 4,276,338 discloses a multi-laminate absorbent article comprising adjacent first and second layers maintained together to improve wicking. US Patent 4,178,407 discloses a single towel having absorbent surface on both sides that additionally comprises an inner layer impermeable to liquid. The towel is designed to have little wet strength and the layer of absorbent material consists of loose fibers. The art also discloses pre-moistened wipes for use in glass cleaner applications. US Patent 4,448,704 discloses an article suitable for cleaning hard surfaces such as glass. The article may be wet or consist of present within ruptural pouches. The article of US Patent 4,448,704 is pre-washed with demineralized water or the solution used to impregnate said article; the liquid composition has a surface tension of less than 35 dynes/cm, and preferably includes a surface-active agent and a partially esterified resin such as a partially esterified styrene/maleic anhydride copolymer. All of said patents are incorporated herein by reference.

The pre-moistened wipes used in the context of the present invention advantageously are not pre-washed, yet the inventors have found that they deliver excellent end result even as single layered sheets. An additional benefit of the premoistened glass wipes is to keep linting at a minimum. Steps such as pre-washing typically loosens up fibers, making the substrate more prone to linting. In the context of hydroentangled structures specifically, the tightness of the fiber integration is optimally achieved in processing of the fibrous materials, not during the making or preparation of the pre-moistened wipe. As a result, preferred compositions of the present invention display improved linting. Additionally, the liquid composition used on the pre-moistened wipes is preferably substantially free of surface active agents. As such, the surface tension of the liquid does not need to reduce surface tension below 35 dynes/cm. In the context of a multi-layered sheet of the present invention has two sides that differ in function. One side is pre-moistened and acts to deliver the liquid while the other is preferably not wet and is designed for buffing or finishing.

In the context of glass and other cleaning situations where lower levels of liquid are required to reduce amount of liquids left on surfaces and grease cleaning efficacy is required, a preferred embodiment includes a dry fibrous web substrate where at least about 65% of the dry fibrous web is composed of hydrophobic fibers such as polyester, polypropylene, polyethylene and the like, and lower levels of hydrophilic fibers such as wood pulp, cotton, and the like are at levels of less than about 35%. The lower level of hydrophilic fibers helps reduce how much liquid the wipe can retain while the higher level of hydrophobic fibers helps to better absorb grease. Aside from benefits associated with improved grease cleaning, the inventors have found that hydrophobic fibers also improve the feel of the wipe on glass and other hard surfaces, providing

an easier cleaning feel to both the consumer and to the surface being treated. This improved ease-of-cleaning, lubricity, or "glide" can be experimentally quantified by friction measurements on relevant hard surfaces. Improved glide from the wipe provides additional freedom in the formulation of the liquid composition. Hydrophobic fibers provide glide benefits whether the wipe is completely pre-moistened and when the wipe is completely dry. This is significant since wipes become increasingly dry as they are used. Thus, the level of C<sub>14</sub> or higher chainlength surfactants which are known to provide lubricity benefits can be substantially reduced or preferably altogether eliminated from the liquid composition used in the pre-moistened wipe while still preserving excellent glide (low friction) characteristics. The use of wipes comprising some level of hydrophobic fibers, particularly polyester, also provides increased flexibility in formulating pre-moistened wipes for glass at acidic pH. It has been found that acidic cleaning compositions significantly hinder the glide of cellulosic substrates such as common paper towels or cellulosic pre-moistened wipes.

In addition to using material composition wipe dimension can also be used to control dosing as well as provide ergonomic appeal. Preferred wipe dimensions are from about 5 1/2 inches to about 9 inches in length, and from about 5 1/2 inches to about 9 inches in width to comfortably fit in a hand. As such, the wipe preferably has dimensions such that the length and width differ by no more than about 2 inches. In the context of heavier soil cleaning, wipes are preferably bigger so that they can be used and then folded, either once or twice, so as to contain dirt within the inside of the fold and then the wipe can be re-used. For this application, the wipe has a length from about 5 1/2 inches to about 13 inches and a width from about 10 inches to about 13 inches. As such, the wipe can be folded once or twice and still fit comfortably in the hand.

In addition to having wipes prepared using a mono-layer substrate, it is advantageous in some situations to have the pre-moistened wipe constructed in multiple layers. In a preferred embodiment, the wipe consists of a multi-laminate structure comprising a pre-moistened outer layer, an impermeable film or membrane inner layer and second outer-layer which is substantially dry. To improve the wet capacity of the wipe and to protect the back layer from getting prematurely wet, an optional absorbent reservoir can be placed between the pre-moistened first outer-layer and the impermeable film or membrane. Preferably, the dimensions of the reservoir are smaller than the dimensions of the two outer layers to prevent liquid wicking from the front layer onto the back layer.

The use of a multi-laminate structure as herein described can be highly desirable in that it allows for a dry buffing step, aimed at substantially removing most of the liquid remaining on the glass following application of the wet side of the pre-moistened wipe on the glass. The inventors have found that even with a buffing step, hydrophilic polymer in the pre-moistened wipe, if present, remains on the glass providing anti-fog properties to the glass. The buffing step also provides improved overall flexibility in the level of solids used in the liquid composition because most of the solids are wiped up together with the remainder of the aqueous composition during

the buffing step. In fact, those skilled in the art can recognize that it can be advantageous to use very low levels, preferably less than about 0.02%, water-soluble though crystalline surfactants because of improved propensity for dry the substrate to remove such crystalline solids from the glass surface.

