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(54) Cleaning wipes

(57) The invention provides an improved cleaning wipe which requires no scrubbing, buffing, polishing or rinsing, with the following components:

(a) a wipe which preferably comprises at least one layer of nonwoven material;
(b) a liquid cleaner which comprises:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

said wipe used to clean surfaces without rinsing, streaking or filming, wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

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Description

[0001] The present invention relates to an improved general purpose cleaning wipe which comprises a wipe combined with a liquid solution comprising surfactant and a combination of water-miscible or soluble solvents. The improved wipe surprisingly accomplishes the desired but difficult-to-achieve goals of enhanced cleaning, with little or no filming or streaking, without buffing the surface cleaned with the wipe.

[0002] Cleaning wipes have been formulated for specific purposes. For example, cleaning wipes containing inverse emulsions (i.e., water-in-lipid) are particularly useful in removing perianal soils from infants. These baby wipes are claimed to be more aesthetically pleasant to use on skin, since they essentially contain a waxy coating which, among other characteristics, prevents premature release of the aqueous liquid cleaning composition contained in the inverse emulsion. Examples of these inverse emulsion impregnated wipes are depicted in Cabell et al., U.S. Patent 5,908,707, Mackey et al., WO 97/40814, Mackey et al., WO 96/14835 and Moore, EP 750063. It is quite clear that these types of wipes do not consider improved cleaning of hard surfaces as paramount.

[0003] Some other references teach the use of premoistened wipes as useful for cleaning surfaces. However, they have been lacking for one reason or another. In U.S. Patent 4,448,704, the use of using a premoistened or dry wiping article containing C2-C3 alcohol as the main solvent and pretreating the substrate to remove impurities which may cause streaking is presented. However, there is no teaching, disclosure or suggestion that the lower alkanol may be paired with a more hydrophobic solvent.

[0004] U.S. Patent 4,666,621, discloses a pre-moistened, streak-free, lint-free hard surface wiping article. However, the disclosed liquid formulation consists of a low (1-6) carbon chain length alcohol as the predominant solvent, the loading on the wipe to be 2.5-4.5 times the weight of the wipe.

[0005] WO 01/38840, of common assignment, discloses improved cleaning wipes in which a combination of a hydrophilic polymer and a nonionic surfactant, preferably, a glycoside, improves filming/streaking performance.

[0006] However, none of the related art teach, disclosure or suggest an improved cleaning wipe impregnated with a liquid cleaner comprising a short chain alcohol and a more hydrophobic solvent, wherein the ratio of short chain alcohol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1. Additionally, such related art does not teach, disclose or suggest the advantages and benefits of the inventive cleaning wipe.

[0007] The present invention is directed to an improved cleaning wipe moistened/impregnated with a liquid cleaning composition in which a surfactant, a short chain alkanol combined with a more hydrophobic solvent, preferably, a glycol ether, and water are combined to provide enhanced cleaning of hard surfaces, without the need for rinsing with water, and in which not only is complete cleaning effected, but done so without the leaving of a significant residue, which is typically called streaking/filming, wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1. Surfaces treated with the wipes, especially glossy hard surfaces, such as glass, mirrors, chrome, tile, shiny metallic surfaces, painted surfaces, porcelain (or other hard, glossy surfaces, whether made of natural or composite materials), and the like, are rendered brighter and shinier in appearance.

[0008] In one aspect, the invention is directed to a cleaning wipe which requires no scrubbing, buffing, polishing or rinsing, comprising:

(a) a wipe which preferably comprises at least one layer of nonwoven material;
(b) a liquid cleaner which comprises:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

said wipe used to clean surfaces without rinsing, streaking or filming,
wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

[0009] In yet another aspect, the invention is directed to a method for cleaning a hard surface, comprising the steps of:

applying to the surface a cleaning wipe combined with a discrete amount of liquid cleaner, said liquid cleaner comprising:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

whereby the surfaces are cleaned without the need for scrubbing, wiping, or immediate rinsing, and are free from streaking and filming, wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

[0010] It is therefore an object and an advantage of the present invention to provide a cleaning wipe impregnated with a liquid cleaner which has greatly improve streaking and filming performance.

[0011] It is another object and another advantage of the present invention to provide a cleaning wipe impregnated with a liquid cleaner in which there is a combination of a short chain alkanol and a glycol ether, at least one of whose purposes is to promote improved streaking/filming on a surface cleaned with said wipe.

[0012] It is yet another object and yet another advantage of the present invention to provide a cleaning wipe which has low to no streaking and filming.

[0013] It is still a further object and still a further advantage of the present invention to provide a consumer convenient cleaning means which cleans surfaces without the need to rinse with water.

[0014] It is another object and a further advantage of the present invention to provide a cleaning wipe which cleans hard surfaces and, especially with respect to glossy surfaces, leaves the surface clean, bright and shiny, without buffing or polishing.

