In addition, the invention relates to a method of incorporation of a cleaning composition into said substrate.

Abstract:
The invention is based on the finding that impregnating a cleaning substrate with a non-ionic, linear polymer unexpectedly improves the cleaning efficacy of the article and prevents redeposition of soil and dirt onto the cleaned hard or soft surface. The non-ionic, linear polymer is, for example, polyacrylamide. In addition, the invention relates to a method of incorporation of a cleaning composition into said substrate.
Pre-moistened cleaning disposable substrate

The present invention is directed to a pre-moistened, disposable, cleaning substrate to improve dirt pick-up and to retard re-deposition of the dirt back onto the cleaned hard or soft surface. The said substrate is incorporated therein with linear non-ionic polymers to improve cleaning. The substrate can be employed to clean hard surfaces such as floors, countertops, toilets, windows, and autos as well as soft surfaces on clothing, furnishings, and carpets. In addition, a method of incorporation of a cleaning composition into said substrate is disclosed.

Household dirt and soil are removed from hard and soft surfaces with a cloth, sponge or other similar hand held implement. To facilitate dirt and soil removal, there are numerous commercially available surface cleaning compositions. The liquid cleaners consist of some small percentage of surfactant, such as a non-ionic, cationic or anionic surfactant, a solvent, such as an alcohol, ammonium hydroxide, a builder, chelating agents, preservatives, biocides and water. A perfume may be added to impart a pleasant fragrance to the cleaner, as well as to mask the unpleasant odour of the solvent and/or surfactant, and, a dye to is optionally added impart a pleasant colour to the cleaning composition.

Liquid cleaners have limited cleaning efficiency with respect to particular types of soils, and are subject to streaking or re-depositing of soil on the surface. There is a need of techniques to improve the cleaning efficiency of cleaning substrates especially with respect to soil and dirt pickup. In particular, the techniques should be compatible and/or usable with existing cleaning products.


U.S. Pat. Spec. No. 5,507,968 discloses a cleansing article comprising a controlled release detergent composition.

U.S. Pat. Spec. No. 6,653,274 discloses a hard surface detergent composition containing a soil entrainment system.


The present invention relates to the finding that impregnating a cleaning substrate with a non-ionic, linear polymer unexpectedly improves the cleaning efficacy of the article and prevents re-deposition of soil and dirt onto the cleaned hard or soft surface. The non-ionic, linear polymer is, for example, polyacrylamide.

5 In another aspect, the invention is directed to a method of incorporation of a cleaning composition into a single layer absorbent material producing a pre-moistened disposable cleaning substrate that comprises the steps of:

a) Obtaining a single or multi-layered absorbent material; and

b) Incorporating therein a cleaning composition.

10 A further embodiment of the invention relates to a pre-moistened disposable cleaning substrate for cleaning surfaces, said substrate comprising:

a) A single layered substrate; and

b) A cleaning composition, said composition comprising:

i) from about 0.001% to about 5% by weight of linear, non-ionic polyacrylamide;

ii) from about 0.25% to about 15% by weight of a non-volatile organic solvent;

iii) from about 0.001% to about 15% by weight of at least one detersive surfactant;

iv) optionally from about 0.001% to about 5% by weight of other cleaning polymers; and

v) balance amount of water.

The polyacrylamide is linear and non-ionic. The polyacrylamide is a high molecular weight polymer having a weight average molecular weight of about 5 \times 10^8 to about 2.5 \times 10^7 amu (=atomic mass units). More preferably, the weight average molecular weight of the polyacrylamide is at least about 1 \times 10^7 to about 2 \times 10^7 amu; and most preferably the weight average molecular weight is between about 1 \times 10^7 and about 1.5 \times 10^7 amu.

When incorporated as part of an aqueous cleaning composition, the linear non-ionic polymer, polyacrylamide, comprises from about 0.001% to about 5.0% or comprises from about 0.001% to about 2.0% or comprises from about 0.001% to about 0.5% of the cleaning composition. All percentages herein are based on weight unless otherwise noted.

Within the context of the description of the invention, the term linear refers to a straight chain polymer that is not crosslinked.
The cleaning compositions can include one or more non-volatile organic solvents at effective levels, from about 0.25% by weight of the composition to about 15% by weight of the composition, or from about 0.5% by weight of the composition to about 10% by weight of the composition, or from about 1% by weight of the composition to about 5%, by weight of the composition. The non-ionic linear polymer, polyacrylamide, provides cleaning and/or wetting even without an organic cleaning solvent present. The cleaning can be further improved by the use of the right organic cleaning solvent.

The non-volatile organic solvent has a vapour pressure of less than about 0.13 mbar at 20°C and/or has a boiling point of at least about 230°C.