The multi-laminate structure is further advantageously used in the context of heavier soiled situations, such as those encountered on outside windows or car glass. By allowing use of a fresh, clean surface for buffing, the multi-laminate structure reduces the amount of dirty liquid pushed around by the pre-moistened wipe.

When a multi-laminate structure is used, it is preferred that the outer pre-moistened layer contain at least about 30% hydrophobic fibers for oil remove and glide. The impermeable inner layer is most preferably polyethylene, polypropylene or mixtures thereof. The composition mixture and thickness of the impermeable layer is chosen so as to minimize, or more preferably eliminate any seepage of liquid from the pre-moistened first outer-layer to the dry second outer-layer. Those skilled in the art will appreciate that use of a reservoir core or of a high fluid capacity pre-moistened outer-layer will test the impermeable layer, such that more than one impermeable layer can be required to ensure sufficient dryness for the second outer-layer of the wipe. The reservoir, if present, will preferably consist of treated or untreated cellulose, either as a stand alone material or as a hybrid with hydrophobic fibers. The hydrophobic content of the reservoir layer is preferably less than about 30%, more preferably less than about 20% by weight of the total fiber content of the layer. In a preferred embodiment, the reservoir consists of air-laid cellulose. The second outer-layer, which is substantially dry to the touch, preferably consists of high absorbency cellulose or blends of cellulose and synthetic fibers.

The inventors have recognized that packing of the wipes that contain a pre-moistened side and a dry side can be challenging. To resolve this packing issue, a preferred folding scheme has been developed. The wipes are folded in either halves, thirds or in other other suitable way such that all of the pre-moistened sides of each of the wipes are folded inward and into each other. As a result, all of the outer dry layers of successive wipes piled into a pouch, container or box, do directly contact any pre-moistened wipe sides. By "directly contact", it is meant that all of the pre-moistened sides of the wipes are separated from dry sides by a liquid impermeable layer. By packing the wipes in such a preferred manner, it is ensured that the dry sides of the wipes do not become contaminated with liquid during storage in the wipes container and prior to use. The packing material can be made of any suitable material, including plastic or cellophane. Optionally, another means to further address potential liquid wicking into the buffing layer, is by simply adding superabsorbent polymer into the buffing layer or between the impermeable layer and the buffing layer.

In a preferred embodiment, a starter kit comprises a sturdy box or other receptacle capable of holding from about eight to about twenty four wipes which have been folded at least

once, and lower cost packages capable of holding from about five to about twelve wipes are used as refill packages.

In the context of the present invention, the pre-moistened wipe is to be used in conjunction with an implement comprising a handle and attachment device for the wipe (i.e. mop head). As used herein, implement signifies any physical means for attachment of substrate, such as pad, dry wipe pre-moistened wipe, and the like. Optionally, but preferably, the pre-moistened wipe includes one or more preservatives so as to ensure fungistatic benefits. Examples of preservatives to be used in association with the pre-moistened wipes of the invention include methyl paraben, bronopol, hexetidine, dichloro-s-triazinetriene, trichloro-s-triazinetriene, and quaternary ammonium salts including dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C12, C14 and C16 dimethyl benzyl (Bardac® 2280 and Barquat® MB-80 sold by Lonza), and the like at concentrations below about 0.02%. Preferred preservatives include citric acid, tetrakis (hydroxymethyl phosphonium sulfate (THPS), sodium pyrithione, Kathon® and 1,2-benzisothiazolin-3-one sold by Avicia Chemicals. The preservatives, if used, are in concentrations from about 0.001% to about 0.05%, more preferably from about 0.005% to about 0.02%. Alternatively, preservation can be achieved using product pH, by making the pH of the aqueous lotion squeezed out of the pre-moistened wipe either greater than about 10.5 or less than about 3.0. Preferred pH-based preservatives include those which are highly volatile such as ammonia (for high pH) and acetic acid (for low pH). When pH-based preservatives are used, particularly when volatile preservatives are used, the concentration of the preservative can be substantially higher than 0.02%. The use of wipes comprising hydrophobic fibers provides sufficient glide on the surface so as to even allow the use of acidic preservation agents. Additionally, a combination of preservatives can be used to achieve the desired preservation benefits. In any event, the preservative(s) can either be applied directly onto the wipe prior to the solution, or alternatively dispersed into the solution prior to moistening the wipe.

Alternatively, it can be beneficial to incorporate antimicrobials directly into the substrate. In this context, it is preferred to use highly water-insoluble antimicrobial actives such as those derived from heavy metals. Examples of insoluble antimicrobials include zinc pyrithione, bismuth pyrithione, copper naphthenate, copper hydroxy quinoline, and the like. Other examples of actives, which do not use heavy metals, include dichloro-s-triazinetriene and trichloro-s-triazinetriene.

#### "Wet-wipe" for Floors and/or Counters and Walls

It is particularly advantageous in the context of floor wipes to have structures with three-dimensionality. The three-dimension structure of the substrates described above have been found to provide improved hair pick-up relative to planar sheets, which in a wet surface



environment is surprising. In a preferred embodiment, the user advantageously uses slight weaving motions in an up-and-down wiping pattern to maximize hair pick-up.