[0015] The invention provides an improved cleaning wipe comprising an absorbent/adsorbent wipe, preferably made of at least one layer of nonwoven material, the wipe being impregnated with a liquid cleaner. The wipe provides excellent cleaning with no or little streaking/filming and imparts resistance to soiling to the surface cleaned therewith.

[0016] The cleaning wipe is preferably impregnated with a liquid cleaner which preferably is a single phase solution or dispersion, having a viscosity generally less than about 1,000 Centipoise ("cps"). The liquid cleaner has the following ingredients:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water, wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

[0017] Additional adjuncts in small amounts such as cosurfactants, chelating agents, buffers, fragrances, dyes, and the like can be included to provide desirable attributes of such adjuncts.

[0018] In the application, effective amounts are generally those amounts listed as the ranges or levels of ingredients in the descriptions which follow hereto. Unless otherwise stated, amounts listed in percentage ("%'s") are in weight percent (based on 100% active) of the cleaning composition.

1. The Substrate

[0019] The substrate for the wipe is generally an absorbent or adsorbent material. Preferably, it is a nonwoven sheet, which is at least one layer, made of wood pulp; or a blend of wood pulp and a synthetic fiber, without limitation, such as polyester, rayon, nylon, polypropylene, polyethylene, other cellulose polymers; or a synthetic fiber or mixture of such fibers. The nonwovens may include nonwoven fibrous sheet materials which include meltblown, coform, air-laid, spun bond, wet laid, bonded-carded web materials, hydroentangled (also known as spunlaced) materials, and combinations thereof. These materials can comprise synthetic or natural fibers or combinations thereof. A binder may or may not be present. Manufacturers include Kimberly-Clark, E.I. du Pont de Nemours and Company, Dexter, American Nonwovens, James River, BBA Nonwovens and PGI. Examples of such substrates are depicted in: Bouchette et al., U.S. Patents 4,781,974 and 4,615,937, Clark et al., U.S. Patent 4,666,621, Amundson et al., WO 98/03713, and Cabell et al., U.S. Patent 5,908,707, Mackey et al., WO 97/40814, Mackey et al., WO 96/14835 and Moore, EP 750063, all of which are incorporated herein by reference.

[0020] Woven materials, such as cotton fibers, cotton/nylon blends, or other textiles may also be used herein. Regenerated cellulose, polyurethane foams, and the like, which are used in making sponges, may also be suitable for use herein.

[0021] The substrate's liquid loading capacity should be at least about 50%-240% of the dry weight thereof, more preferably at least about 100%-240%, and most preferably between about 150%-240%. This is expressed as loading ½ to less than 2.5 times the weight (or, more accurately, the mass) of the substrate. This loading of the substrate is very important to the invention, as it will predict greater or lesser streaking/filming performance, as demonstrated by the Experimental Section below.

[0022] The substrate varies without limitation from about .01 to about 1,000 grams per square meter, most preferably 25 to 120 grams/m^2 (referred to as "basis weight") and typically is produced as a sheet or web which is cut, die-cut, or otherwise sized into the appropriate shape and size.

[0023] The substrates, which are now referred to simply as wipes, can be individually sealed with a heat-sealable

or glueable thermoplastic overwrap (such as polyethylene, Mylar, and the like). More preferably the wipes can be packaged as numerous, individual sheets which are then impregnated or contacted with the liquid cleaning ingredients of the invention for more economical dispensing. Even more preferably, the wipes can be formed as a continuous web during the manufacturing process and loaded into a dispenser, such as a canister with a closure, a paper or other material carton with a closure or fold, or a tub with closure. The closure is to seal the moist wipes from the external environment and to prevent premature volatilization of the liquid ingredients. Without limitation, the dispenser may be formed of plastic, such as high density polyethylene, polypropylene, polycarbonate, polyethylene pterethalate (PET), polyvinyl chloride (PVC), or other rigid plastics; or, of paper, cartonboard, or other material. The continuous web of wipes could preferably be threaded through a thin opening in the top of the dispenser, most preferably, through the closure. A means of sizing the desired length or size of the wipe from the web would then be needed. A knife blade, serrated edge, or other means of cutting the web to desired size can be provided on the top of the dispenser, for non-limiting example, with the thin opening actually doubling in duty as a cutting edge. Alternatively, the continuous web of wipes could be scored, perforated, folded, segmented, or partially cut into uniform or non-uniform sizes or lengths, which would then obviate the need for a sharp cutting edge. Further, as in hand tissues, the wipes could be interleafed, so that the removal of one wipe advances the next, and so forth.

[0024] The wipes will preferably have a certain wet tensile strength which is without limitation about 25 to about 250 Newtons/m, more preferably about 75-170 Newtons/m.

2. The liquid cleaner

[0025] The liquid cleaner is impregnated, dosed, loaded, metered, or otherwise dispensed onto the wipe. This can be executed in numerous ways. For example, each individual wipe could be treated with a discrete amount of liquid cleaner. More preferably, a mass treatment of a continuous web of wipes with the liquid cleaner will ensue. In some cases, an entire web of wipes could be soaked in the cleaner. In other cases, while the web is being spooled, or even during the creation of the nonwoven material, the liquid cleaner could be sprayed or otherwise metered onto the web. A mass, such as a stack of individually cut and sized wipes could also be impregnated in its container by the manufacturer, or, even by the user. What follows is a description of the individual constituents of the liquid cleaner.