Due to their low volatility, these solvents tend not to evaporate rapidly and allow sufficient "working" time for the wipe before it dries out. Preferred solvents are esters and glycol ethers. The most preferred solvents are glycol ethers of high boiling point.

Such solvents have a terminal C3-C6-hydrocarbon chain attached to from two to three alkylene glycol moieties to provide the appropriate degree of hydrophobicity, high boiling point (and/or low vapour pressure) and, preferably, surface activity. Examples of commercially available hydrophobic cleaning solvents based on alkylene glycol chemistry include triethyleneeglycol monomethyl ether (Methoxytriglycol ether from Dow Chemicals), diethylene glycol monoethyl ether (Carbitol® Solvent from Dow Chemicals), triethyleneeglycol monoethyl ether (Ethoxytriglycol from Dow Chemicals), diethyleneeglycol butylether (Butyl CARBITOL), triethyleneeglycol monobutyl ether (Butoxytriglycol ether), diethyleneeglycol monohexyl ether (Hexyl CARBITOL), ethylene glycol phenyl ether (Dowanol® EPh), dipropyleneeglycol methyl ether (DOWANOL DPM), tripropylene glycol methyl ether (DOWANOL TPM), dipropylene glycol methylether acetate (DOWANOL DPMA), dipropylene glycol-n-propyl ether (DOWANOL DPnP), tripropyleneeglycol n-propyl ether (DOWANOL TPnP), dipropyleneeglycol n-butyl ether (DOWANOL DPnB), tripropylene glycol n-butyl ether (DOWANOL TPnB), propyleneeglycol phenyl ether (DOWANOL PPh). These solvents are commercially available from Dow Chemicals USA.

Additional solvents of this class are available from Clariant GmbH, Germany. Examples include methyl tetraglycol, and butyl polyglycol. Other suitable solvents include alkyl pyrroli-done.

The cleaning compositions herein may comprise from about 0.001% to 15% by weight of a detergine surfactant. Preferably such compositions comprise from about 0.01% to 2% by weight of surfactant. More preferably such compositions comprise from about 0.01% to 0.5% by weight of surfactant. Detergine surfactants are preferably, zwitterionic or amphoteric or
non-ionic type or can comprise compatible mixtures of these types. Suitable surfactants are described in *U.S. Pat. Spec. Nos.* 3,664,961; 3,919,678; 4,222,905; and 4,239,659.

Non-limiting examples of non-ionic surfactants include: a) C12-C18-alkyl ethoxylates, such as Neodol® non-ionic surfactants from Shell; b) C6-C12-alkyl phenol alkoxylates, wherein the alkoxylate units are a mixture of ethyleneoxy and propyleneoxy units; c) C12-C18 alcohol and C6-C12-alkyl phenol condensates with ethylene oxide/propylene oxide block polymers, such as Pluronic® from BASF; d) C14-C22-mid-chain branched alcohols, BA, as disclosed in *U.S. Pat. Spec. No.* 6,150,322; e) C14-C22-mid-chain branched alkyl alkoxylates, BAEx, wherein x is 1-30, as disclosed in *U.S. Pat. Spec. Nos.* 6,153,577, 6,020,303, and 6,093,856; f) alkyl polysaccharides, as disclosed in *U.S. Pat. Spec. No.* 4,565,647, specifically alkylpolyglycosides, as disclosed in *U.S. Pat. Spec. Nos.* 4,483,780 and 4,483,779; g) polyhydroxy fatty acid amides, as disclosed in *U.S. Pat. Spec. No.* 5,332,528,WO 92/06162, WO 93/19146, WO 93/19038, and WO 94/09099; h) ether capped poly(oxyalkylated) alcohol surfactants, as disclosed in *U.S. Pat. Spec. No.* 6,482,994 and WO 01/42408; and i) amine oxides.

Preferred surfactants for use herein are the alkylpolysaccharides that are disclosed in *U.S. Pat. Spec. Nos.* 5,776,872; 5,883,059; 5,883,062; and *U.S.* 5,906,973.