Optimum wetness is from about 1 gram of solution to about 5 grams of solution per gram of wipe. In the context of a floor cleaning wipe, the pre-moistened substrate can optionally include an absorbent core reservoir with a large capacity to absorb and retain fluid. Preferably, the absorbent reservoir has a fluid capacity of from about 5 grams to about 15 grams per gram of absorptive material. Pre-moistened wipes intended to be used for the cleaning of walls, exterior surfaces, etc. will have a capacity of from about 2 grams to about 10 grams of dry fibrous web.

Since there is no rinsing step in the context of a general purpose pre-moistened wipe, it is essential that the non-volatile content be kept to a minimum to avoid film/streak residue from product. Also, it has been found that compositions consisting of primarily organic hydrophobic cleaning solvents can deliver an excellent end result along with good cleaning in the context of a general purpose pre-moistened wipe for reasons similar to those described in pre-moistened glass wipes. Buffers with molecular weights of less than about 150 g/mole can be used advantageously to improve cleaning without harming end result performance. Examples of preferred buffers include ammonia, methanol amine, ethanol amine, 2-amino-2-methyl-1-propanol, 2-dimethylamino-2-methyl-1-propanol, acetic acid, glycolic acid and the like. Most preferred among these are ammonia, 2-dimethylamino-2-methyl-1-propanol and acetic acid. When used, these buffers are present in from about 0.005% to about 0.5%, with the higher levels being more preferred for the more volatile chemicals. As in the case of glass wipes, the inventors have found that simple compositions using low levels of non-volatile surfactant with preferably high levels of the preferred organic cleaning solvent are sufficient to provide excellent cleaning and wetting performance even in the absence of the hydrophilic polymer. However, the addition of polymer can advantageously be used to provide other benefits such as anti-spotting, antifogging and easier next-time-cleaning.

To provide added convenience general purpose pre-moistened wipes are attached to a mop head with a handle. Thus, the pre-moistened wipe is ideal for light cleaning and disinfecting. Since the amount of solution released from the wipe is much more limited than that delivered through conventional cleaning, very effective anti-microbial systems need to be used. In one such composition the general purpose and floor pre-moistened wipe can contain a solution comprising an effective level of detergent surfactant and citric acid at about 0.5 to about 5%. To boost the efficacy of such solution hydrogen peroxide or a source of hydrogen peroxide can be added at about 0.5% to about 3%. An alternative composition could use quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C<sub>12</sub>, C<sub>14</sub> and C<sub>16</sub> dimethyl benzyl ammonium chlorides, at levels greater than about 0.05%. Such compounds have been found to often interfere with the benefits of the preferred polymers. While these solutions (e.g., those comprising sources of hydrogen peroxide, quaternary ammonium

compounds and citric acid) deliver a high degree of anti-microbial efficacy they can leave a filmy surface because they are solids and need to be used at high levels.

Better end result performance is delivered by compositions containing primarily the organic cleaning solvents described above at from about 0.25% to about 10%, more preferably 0.5% to about 5% to provide cleaning and wetting, in combination with non-volatile buffers described above. Low levels of non-volatiles including hydrophilic polymer can advantageously be incorporated such that the total level of non-volatiles excluding perfume and antimicrobials, is from about 0% to about 0.08%, more preferably from 0% to about 0.055%, most preferably from about 0% to about 0.025%. In a preferred embodiment, the combination of surfactants, wetting polymers, buffers and hydrophobic organic cleaning solvents are chosen so as to provide a surface tension reduction from water (72 dynes/cm) of more than about 25 dynes/cm, more preferably more than 30 dynes/cm, most preferably more than 35 dynes/cm. Optionally, low levels of more effective anti-microbial ingredients such as bronopol, hexitidine sold by Angus chemical (211 Sanders Road, Northbrook, Illinois, USA), Kathon®, 2-((hydroxymethyl)(amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate, formaldehyde, and glutaraldehyde, quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C12,C14 and C16 dimethyl benzyl (Bardac® 2280 and Barquat® MB-80 sold by Lonza), dichloro-s-triazinetrione, trichloro-s-triazinetrione, and more preferably 1,2-benzisothiazolin-3-one sold by Avicia Chemicals, chlorhexidine diacetate sold by Aldrich-Sigma, sodium pyrithione and polyhexamethylene biguanide at about 0.001% to about 0.1%, more preferably from about 0.005% to about 0.05% are added for preserving and/or providing antimicrobial benefits.

An important benefit of the wet wipes used in the context of the present invention is the fact that judicious selection of the antimicrobial actives combined with the lack of a rinsing step required by the invention, and lack of a buffing step (consumers are in the habit of cleaning floors and countertops to a wet end result), allow for residual disinfectancy benefits. By residual disinfectancy, it is meant that the residual antimicrobial actives delivered by the wet wipe onto the hard surface at least about 99.9% cidal against bacteria and other microorganisms for a period of from about 8 to about 72 hours, more preferably from about 12 to about 48 hours, most preferably at least about 24 hours. While residual disinfectancy can be achieved using conventional approaches (i.e., spray product with a paper towel, sponge, rag, etc.), the premoistened wipe has the added convenience of delivering the cleaning and disinfectancy benefits in one package. The residual properties result from a combination of low vapor pressure and high cidal efficacy of the antimicrobial actives associated with the compositions of the present invention. Those skilled in the art will recognize that residual disinfectancy benefits, if present in the context of compositions comprising a very low level of surfactant, are even more easily achieved in compositions wherein the level of surfactants is raised. Residual disinfectancy, in addition to excellent end result, can provide consumers with reassurance as to the effectiveness of the wet wipe. Such reassurance

is most important for tasks such as cleaning of surfaces that are particularly susceptible to harboring germs, most particularly counter tops, stove tops, appliances, sinks, furniture, showers, glass and other fixtures that are near or inside the kitchen or bathroom(s).