3. Surfactants

[0026] An essential part of the invention lies in the use of a low residue surfactant, of which especially preferred is an alkali metal (sodium, potassium, lithium counterion; ammonium is also a possibility) alkyl diphenyl oxide disulfonate, as the major surfactant portion of the liquid cleaner used to impregnate the wipe. These alkali metal alkyl diphenyl oxide disulfonates are atypical surfactants and preferably include an alkyl chain group of $C_{6\text{-}20}$. The preferred alkali metal alkyl diphenyl oxide disulfonates are from Dow under the brand name Dowfax. Especially preferred is Dowfax 2A1, a sodium dodecyl diphenyl oxide disulfonate. Pilot Chemical, with Calfax, is another source of the alkyl diphenyl oxide sulfonate surfactant.

[0027] Alternatively, one may wish to use the alkyl polyglycosides. The preferred glycosides include those of the formula:

$$RO(C_nH_{2n}O)_y(Z)_x$$

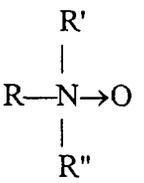
wherein R is a hydrophobic group (e.g., alkyl, aryl, alkylaryl etc., including branched or unbranched, saturated and unsaturated, and hydroxylated or alkoxylated members of the foregoing, among other possibilities) containing from about 6 to about 30 carbon atoms, preferably from about 8 to about 16 carbon atoms, and more preferably from about 8 to about 12 carbon atoms; n is a number from 2 to about 4, preferably 2 (thereby giving corresponding units such as ethylene, propylene and butylene oxide); y is a number having an average value of from 0 to about 12, preferably 0; Z is a moiety derived from a reducing saccharide containing 5 or 6 carbon atoms (e.g., a glucose, fructose, mannose, galactose, talose, gulose, allose, altrose, idose, arabinose, xylose, lyxose, or ribose unit, etc., but most preferably a glucose unit); and x is a number having an average value of from 1 to about 10, preferably from 1 to about 5, and more preferably from 1 to about 3. In actual practice, R may be a mixture of carbon chains, for instance, from 8 to 16 carbon atoms and Z may be a mixture of saccharide units from 0 to 6.

[0028] It would be apparent that a number of variations with respect to the makeup of the glycosides are possible. For example, mixtures of saccharide moieties (Z) may be incorporated into polyglycosides. Also, the hydrophobic group (R) can be attached at the 2-, 3-, or 4-positions of a saccharide moiety rather than at the 1-position (thus giving, for example, a glucosyl as opposed to a glucoside). In addition, normally free hydroxyl groups of the saccharide moiety may be alkoxylated or polyalkoxylated. Further, the $(C_nH_{2n}O)_y$ group may include ethylene oxide and propylene oxide

in random or block combinations, among a number of other possible variations.

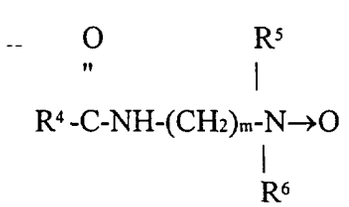
[0029] Non-limiting examples of glycoside surfactants include Glucopon 225 (a mixture of C_8 and C_{10} chains equivalent to an average of $C_{9.1}$, with x of the general formula above of 1.7, and an HLB of 13.6; Glucopon 220 (a mixture of C_8 and C_{10} chains equivalent to an average of $C_{9.1}$, with x of the general formula above of 1.5, and an HLB of 13.5; Glucopon 325 (a mixture of C_8, C_{10}, C_{12}, C_{14}, and C_{16} chains equivalent to an average of $C_{10.2}$, with x of the general formula above of 1.6, and an HLB of 13.1; Glucopon 625 (a mixture of C_{12}, C_{14}, and C_{16} chains equivalent to an average of $C_{12.8}$, with x of the general formula above of 1.60, and an HLB of 12.1; and Glucopon 600 (a mixture of C_{12}, C_{14}, and C_{16} chains equivalent to an average of $C_{12.8}$, with x of the general formula above of 1.40, and an HLB of 11.5, all manufactured by the Henkel Corporation. Of these, Glucopon 225 and Glucopon 220 are preferred and Glucopon 425 is especially preferred. Glucosides from other manufacturers, such as Triton CG-110, having an HLB of 13.6 and manufactured by Union Carbide also may serve as examples of suitable surfactants.