Suitable alkylpolysaccharides for use herein are disclosed in *U.S. Pat. Spec. No.* 4,565,647, having a hydrophobic group containing from about 6 to about 30 C-atoms, preferably from about 10 to about 16 C-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 chain length mixture comprising from about 10 C-atoms to about 16 C-atoms. Preferably, the alkyl group of the alkyl polysaccharide consists of a mixture of chain length, preferably from about 6 to about 18 C-atoms, more preferably from about 8 to about 16 C-atoms, and hydrophilic group containing from about one to about 1.5 saccharide, preferably glucoside, groups per molecule. This "broad chain length distribution" is defined by at least about 50% of the chain length mixture comprising from about 10 C-atoms to about 16 C-atoms. A broad mixture of chain lengths, particularly C8-C16, is highly desirable relative to narrower range chain length mixtures, and particularly versus lower (i.e., C8-C10 or C8-C12) chain length alkyl polyglycoside mixtures. It is also found that the preferred C8-C16-alkyl polyglycoside provides much improved perfume solubility versus lower and narrower chain length alkyl polyglycosides, as well as other
preferred surfactants, including the C8-C14-alkyl ethoxylates. Any reducing saccharide containing 5 or 6 C-atoms can be used, e.g., glucose, galactose and galactosyl moieties can be substituted for the glycosyl moieties. The hydrophobic group is optionally 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, 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 8-18, preferably from 10-16, C-atoms. Preferably, the alkyl group is a straight-chain saturated alkyl group. The alkyl group can contain up to about 3 hydroxy groups and/or the polyalkyleneoxide chain can contain up to about 10, preferably less than 5, alkyleneoxide moieties. Suitable alkyl polysaccharides are octyl, nonyl, decyl, undecyl, dodecyl, tridecyl, tetradecyl, pentadecyl, hexadecyl, heptadecyl, and octadecyl, di-, tri-, tetra-, penta-, and hexaglucosides and/or galactoses. Suitable mixtures include coconut alkyl, di-, tri-, tetra-, and pentaglucosides and tallow alkyl tetra-, penta- and hexaglucosides.

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 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 WO 86/05199. Technical alkyl polyglycosides represent mixtures of alkyl groups and mixtures of monosaccharides and different oligosaccharides. Alkyl polyglycosides (sometimes referred to as "APG's") are preferred since they provide additional improvement in surface appearance of the surface being cleaned 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 C-atoms, preferably from about 8 to about 10 C-atoms or a mixture of such alkyl moieties. C8-C16-alkyl polyglucosides are commercially available, e.g. Simusol® surfactants available from Seppic Corporation, France, and Glucopon®425 avail-
able from Henkel KGaA, Germany). 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 C8-C16-alkyl polyglucosides, such as Plantaren® 2000, PLANTAREN 2000 N, and PLANTAREN 2000 N UP, available from Henkel. Examples are N-methyl-N-1-deoxyglucityl cocoamide and N-methyl-N-1-deoxyglucityl oleamide. Processes for making polyhydroxy fatty acid amides are known and are described in U.S. Pat. Spec. Nos. 2,965,576 and 2,703,798.

Non-limiting examples of zwitterionic surfactants include: derivatives of secondary and tertiary amines, derivatives of heterocyclic secondary and tertiary amines, or derivatives of quaternary ammonium, quaternary phosphonium or tertiary sulphonium compounds, cf. U.S. Pat. Spec. No. 3,929,678 (column 19, line 38-column 22, line 48), for examples of zwitterionic surfactants; betaine, including alkyl dimethyl betaine and cocodimethyl amidopropyl betaine, C8-C18 (preferably C12-C18) amine oxides and sulpho and hydroxy betaines, such as N-alkyl-N,N-dimethylammino-1-propane sulphonate where the alkyl group can be C8-C18, preferably C10-C14.

Non-limiting examples of ampholytic surfactants include: aliphatic derivatives of secondary or tertiary amines, or aliphatic derivatives of heterocyclic secondary and tertiary amines in which the aliphatic radical can be straight- or branched-chain. One of the aliphatic substituents contains at least about 8 C-atoms, from about 8 to about 18 C-atoms, and at least one contains an anionic water-solubilizing group, e.g. carboxy, sulphonate, sulphate. See U.S. Pat. Spec. No. 3,929,678, column 19, lines 18-35, for examples of ampholytic surfactants.

Non-limiting examples of anionic surfactants useful herein include: a) C11-C18-alkyl benzene sulphonates (LAS); b) C10-C20 primary, branched-chain and random alkyl sulphates (AS); c) C10-C18 secondary (2,3) alkyl sulphates; d) C10-C18-alkyl alkoxysulphates (AES) wherein preferably x is from 1-30; e) C10-C18-alkyl alkoxycarboxylates preferably comprising 1-5 ethoxy units; f) mid-chain branched alkyl sulphates as disclosed in U.S. Pat. Spec. Nos. 6,020,303 and 6,060,443; g) mid-chain branched alkyl alkoxysulphates as disclosed in U.S. Pat. Spec. Nos. 6,008,181 and 6,020,303; h) modified alkylbenzene sulphonate (MLAS) as disclosed in: WO 99/05243, WO 99/05242, WO 99/05244, WO 99/05082, WO 99/05084, WO 99/05241, WO 99/07656, WO 00/23549, and WO 00/23548; i) methyl ester sulphonate (MES); and j) alpha-olefin sulphonate (AOS).