Preferred antimicrobial actives for residual benefits as delivered from a wet wipe or a dry wipe that becomes wet as a result of contact with a wet composition during the cleaning process, include Kathon®, 2-((hydroxymethyl) (amino)ethanol, propylene glycol, sodium hydroxymethyl amino acetate, formaldehyde, and glutaraldehyde, quaternary ammonium salts such as dioctyl dimethyl ammonium chloride, octyl decyl dimethyl ammonium chloride, didecyl dimethyl ammonium chloride, C12,C14 and C16 dimethyl benzyl (Bardac® 2280 and Barquat® MB-80 sold by Lonza), dichloro-s-triazinetriene, trichloro-s-triazinetriene, and more preferably tetrakis(hydroxymethyl) phosphonium sulphate (THPS), 1,2-benzisothiazolin-3-one sold by Avicia Chemicals, chlorhexidine diacetate sold by Aldrich-Sigma, sodium pyrithione and polyhexamethylene biguanide at about 0.001% to about 0.1%, more preferably from about 0.005% to about 0.05%. The specific antimicrobial actives and combinations thereof are chosen so as to be effective against specific bacteria, as desired by the formulator. Preferably, the antimicrobial actives are chosen to be effective against gram-positive and gram-negative bacteria, enveloped and non-enveloped viruses, and molds that are commonly present in consumer homes, hotels, restaurants, commercial establishments and hospitals. Most preferably, the antimicrobials provide residual disinfectancy against *Salmonella choleraesuis*, *Pseudomonas aeruginosa*, *Staphylococcus aureus* and *Escherichia coli*, and combinations thereof. Wherever possible, the antimicrobial actives are chosen to have residual disinfectancy benefits against more than one bacterial organism, and more preferably against at least one gram-negative organism and at least one gram-positive organism.

The inventors have found that residual disinfectancy can also be achieved or enhanced using pH. Additionally, use of low levels of surfactants to reduce surface tension by more than about 25 dynes/cm, preferably more than about 30 dynes/cm, can advantageously be used in combination with pH effects in the context of a pre-moistened wipe. Thus, compositions at a pH 10.5 or greater or a pH of 3 or lower are found to deliver the desired residual efficacy. The preferred hydrophilic, substantive polymer can be used to improve residuality, particularly for volatile actives such as acetic acid. The use of pH can also help lower the level of the above actives needed to achieve residual. Preferred actives that are effective as a result of pH include lactic acid, glycolic acid, C<sub>8</sub>, C<sub>9</sub>, C<sub>10</sub> fatty acids, sodium hydroxide, potassium hydroxide.

Use of low levels of non-volatile compounds in the compositions used in the context of the present invention presents a challenge for perfume incorporation. Some methods to improve solubility of perfume are disclosed below. However, in certain instances, particularly when hydrophobic perfumes are desired, perfume incorporation can be problematic. To circumvent this issue, the inventors have advantageously found that perfume delivery can be achieved by directly applying concentrated perfume to either the wipe (or pad). In this manner, virtually any perfume

can be used. In order to minimize any residue negatives that can be caused by the concentrated perfume, the perfume is preferentially applied to the perimeter of the wipe or pad, or to areas that do not directly contact the surface to be treated. In another embodiment, perfume can also be added into the package containing the wipes. In similar fashion, use of low levels of non-volatile actives makes incorporation of effective suds suppressors into the aqueous composition more difficult. It has been found that suds suppressors can more easily, and more effectively be applied directly to the wipe to prevent suds control. It is found that this not only addresses a consumer perception of too much sudsing, but surprisingly also has shown an improved end result upon surface drying. Furthermore, it has been found that applying suds suppressor directly onto the wipes makes process a lot easier through better control of suds during manufacturing and packaging. Preferred suds suppressors are those that are effective at levels of no more than about 0.1 grams of suds suppressor per gram of substrate, more preferably at levels less than about 0.01 grams suds suppressor per gram of substrate, most preferably, less than about 0.005 grams suds suppressor per gram of substrate. The most preferred suds suppressor in this context is DC AF, manufactured by the Dow Corning company. The use of suds suppressors to improve surface appearance is particularly significant since these materials are effective at very low levels.

#### Making processes

The compositions used in the context of the present invention can be made by mixing together all ingredients. It has been found that for maximum perfume solubilization in compositions where the actives are present at low levels, a preferred order of addition is necessary. This involves the making of a premix like the perfume compositions disclosed hereinbefore, that is then added to the "base" product. The premix comprises raw materials added in the following order: surfactant(s), if any, at about 25% activity or higher, then perfume, then polymer, then the optional suds suppressor. In certain cases, it is advantageous to add solvent(s) and/or the optional buffer, to the premix after the optional suds suppressor. Thorough mixing of the premix provides the best results. The premix is then added to the base, which contains water and the other components. The combined mixture (i.e., premix in the base) is then mixed to obtain a homogeneous solution.

Another preferred method to incorporate maximum perfume into compositions with limited surfactant, is to create a premix in which perfume is added to a cyclodextrin mixture in aqueous media. Alternatively, the perfume-cyclodextrin mixture can be pre-formed prior to the premix. This approach ensures maximum perfume incorporation into the composition, and can provide perfume to compositions with little or no surfactant.