[0030] Glucoside surfactants are frequently supplied as mixtures with other surfactants. For example, mixtures with some anionic surfactants, or the amphoteric surfactants, cocamidopropylbetaine or cocamidopropyl amineoxide, available from the Henkel Corporation, may be desirable. Other nonionics which may be useful herein include, without limitation, alkoxylated alcohols, alkoxylated phenol ethers, and other surfactants often referred to as semi-polar nonionics, such as the trialkyl amine oxides. The alkoxylated phenol ethers include octyl- and nonylphenol ethers, with varying degrees of alkoxylation., such as 1-10 moles of ethylene oxide per mole of phenol. The alkyl group can vary from C_{5-15}, although octyl- and nonyl chain lengths are readily available. It is most preferred to use a C_{6-11} short chain alcohol with 4-6 moles of ethylene oxide per mole of alcohol. Various suitable products available from Rohm and Haas under the trademark Triton, such as Triton N-57, N-101, N-111, X-45, X-100, X-102, and from Mazer Chemicals under the trademark Macol, from GAF Corporation under the trademark Igepal, from Texaco Chemical Company under the trademark Surfonic. The alkoxylated alcohols include ethoxylated, and ethoxylated and propoxylated C_{6-16} alcohols, with about 2-10 moles of ethylene oxide, or 1-10 and 1-10 moles of ethylene and propylene oxide per mole of alcohol, respectively. Exemplary surfactants are available from Shell Chemical under the trademarks Neodol and Alfonic; and Huntsman. The semi-polar amine oxides are also possible. The amine oxides, referred to as mono-long chain, di-short chain, trialkyl amine oxides, have the general configuration:

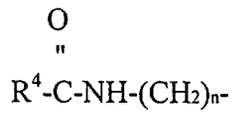


wherein R is C_{6-24} alkyl, and R' and R" are both C_{1-4} alkyl, or C_{1-4} hydroxyalkyl, although R' and R" do not have to be equal. These amine oxides can also be ethoxylated or propoxylated. The preferred amine oxide is lauryl amine oxide. The commercial sources for such amine oxides are Barlox 10, 12, 14 and 16 from Lonza Chemical Company, Varox by Witco and Ammonyx by Stepan Co.

[0031] A further possible semi-polar nonionic surfactant is alkylamidoalkylenedialkylamine oxide. Its structure is shown below:

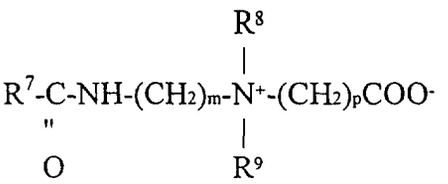


wherein R^4 is C_{5-20} alkyl, R^5 and R^6 are C_{1-4} alkyl,



or $-(CH_2)_p-OH$, although R^5 and R^6 do not have to be equal or the same substituent, and m is 1-5, preferably 3, and p is 1-6, preferably 2-3. Additionally, the surfactant could be ethoxylated (1-10 moles of EO/mole) or propoxylated (1-10 moles of PO/mole). This surfactant is available from various sources, including from Lonza Chemical Company, as a cocoamidopropyldimethyl amine oxide, sold under the brand name Barlox C.

[0032] Additionally semi-polar surfactants include phosphine oxides and sulfoxides. Other possible surfactants include amphoterics. The amphoteric surfactant is typically an alkylbetaine or a sulfobetaine. One group of preferred amphoterics are alkylamidoalkyldialkylbetaines. These have the structure:



[0033] The amounts of surfactants present are to be somewhat minimized, for purposes of cost-savings and to generally restrict the dissolved actives which could contribute to leaving behind residues when the composition is applied to a surface. However, the amounts added are generally about 0.001-6%, more preferably 0.002-4.00% surfactant. These are generally considered to be cleaning-effective amounts.

4. Solvents

[0034] A key to the invention is the use of a combination of solvents in the liquid cleaner: a short chain alkanol with a more hydrophobic solvent, most preferably, a glycol ether. The two solvents should be in a ratio of short chain alkanol to hydrophobic solvent from about 1.75 : 1 to about 0.5 : 1. Further, in the invention, the completed liquid cleaner load on the wipe is less than 2.5 : 1. It may be possible to include a further water soluble or dispersible organic solvent having a vapor pressure of at least 0.001 mm Hg at 25°C, such as selected from C_{1-6} alkanols, C_{1-6} diols, C_{1-6} alkyl ethers of alkylene glycols and polyalkylene glycols, and mixtures thereof.

The short chain alkanol can be selected from ethanol, n-propanol, isopropanol, the various positional isomers of butanol, and mixtures of the foregoing. Thus, the short chain alkanol is most preferably selected from C_{2-4} alkanols. Methanol may be less preferred because of toxicity concerns. It may also be possible to utilize in addition to, or in place of, said alkanols, the diols such as methylene, ethylene, propylene and butylene glycols, and mixtures thereof. It is, however, most preferred to use isopropyl alcohol (also referred to as isopropanol) or 2-propanol (sometimes referred to hereinafter as "IPA").

[0035] The second, important solvent is a more hydrophobic solvent, preferably, an alkylene glycol ether solvent in this invention. These can include, for example, monoalkylene glycol ethers such as ethylene glycol monopropyl ether, ethylene glycol mono-n-butyl ether, propylene glycol monopropyl ether, and propylene glycol mono-n-butyl ether, and polyalkylene glycol ethers such as diethylene glycol monoethyl or monopropyl or monobutyl ether, di- or tri-polypropylene glycol monomethyl or monoethyl or monopropyl or monobutyl ether, etc., and mixtures thereof. Additionally, acetate and propionate esters of glycol ethers may be used. The most preferred glycol ether is propylene glycol mono n-butyl ether, Dowanol PnB, from Dow Chemical Company.

Additional water insoluble solvents may be included in minor amounts (0-1%). These include isoparaffinic hydrocarbons, mineral spirits, alkylaromatics, and terpenes such as d-limonene. Additional water soluble solvents may be included in minor amounts (0-1%). These include pyrrolidones, such as N-methyl-2-pyrrolidone, N-octyl-2-pyrrolidone and N-dodecyl-2-pyrrolidone.

[0036] It is preferred to limit the total amount of solvents to preferably no more than about 20%, and more preferably, no more than about 10%, of the cleaner. A particularly preferred range is about 1-10%. These amounts of solvents are generally referred to as dispersion-effective or solubilizing-effective amounts. The solvents, especially the glycol ethers, are also important as cleaning materials on their own, helping to loosen and solubilize greasy or oily soils from surfaces cleaned. But the volatile solvents, such as IPA, are necessary to prevent the leaving of residues on the surface cleaned.

In the Experimental section below, the importance of the ratio between the short chain alkanol and the more hydrophobic solvent is demonstrated.

5. Cosurfactants

[0037] Although the disclosed surfactant and solvents of the invention provide excellent cleaning performance, it may sometimes be desired to add small amounts of cosurfactants to the formulations to obtain additional cleaning benefits. The surfactant may be used in conjunction with other nonionic or amphoteric surfactants, or mixtures thereof, such as are known in the art. Such surfactants are described, for example, in McCutcheon's Emulsifiers and Detergents (1997), the contents of which are hereby incorporated by reference.

[0038] Illustrative nonionic surfactants are the ethylene oxide and mixed ethylene oxide / propylene oxide adducts of alkylphenols, the ethylene oxide and mixed ethylene oxide / propylene oxide adducts of long chain alcohols or of fatty acids, mixed ethylene oxide / propylene oxide block copolymers, esters of fatty acids and hydrophilic alcohols, such as sorbitan monooleate, alkanolamides, and the like.

Illustrative amphoteric surfactants are those which have both acidic and basic groups in their structure, such as amino and carboxyl radicals or amino and sulfonic radicals, or amine oxides and the like. Suitable amphoteric surfactants include betaines, sulfobetaines, imidazolines, and the like.

[0039] The amounts of cosurfactants will generally be about less than the level of the primary low residue surfactant. It is probably less preferred to include either other anionic or cationic surfactants, because of their tendency to leave residues. However, judicious formulation with other dispersing aids may allow for the use of these latter surfactants.

6. Polymers

[0040] Polymers may or may not be added to the liquid formulations herein. A list of possibly appropriate polymers may be found in co-pending application Serial No. 09/448,703, filed November 24, 1999, of Malcolm A. Deleo et al., of common assignment herewith and incorporated by reference thereto. Mixtures of any of the foregoing polymers may be possible or desirable. The hydrophilic polymer or polymers are present at a level of about 0.001-5%, more preferably, about 0.001-1% of the liquid cleaner.

7. Chelating Agent

[0041] The chelating agent may also be an important part of the invention. Chelants useful herein include the various alkali metal, ammonium and substituted ammonium polyacetates, carboxylates, polycarboxylates and polyhydroxysulfonates. Non-limiting examples of polyacetate and polycarboxylate builders include the sodium, potassium, lithium, ammonium and substituted ammonium salts of ethylenediamine tetraacetic acid, ethylenediamine triacetic acid, ethylenediamine tetrapropionic acid, diethylenetriamine pentaacetic acid, nitrilotriacetic acid, oxydisuccinic acid, iminodisuccinic acid, mellitic acid, polyacrylic acid or polymethacrylic acid and copolymers, benzene polycarboxylic acids, gluconic acid, sulfamic acid, oxalic acid, phosphoric acid, phosphonic acid, organic phosphonic acids, acetic acid, and citric acid. These chelating agents may also exist either partially or totally in the hydrogen ion form, for example, citric acid or disodium dihydrogen ethylenediamine tetraacetate, depending upon the pH of the liquid formulation. The substituted ammonium salts include those from methylamine, dimethylamine, butylamine, butylenediamine, propylamine, triethylamine, trimethylamine, monoethanolamine, diethanolamine, triethanolamine, isopropanolamine, and propanolamine. Most preferred is monoethanolamine.