In certain cases, perfume solubilization can not be achieved, even with the preferred processing methods. However, in applications such as, but not limited to, counter and floor

cleaners, the entire heterogeneous composition can be added directly to the article of use to make the pre-moistened wipes or mops prior to packing them as a stack of pre-moistened wipes or mops, or alternatively it can be packed in a bottle of cleaning solution to be poured onto the stack of wipes by the user at first use, so as to create a stack of pre-moistened mops at first use.

In cases where the surfactant active level does not limit perfume solubility in the compositions, a single step making process can be followed. For example, an acceptable order of addition is to first incorporate water, any detergent surfactant and/or organic acid, followed by any hydrophobic cleaning solvent. Once the solvent is added, pH is adjusted to optimum as desired by the formulator. The polymer can then be added followed by any optional peroxide, perfume and/or dye.

#### "Perfume" Compositions

Most compositions described above can advantageously be used in concentrated form because their ability to solubilize significant levels of perfume via hydrophilic polymer. For example perfumes not completely soluble in water at 100 parts per million can be dissolved using about 0.05% or more hydrophilic polymer. Additionally, the preferred alkyl polyglucoside at low levels can be used to improve perfume solubility. By low levels, it is meant concentrations of less than about 0.05% polyglucoside. It is found that the preferred polyglucoside can dissolve three to ten times of perfume on a weight basis in water, and the ability of the polymer to dissolve/disperse perfume is improved even more. This is beneficial since it keeps the amount of non-volatile materials low to minimize residue. For example, 0.5% of the preferred alkyl polyglucoside with 0.5% PVNO can be used to dissolve up to about 0.5% perfume. At lower surfactant and hydrophilic polymer levels, a larger ratio of perfume to actives can be dissolved. Thus, the combination of 0.03% alkyl polyglucoside and 0.015% can dissolve up to about 0.1% perfume, where other nonionics can only dissolve about half the level of perfume.

#### Kit of mops and mop-holding cleaning implement

It is highly desirable in the context of using the product defined herein on a regular, e.g., daily, bi-weekly or weekly basis, especially without rinsing, to maintain the cleanliness of a bath room, shower, walls, counter tops, glass, floors etc., that the product be marketed in a container, in association with instructions to use it on a regular basis, preferably after showering and/or bathing, especially without rinsing. The instructions can be either directly printed on the container itself or presented in a different manner including, but not limited to, a brochure, print advertisement, electronic advertisement, and/or other advertisement, so as to communicate the set of instructions to a consumer of the article of manufacture. The consumer needs to know the

method of use, and the benefits from following the method of use in order to obtain the full value of the invention.

The compositions used in the context of the present invention are to be used with a cleaning implement that comprises a removable pre-moistened cleaning mop which alleviates the need to rinse the mop during use. This preferably includes a cleaning implement that comprises a removable cleaning mop with sufficient absorbent capacity, on a gram of absorbed fluid per gram of cleaning mop basis, that allows the cleaning of a large area, such as that of the typical hard surface floor or wall (e.g., 80-100 ft<sup>2</sup>), without the need to change the mop. This, in turn, requires the use of a superabsorbent material, preferably of the type disclosed hereinbefore and in S.N. 08/756,507, incorporated by reference hereinbefore.

The liquid compositions described above are to be used with an implement for cleaning a surface, the implement preferably comprising:

- a. cleaning pad, preferably removable, containing an effective amount of a superabsorbent material, and having a plurality of substantially planar surfaces, wherein each of the substantially planar surfaces contacts the surface being cleaned, more preferably said pad is a removable cleaning pad having a length and a width, the pad comprising
  - i. scrubbing layer; and
  - ii. optionally an absorbent layer comprising a first layer and a second layer, where the first layer is located between the scrubbing layer and the second layer (i.e., the first layer is below the second layer) and has a smaller width than the second layer; and
- b. optionally, a handle.

Optionally, a preferred aspect of the cleaning pad is the use of multiple planar surfaces that contact the soiled surface during the cleaning operation. In the context of a cleaning implement such as a mop, these planar surfaces are provided such that during the typical cleaning operation (i.e., where the implement is moved back and forth in a direction substantially perpendicular to the pad's width), each of the planar surfaces contact the surface being cleaned as a result of "rocking" of the cleaning pad.

The preferred cleaning implements have a pad which offers beneficial soil removal properties due to continuously providing a fresh surface, and/or edge to contact the soiled surface, e.g., by providing a plurality of surfaces that contact the soiled surface during the cleaning operation.