[0042] Other chelating agents, and dependent on the desired pH of the formulation (see below), are the mono-, di-, tri-, and tetrapotassium and ammonium salts of ethylenediamine tetraacetic acid. See, for example, Robbins et al., U. S. Patents 6,242,401, 6,159,916, 6,214,784, 5,972,876, Chang et al., U.S. Patent 5,948,742, Ochomogo et al., U.S. Patent 5,948,741, and Mills et al., U.S. 5,814,591.

The amount of chelant added should be in the range of 0.001-2%, more preferably 0.001-2%, by weight of the cleaner.

8. Water

[0043] Since the cleaner is an aqueous cleaner with relatively low levels of actives, the principal ingredient is water, which should be present at a level of at least about 70%, more preferably at least about 80%, and most preferably, at least about 90%.

[0044] Distilled, deionized, or industrial soft water is preferred so as not to contribute to formation of a residue and to avoid the introduction of undesirable metal ions.

9. Miscellaneous Adjuncts

[0045] Buffering and pH adjusting agents may be desirable components. These would include minute amounts of inorganic agents such as alkali metal and alkaline earth salts of silicate, metasilicate, borate, carbonate, carbamate, phosphate, ammonia, and hydroxide. Organic buffering agents such as monoethanolamine, monopropanolamine, diethanolamine, dipropanolamine, triethanolamine, and 2-amino-2-methylpropanol are also desirable.

[0046] Small amounts of adjuncts can be added for improving aesthetic qualities of the invention. Aesthetic adjuncts include fragrances or perfumes, such as those available from Givaudan-Rohre, International Flavors and Fragrances, Quest, Sozio, Firmenich, Dragoco, Norda, Bush Boake and Allen and others, and dyes or colorants which can be solubilized or suspended in the formulation. Further solubilizing materials, such as hydrotropes (e.g., water soluble salts of low molecular weight organic acids such as the sodium or potassium salts of xylene sulfonic acid), may also be desirable. Adjuncts for cleaning include additional surfactants, such as those described in Kirk-Othmer, Encyclopedia of Chemical Technology, 3rd Ed., Volume 22, pp. 332-432 (Marcel-Dekker, 1983), and McCutcheon's Soaps and Detergents (N. Amer. 1984), which are incorporated herein by reference. Dyes or colorants which can be solubilized or suspended in the formulation, such as diaminoanthraquinones, may be added, although it is cautioned that since leaving little or no residue is an objective of the invention, that only minute amounts should be used. Thickeners, such as polyacrylic acid, xanthan gum, alginates, guar gum, methyl, ethyl and propylhydroxycelluloses, and the like, may be desired additives, although the use of such polymers is to be distinguished from the previously mentioned hydrophilic polymers in 6 above. Defoamers, such as, without limitation, silicones, aminosilicones, silicone blends, silicone/hydrocarbon blends, and the like, available from Dow Coming, Wacker, Witco, Ross and Hercules.

The amounts of these aesthetic adjuncts should be in the range of 0-2%, more preferably 0-1%.

Other various adjuncts which are known in the art for detergent compositions can be added so long as they are not used at levels that cause unacceptable spotting/filming.

[0047] Additionally, because the surfactants in liquid systems are sometimes subject to attack from microorganisms, it may be advantageous to add a mildewstat or bacteriostat. Exemplary mildewstats (including non-isothiazolone compounds) include Kathon GC, a 5-chloro-2-methyl-4-isothiazolin-3-one, Kathon ICP, a 2-methyl-4-isothiazolin-3-one, and a blend thereof, and Kathon 886, a 5-chloro-2-methyl-4-isothiazolin-3-one, all available from Rohm and Haas Company; Bronopol, a 2-bromo-2-nitropropane 1,3-diol, from Boots Company Ltd.; Proxel CRL, a propyl-p-hydroxybenzoate, from ICI PLC; Nipasol M, an o-phenyl-phenol, Na^+ salt, from Nipa Laboratories Ltd.; Dowicide A, a 1,2-benzoisothiazolin-3-one, from Dow Chemical Co.; and Irgasan DP 200, a 2,4,4'-trichloro-2-hydroxydiphenylether, from Ciba-Geigy A.G. See also, Lewis et al., U.S. 4,252,694 and U.S. 4,105,431, incorporated herein by reference. Other suitable preservatives include methyl, ethyl and propyl parabens, short chain organic acids (such as acetic, lactic and glycolic acids), bisguanidine compounds (e.g., Dantagard or Glydant) and the short chain alkanols mentioned in 3. above can be bifunctional and also act as preservatives, such as IPA.

EXPERIMENTAL

[0048] In the following experiments, a base inventive liquid cleaner to be impregnated on wipes was established. The formulation of the liquid cleaner was:

TABLE I

Isopropyl Alcohol[1]	TBA
Glycol Ether[2]	TBA
Dowfax 2A1 Surfactant[3]	0.05%
Monoethanolamine [4]	0.05%
Fragrance	0.02%
Deionized Water	(balance)

[1] Short chain alkanol solvent

[2] More hydrophobic solvent: Dowanol PnB - propylene glycol n-butyl ether (Dow Chemical Company)

[3] Alkyl diphenyloxidedisfulfonate (Dow Chemical)

[4] Buffer/solvent

[0049] The liquid cleaner of Tables I is then iterated by varying the ratio of the short chain alkanol to the more hydrophobic solvent (glycol ether), then placed in differing loads onto wipes, which are then referred to as wet wipes. Wipes are typically made from fibrous sheet materials as described in 1 Substrate above. Examples of the substrates

from which the wipes are made include:

TABLE II

Manufacturer and Item	Description
DuPont 8838 and 8892	Spunlaced Pulp-Polyester Blends
Kimberly Clark Hydroknit	Spunlaced Pulp-Polypropylene
Kimberly Clark Spunbond	Spun, Fine Fiber Polypropylene
Kimberly Clark Meltblown PP/EHRT	Meltblown Polypropylene
American Nonwovens, ANC 4297	Carded Nonwoven, 70/30 Rayon/Polyester
American Nonwovens, ANC 4297	Carded Nonwoven, 100 Rayon
James River	Pulp or Pulp Blends
Dexter 10180 Hydrospun	Spunlaced Pulp Blend
Dexter ZA-0155	Spunlaced Pulp-Polyester Blends
Dexter 8589	Rayon/Pulp Blend
Dexter 4459	Pulp/Polyethylene Blend

Examples 1-8: Evaporation Times on Mirror Tiles

[0050] In this test, the filming/streaking performance of wipes -- such as described in Table II, to which a discrete amount of the liquid cleaner described in Table I was added, typically in an amount exceeding 100% of the weight of the wipe on a gram/gram basis - in various ratios of short chain alkanol to more hydrophobic solvent, and also compared against current commercial formulas. The test surfaces were glass mirror tiles at different temperatures (35°F, or, 1.66°C; 70°F or 21°C; 100°F or 37.7°C) which were wiped for 3 strokes back and forth in a similar manner and evaporation times were measured. Unexpectedly, rapid evaporation times, particularly at 35°F, are predictive of good streaking/filming performance. The results are depicted in Table III:

TABLE III

IPA%:PnB%	Wipe/Load	Evaporation Time (sec)			Ratio
		35°F	**70°F**	**100°F**	
5.4:0	(ZA)x2	730±2	107±25	13±5	5.4:0
5:0.4	(ZA)x2	508±13	54±8	12±2	12.5:1
4:1.4	(ZA)x2	469±91	45±14	7±1	2.85:1
3:2.4	(ZA)x2	332±10	42±10	5±0	1.25:1
2:3.4	(ZA)x2	347±4	42±9	6±2	0.588:1
0.4:5.0	(ZA)x2	463±23	35±11	6±1	0.08:1
Current	(8589)x2.5	453±30	54±7	15±7	
Current	(8589) x2	363±10	43±12	13±3	

[1]Formula matrix: 0.05% Dowfax 2A1, 0.05% MEA, IPA, PnB, 0.02% Fragrance, Water

[2] ZA = Dexter ZA 0155; 8589 = Dexter 8589

[3] Load: x2 = twice weight of wipe; x2.5 = 2.5 times weight of wipe.

4 Current = commercially marked formulation which contains: 3.97% propylene glycol t-butyl ether, 0.1% hexyloxyethanol, 1.88% IPA, 0.08% Na Lauryl-sarcosinate (about 0.47 : 1 ratio of short chain alkanol to more hydrophobic)

[0051] The data from Table III demonstrates the surprisingly improved performance wherein the inventive ratio of short chain alcohol to hydrophobic solvent from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

[0052] In the next set of Examples, the actual streaking/filming performance after cleaning an artificial soil from

mirrors was tested.

[0053] A panel study was coordinated with 26 panelists to grade the streaking caused by wiping soiled mirrors. A car soil (sebum, air borne soil, triethanolamine, carbon black) was developed and 0.2g of the soil sprayed on clean mirrors. A premoistened wipe wound over by a fixed weight was wiped 10 times in a circular motion on the soiled mirror, allowed to dry and visually graded. The controls were Clorox® Disinfecting Wipes (most streaking; most likely due to the presence of a germicide in the formula) and Windex® sprayed and buffed with a Kim-Wipe® (least streaking). This latter control sets a particularly tough standard, since it is comparing the performance of a spray cleaner with a dry, clean cloth, with repeated wiping (naturally, this control is very different from and not as convenient to use as a pre-moistened wipe). The test products and scores on a scale of 1-10 (where higher scores are desirable) are listed below in TABLE IV.

TABLE IV

Product	Score (1-10)
-CDW*	1.3±0.5
-Windex (buffed)*	8.1±1.1
-Current** (8589, x2.5) (duplicate)	5.4±1.6; 6.1±1.7
-Current** (ZA, x2) (duplicate)	5.1±2.0; 6.3±1.8
-012-AA‡ (ZA, x2) (duplicate)	8.2+1.3; 7.7+1.4

*CDW and Windex (buffed) were used as test mirrors to check the visual grading ability of the panelists.