The detergent surfactant is preferably linear, e.g., branching and aromatic groups should not be present, and the detergent surfactant is preferably relatively water soluble, e.g., having a hydrophobic chain containing preferably from about 8 to about 16, carbon atoms, and, for nonionic detergent surfactants, having an HLB of from about 9 to about 15, more preferably from about 10 to about 13.5. The most preferred surfactants are the alkylpolyglucosides described hereinbefore. Other preferred surfactants are the alkyl ethoxylates comprising from about 9 to about 12 carbon atoms, and from about 4 to about 8 ethylene oxide units. These surfactants offer

excellent cleaning benefits and work synergistically with the required hydrophilic polymers. A most preferred alkyl ethoxylate is  $C_{11}EO_5$ , available from the Shell Chemical Company under the trademark Neodol<sup>®</sup> 1-5. The  $C_{11}EO_5$  is particularly preferred when used in combination with the preferred cosurfactants,  $C_8$  sulfonate and/or Poly-Tergent CS-1. Additionally, the preferred alkyl ethoxylate surfactant is found to provide excellent cleaning properties, and can be advantageously combined with the preferred  $C_{8-16}$  alkyl polyglucoside in a matrix that includes the wetting polymers of the present invention. While not wishing to be limited by theory, it is believed that the  $C_{8-16}$  alkyl polyglucoside can provide a superior end result (i.e., reduce hazing) in compositions that additionally contain the preferred alkyl ethoxylate particularly when the preferred alkyl ethoxylate is required for superior cleaning. The preferred the  $C_{8-16}$  alkyl polyglucoside is also found to improve perfume solubility of compositions comprising alkyl ethoxylates. Higher levels of perfume can be advantageous for consumer acceptance.

The invention also comprises a detergent composition as disclosed herein in a container in association with instructions to use it. This container can have an assembly of one or more units, either packaged together or separately. For example, the container can include a pad or a dry wipe with cleaning solution, so that the user pre-moistens the wipes once at first use for future uses by pouring the cleaning solution into the package containing the stack of wipes. A second example is a container with pre-moistened mops or wipes, either with or without an implement, with or without a handle.

The detergent composition, (cleaning solution) is an aqueous-based solution comprising the hydrophilic polymer, optionally, but preferably, and optionally one or more detergent surfactants, the preferred alkylpolyglycosides being present if the hydrophilic polymer isn't present, optional solvents, builders, chelants, suds suppressors, enzymes, etc. Suitable polymers are those previously described herein. Suitable surfactants are commercially and are described in McCutcheon's Vol. 1: Emulsifiers and Detergents, North American edition, McCutcheon's Division, MC Publishing Company, 1999. Again, the most preferred polymers are polymers containing amine oxide moieties. The most preferred surfactants are the  $C_8$ - $C_{16}$  polyalkylglucosides, and  $C_{9-12}$  ethoxylates with from about 4 to about 8 oxyethylene units, and mixtures thereof. These compositions have been disclosed hereinbefore.

A suitable preferred cleaning solution for use in the method of cleaning floors, counters, walls, according to the present invention, with disposable pre-moistened wipes, pads, mops etc. comprises: from about 0.001% to about 0.25%, preferably from about 0.005% to about 0.15%, more preferably from about 0.01% to about 0.07% of the hydrophilic polymer. The level of polymer chosen will depend on the application. For example, it is found that higher levels of hydrophilic polymer can leave a sticky feel on floors. Such a tack is more easily tolerated in applications such counters, stove tops and walls. The composition can contain only the polymer, but preferably also contains from about 0.001% to about 0.5%, preferably from about 0.005% to about 0.25%, more preferably from about 0.005% to about 0.1%, of detergent surfactant,

preferably comprising said alkylpolyglucoside, more preferably the preferred alkyl polyglycoside containing a C<sub>8-16</sub> alkyl group and from about 1 to about 1.5, preferably from about 1.1 to about 1.4 glycosyl groups, and/or linear alkyl ethoxylate detergent surfactant (e.g., Neodol 1-5™, available from Shell Chemical Co.) and/or an alkyl sulfonate (e.g., Bioterge PAS-8s™, a linear C<sub>8</sub> sulfonate available from Stepan Co.); optionally, from about 0.001% to about 0.5%, preferably from about 0.01% to about 0.3 volatile buffer material, e.g., ammonia, 2-dimethylamino-2-methyl-1-propanol; optionally, from about 0.001% to about 0.05%, preferably from about 0% to about 0.02% non-volatile buffer material, e.g., potassium hydroxide, potassium carbonate, and/or bicarbonate; optionally, from about 0.001% to about 0.5%, preferably from about 0.05% to about 0.25%, of; other optional adjuvants such dyes and/or perfumes; and from about 99.9% to about 80%, preferably from about 99% to about 85%, more preferably from about 98% to about 90%, deionized or softened water. The exact level of deionized or softened water will depend on the nature of the application. Concentrates can have less than 80% deionized or soft water, depending on the concentration factor (e.g., 5X, 10X, 20X).

#### Method of cleaning using a mop implement and pre-moistened mops

The method of cleaning floors and other large surfaces according to the present invention comprises several steps. While several types of mops (i.e. wipes) and/or different types of implements can be used, it is an essential feature of the method of the present invention that the mops be used with an implement comprising a handle and a mop head and that the mops be pre-moistened (either in the plant, or at first use by the user himself). The first step of the method of cleaning according to the invention is to attach a mop (or wipe) to the implement, then other steps follow where the mop is used to clean the surface. Preferably the distribution of cleaning solution is substantially uniform. It is an advantage of the type of product herein that no rinsing is needed and, in fact, can be counterproductive since the efficiency of the method is improved by not rinsing. The polymer is primarily effective as a result of staying on the surface to render it hydrophilic. In fact, the method can comprise applying only an aqueous solution of the polymer, or the polymer plus perfume, to the surface.