**Current is the currently marketed glass cleaner wipe.

‡012-AA is the new inventive formula with 2% IPA, 3.4% PnB and the formulation described above in Table III, fn 1.

[0054] The data in Table IV demonstrate the superior streaking/filming performance of the inventive wipes, wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 :1.

Examples 14-20 (Streaking/Filming)

[0055] The next set of examples further confirms the use of evaporation rates at low temperatures as predictive of good streaking/filming performance, as well as confirming the need to maintain a cleaner/wipes load of less than 2.5. In this study, a larger panel of panelists graded the filming/streaking caused by wiping soiled mirrors. A car soil (sebum, airborne soil, triethanolamine, carbon black) was developed and a small amount (less than 0.5g) was sprayed onto clean mirrors. A premoistened wipe (containing the liquid cleaners depicted in Table V) was used to wipe 10 times in a circular motion on the soiled mirror, allowed to dry and visually graded by the panelists on a 1 to 10 scale (score of 10 meaning "least soiled"; a score of 1 meaning "most filming/streaking"). The controls were Clorox® Disinfecting Wipes ("CDW"; most streaking) and Windex® cleaner sprayed once/buffed with a Bounty® paper towel (least streaking; it is again observed that this compares the performance of a spray cleaner with a dry, clean cloth, with repeated wiping. Thus, this control is very different from and not as convenient to use as a premoistened wipe). The test products and scores on a scale of 1-10 are listed below in Table V.

TABLE V

Product	Score (1-10)
CDW[1]	1.3±0.5
Windex (buffed)[1]	8.1±1.1
Current[2] (4459, x2)	4.7±1.9
2%IPA/3.4%PnB[3] (4459, x2)	8.8+1.4
2%IPA/3.4%PnB[4] (4459, x2)	6.5+1.9
3%IPA/2.4%PnB[3] (4459, x2)	7.6+2.2
3%IPA/2.4%PnB[4] (4459, x2)	7.1+1.8

[1]CDW and Windex (buffed) were used as test mirrors to check the visual grading ability of the panelists.

[2]Current is the currently marketed glass cleaner wipe; 4459 = Dexter 4459.

[3]These formulations contain 0.02% fragrance.

[4]These formulations contain 0.03% fragrance.

[0056] Review of the above Examples in Table V leads to the conclusions that evaporation rates at low temperatures (the invention is underscored) correlates with excellent streaking/filming performance, while a loading ratio of 2 (cleaner to substrate) provides superior S/F performance regardless of substrate.

Claims

1. A cleaning wipe having enhanced streaking/filming performance, comprising:

(a) a wipe which preferably comprises at least one layer of nonwoven material;
(b) a liquid cleaner which comprises:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

said wipe used to clean surfaces without rinsing, streaking or filming,
wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

2. The wipe of claim 1 wherein said low surfactant is a low residue surfactant.

3. The wipe of claim 1 wherein said low residue surfactant is an alkali metal alkyl diphenyl oxide disulfonate.

4. The wipe of claim 1 wherein said short chain alkanol is a C_{2-4} alcohol.

5. The wipe of claim 1 wherein said more hydrophobic solvent is a glycol ether.

6. The wipe of claim 1 further comprising at least one adjunct selected from the group consisting of additional surfactants, cosurfactants, chelating agents, buffers, thickeners, dyes, colorants, biocides, fragrances, defoamers and mixtures thereof.

7. A method for cleaning a surface comprising:

contacting said surface with a wipe impregnated with a liquid cleaner, said liquid cleaner itself comprising:

(a) a liquid cleaner which comprises:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

said wipe used to clean surfaces without rinsing, streaking or filming,
wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

8. A dispenser for cleaning wipes comprising a container with a plurality of said wipes therein, said wipes being treated with a liquid cleaner, said liquid cleaner comprising:

(a) a liquid cleaner which comprises:

(i) a surfactant;
(ii) a short chain alkanol and a more hydrophobic solvent; and
(iii) the remainder, water,

said wipe used to clean surfaces without rinsing, streaking or filming,
wherein the ratio of short chain alkanol to hydrophobic solvent is from about 1.75 : 1 to about 0.5 : 1, and wherein the liquid cleaner load on the wipe is less than 2.5 : 1.

9. The dispenser of claim 8 wherein said plurality of wipes comprise a continuous web of nonwoven material.

10. The dispenser of claim 9 further comprising means for sizing an individual wipe from said continuous web.

11. The dispenser of claim 8 wherein said plurality of wipes comprise a series of individual sheets of nonwoven material.

European Patent Office

EUROPEAN SEARCH REPORT

Application Number
EP 02 25 4080

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Category	Citation of document with indication, where appropriate, of relevant passages	Relevant to claim	CLASSIFICATION OF THE APPLICATION (Int.Cl.7)
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The present search report has been drawn up for all claims

Place of search	Date of completion of the search	Examiner
MUNICH	30 August 2002	Loloiu, C

CATEGORY OF CITED DOCUMENTS

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