Instructions for use are rendered in consumer-friendly language on the packaging and/or advertising (e.g., leaflets, coupons, displays, etc.). By consumer-friendly language, it is meant that consumers would be instructed how to preferably use the product to achieve best results. The units of measurement provided to consumers will reflect consumer understanding, e.g., English dosing units will be preferred in the United States, and metric units will be used in most European nations. Pictures can be used, either with, or without, words in helping make the instructions consumer-friendly. Special packaging design can also be advantageously used to convey instructions in a consumer-friendly fashion. Ergonomic appeal can also make product



use more intuitive, either with or without words and pictures. In particular, the packaging can be designed to facilitate proper dispensing.

#### Floor Cleaning Processes

In the context of a floor surfaces cleaner (as well as in other types of cleaner, eg. wall-cleaners, glass, cleaners, shower cleaners...etc.), the compositions are distributed using a pre-moistened mop. By floor cleaners, we mean compositions intended to clean and preserve common flooring inside or outside of the home or office. Floors that can be cleaned with compositions described above include but are not limited to living room, dining room, kitchen, bathroom, cellar, attic, patio etc. These floors can consist of ceramic, porcelain, marble, Formica®, no-wax vinyl, linoleum, wood, quarry tile, brick or cement, and the like.

#### Glass Cleaning mops

For increased convenience, the glass cleaning compositions used in the context of the present invention will be delivered in the form of a pre-moistened mop (i.e. wipe). The pre-moistened wipe is attached to a mop head and handle, especially for tough to reach areas (e.g., indoor or outdoor windows, second or higher story windows, large pieces of glass). For ease of use and versatility, the handle can consist of one or more small extendible attachment or a telescopic pole. For best results, the mop head unit includes a squeegee for optional buffing. The pre-moistened wipe provides liquid and scrubbing all in one execution. For best results, i.e., soil removal with delivery of high gloss and no streaks to treated areas such that no rinsing is required, dosing should be preferably from about 1 milliliter to about 10 milliliters per square meter, more preferably from about 3 milliliters to about 5 milliliters per square meter. For best results, a preferred wiping pattern consists of a side-to-side- overlapping motion starting in the upper left hand (or right hand) corner of the glass, progressing the wipe pattern down the glass continuing in side-by side patterns, and ending in the bottom left or right corner. The pre-moistened wipe is then flipped, and the glass is cleaned in an up-and-down pattern starting from the left (or right) end of the glass and progressing to the right (or left) such that the wiping motion covers the entire piece of glass. An alternative wiping pattern begins with up-and-down wiping motions, flipping the pre-moistened and finishing with side-to-side wiping motions. The alternative wiping method simply reverses the timing of the side-to-side and up-and-down wiping patterns. A benefit to the combined side-to-side and up-and-down patterns is minimization of streaks as a result of improved spreading of solution and the elimination of streak lines from paper towel linear motions (i.e., the edges of the paper towel or cloth form provide visible

demarcations of where wiping has taken place). Preferably, the left-on solution evaporates quickly following completion of the wipe pattern. For best end result, pressure placed on the pre-moistened wipe is decreased during the final wiping steps. In this manner, solution dripping is reduced and the wipe can be effectively used in reabsorbing some of the liquid during the final wiping stage. The compositions used in the context of this invention work particularly well in a no-rinse application for window glass, car glass, mirrors, chrome, silver, stove tops, glass tables, appliances, and the like. Unlike conventional glass cleaners, pre-moistened wipes do not require extra buffing to deliver excellent filming/streaking end results, particularly for light cleaning tasks. Additionally, the hydrophilic polymer delivers several important consumer benefits, including anti-fog and soil spotting prevention properties. The compositions are ideally suited for light duty jobs, i.e., stove top cleanliness, i.e., weekly maintenance. Importantly, residual levels of the hydrophilic polymers provide shine and soil prevention. Solvents, particularly volatile solvents, are preferably incorporated in these compositions, as they can provide additional cleaning, if needed, without streaking in a no-rinse application. The compositions also deliver next-time easier cleaning advantages of grease, encrusted foods and stains via the residual polymer left on surface. Additionally, the compositions can be used with articles to improve cleaning, such as abrasive pads, heat and steam and combinations thereof. For particularly tough soil removal or highly soiled surfaces, use of a multi-laminate wipe is even more advantageous. The same level of liquid and wiping pattern(s) is used as described above, but instructions would include an additional buffing or polishing step in order to remove potentially dirty liquid and prevent soil redeposition on glass.

#### General Purpose and Floor Cleaning Using a Pre-moistened Mop

It is an essential feature of the method of the present invention that the General Purpose and Floor Cleaning compositions described above be delivered in the form of a pre-moistened mop (i.e. wipe) as described hereinbefore, that is attached to a mop head and/or handle. The pre-moistened mop provides liquid and scrubbing all in one execution. Mopping pattern with a pre-moistened mop used with a handle is preferably performed in an up-and-down overlapping motion from left to right (or right to left) and then repeated using an up-and-down overlapping pattern from left to right (or right to left). The up-and-down motion preferentially covers about 0.5 meters to about 1 meter. The left to right distance preferentially is about 1 to about 2 meters. This mopping pattern is then repeated until the wipe is either substantially exhausted or dried out. Pre-moistened wipes can be advantageous particularly for cleaning small areas, such as encountered in typical bathrooms. They are also readily available and versatile in that they can be used to clean surfaces other than floors, such as counter tops, walls etc., without having to use a variety of other liquids and/or implements. This approach also effectively removes and controls microorganisms by minimizing implement inoculation, which is often seen with

conventional re-usable systems such as sponge, string and strip mops. Lack of implement inoculation leads to a cleaner and more germ-free end result.

It has been shown that contacts between the mops, and the hands of the user can be avoided. This is especially important in case the mops to be attached to a cleaning implement as described above are pre-moistened (i.e. wetted). Indeed, some compounds present into the wetting cleaning composition may have a negative effect (drying, whitening, ...etc.) to the skin of the consumer. Thus, it is an object of the present invention to provide a method of cleaning floors and other large surfaces with a cleaning device (i.e. cleaning implement) as described therein that comprises a handle and a mop head attached thereonto, and a disposable mop wetted with a cleaning composition (see examples of compositions in the above description), said mop being initially at least partially folded and packaged into a box containing a stack of said mops (i.e. wipes), and said mop being releasably fixed onto said mop head before and while cleaning, said method being comprising the steps of:

- (i) opening said box - said box having width and length dimensions slightly superior to the surface of the mop head -, so as to expose the mop being on top of said stack of mops, then
- (ii) manually unfolding said top mop so that it presents a first surface having width and length dimensions slightly superior to the surface of the mop head, then
- (iii) placing the implement mop head into the box so that the lower surface of said mop head contacts said first surface of said top wipe, and then folding the secondary surfaces of said top wipe back onto said mop head in a removable manner, then
- (iv) removing the implement with the wipe attached thereonto and closing the box with its cover so as to prevent evaporation of the cleaning composition, then
- (v) wiping the floor using said device, and then remove the wipe once used.

The above method, dramatically decreases the need for touching the wetted mops with hands, and thus greatly and advantageously diminishes the risk of skin damage. In addition, and more importantly, it avoids spilling of the wetting solution during the step of fixing the mop onto the mop head, which renders the whole process much cleaner.

Preferably, said unfolded top mop comprises at least two secondary surfaces to be folded around the mop head and removably attached thereonto. Also preferably, said peel off film is intended to be completely detached from the box at first use and trashed.

It is a further object of the present invention to provide a kit comprising

- (i) a box containing a stack of wetted mops (i.e. wipes),
- (ii) an implement comprising a handle and a mop head attached thereonto,

for use in a method as described above.

In order to further describe to the consumers the different steps of the method described above, the box containing the mops and/or the package containing the implement or the cleaning kit - comprising the implement together with the mops -, preferably comprises a label with drawings figuring the different method steps, as shown in figure 1.

### CLEANING IMPLEMENT

In the present invention, the method of cleaning floors and other large surfaces uses any of the above described detergent compositions optionally containing a disappearing dye, with an implement for cleaning a surface of the type disclosed hereinbefore, the implement comprising:

- a. removable cleaning pad preferably comprising a super-absorbent material and having a plurality of substantially planar surfaces, wherein each of the substantially planar surfaces contacts the surface being cleaned, and preferably a pad structure which has both a first layer and a second layer, wherein the first layer is located between the scrubbing layer and the second layer and has a smaller width than the second layer; and
- b. a handle.

As discussed hereinbefore, in a preferred aspect of the invention, the pad preferably contains a superabsorbent material and preferably also provides significant cleaning benefits. The preferred cleaning performance benefits are related to the preferred structural characteristics described below, combined with the ability of the pad to remove solubilized soils. The preferred cleaning pad, as described herein, when used with the preferred detergent composition, as described hereinbefore, provides optimum performance.

The preferred pads provide multiple planar surfaces as discussed hereinbefore.

As used herein, all numerical values are approximations based upon normal variations; all parts, percentages, and ratios are by weight and by weight of the composition unless otherwise specified.

**WHAT IS CLAIMED IS:**

1. A method of cleaning floors and other large surfaces with a cleaning device comprising a handle and a mop head attached thereonto, and a disposable mop wetted with a cleaning composition, said mop being initially at least partially folded and packaged into a box containing a stack of said mops, and said mop being releasably fixed onto said mop head before and while cleaning, said method being characterized in that it comprises the steps of:
  - (i) opening said box - said box having width and length dimensions slightly superior to the surface of the mop head -, so as to expose the mop being on top of said stack of mops, then
  - (ii) manually unfolding said top mop so that it presents a first surface having width and length dimensions slightly superior to the surface of the mop head, then
  - (iii) placing the implement mop head into the box so that the lower surface of said mop head contacts said first surface of said top wipe, then
  - (iv) removing the implement with the wipe attached thereonto and closing the box with its cover so as to prevent evaporation of the cleaning composition, then
  - (v) wiping the floor using said device, and then removing the wipe once used.
2. A method according to claim 1, wherein said unfolded top mop, prior to being fixed to said mop head, comprises at least two secondary surfaces to be folded around the mop head and removably attached thereonto.
3. A method according to any of the preceding claims, wherein a peel off film closes said box and is intended to be completely detached from said box at first use, and trashed.
4. A kit comprising
  - (i) a box containing a stack of wetted wipes,
  - (ii) an implement comprising a handle and a mop head attached thereonto,, for use in a method according to claim 1.
5. A kit according to claim 4, which further comprises usage instructions describing the steps of the method according to claim 1.
6. A box containing a stack of mops, or wipes, with usage instructions for a method of cleaning according to claim 1.

7. A method according to claim 1, substantially as herein described and illustrated.
8. A kit according to claim 4, substantially as herein described and illustrated.
9. A box according to claim 6, substantially as herein described and illustrated.
10. A new method of cleaning floors and other surfaces, a new kit, or a new box, substantially as herein described.

Fig. 1