Non-limiting examples of cationic surfactants include: the quaternary ammonium surfactants, which can have up to 26 C-atoms; a) alkoxylate quaternary ammonium (AQA) surfactants as disclosed in U.S. Pat. Spec. No. 6,136,769; b) dimethyl hydroxyethyl quaternary ammonium as disclosed in U.S. Pat. Spec. No. 6,004,922; c) polyamine cationic surfactants as disclosed
in WO 98/35002, WO 98/35003, WO 98/35004, WO 98/35005, and WO 98/35006; d) cationic ester surfactants as disclosed in U.S. Pat. Spec. Nos. 4,228,042, 4,239,660 4,260,529 and 6,022,844; e) amino surfactants as disclosed in U.S. Pat. Spec. No. 6,221,825 and WO 00/47708, specifically amido propyldimethyl amine; and f) ethoxylated and propoxylated quaternary ammonium compounds.

Non-limiting examples of semi-polar non-ionic surfactants include: water-soluble amine oxides containing one alkyl moiety of from about 10 to about 18 C-atoms and 2 moieties selected from the group consisting of alkyl groups and hydroxyalkyl groups containing from about 1 to about 3 C-atoms; water-soluble phosphine oxides containing one alkyl moiety of from about 10 to about 18 C-atoms and 2 moieties selected from the group consisting of alkyl groups and hydroxyalkyl groups containing from about 1 to about 3 C-atoms; and water-soluble sulphoxides containing one alkyl moiety of from about 10 to about 18 C-atoms and a moiety selected from the group consisting of alkyl and hydroxyalkyl moieties of from about 1 to about 3 C-atoms. See WO 01/32816, U.S. Pat. Spec. No. 4,681,704, and U.S. Pat. Spec. No. 4,133,779.

Cleaning compositions optionally comprise from about 0% to about 5%, or from about 0.001 to about 5% of a cleaning polymer, or from about 0.01 to about 2% of a cleaning polymer, or from about 0.01 to about 0.5% of a cleaning polymer, wherein said polymer comprises at least one cationically charged unit, inter alia, quaternary ammonium moiety or unit which can form a cationic charge in situ, inter alia, an amine moiety. Stated in another way, the oligomer, polymer, or co-polymer resulting from the herein below described monomer units have one net cationic charge at a pH=7. The charge can be distributed among any of the herein described units.

The cleaning polymer(s) adsorbs on the non-woven substrate and helps clean or trap the dirt on it. This prevents the dirt from being smeared around or re-deposited on the surface that is being cleaned.

Cationic polymers in general and their method of manufacture are known in the literature. For example, a detailed description of cationic polymers can be found in M. Fr. Hoover, Journal of Macromolecular Science Chemistry, A4(6), pp 1327-1417, October, 1970. Other suitable cationic polymers are those used as retention aids in the manufacture of paper. They are described in Pulp and Paper, Chemistry and Chemical Technology Volume III edited by James Casey (1981). The molecular weight of these polymers is in the range of 2000-5 x 10^5. Suitable cleaning polymers are listed below:

Polyacrylic acid type polymers and its derivatives, such as Acusol® type or Glascol® E-11;
Polyethyleneimine and its derivatives These are commercially available under the trade name LupasoKB from BASF AG of Ludwigshafen, Germany; Polyamidoamine-epichlorohydrin (PAE) resins which are condensation products of polyalkylene polyamine with polycarboxylic acid. The most common PAE resins are the condensation products of diethylenetriamine with adipic acid followed by a subsequent reaction with epichlorohydrine. They are available from Hercules Inc. of Wilmington, Del. under the trade name Kymene® or from BASF A.G. under the trade name Luresin®. These polymers are described in Wet Strength Resins and Their Applications edited by L. L. Chan, TAPPI Press (1994):

\[
\begin{align*}
- & \text{rBJr} \\
& \text{R}_1, \text{Z}_1
\end{align*}
\]

wherein \( t \) is a repeating unit, \( \text{R}_1, \text{R}_2 \), and \( \text{Z}_1 \) are defined herein below. The linear polymer units are formed from linearly polymerizing monomers. Linearly polymerizing monomers are defined herein as monomers which under standard polymerizing conditions result in a linear polymer chain or alternatively which linearly propagate polymerization. The linearly polymerizing monomers have the formula:

\[
\begin{align*}
& \text{R}_1, \text{R}_2 \\
& \text{Z}_1
\end{align*}
\]

For example, vinyl acetate monomers incorporated into the backbone are hydrolyzed to form vinyl alcohol units. Linear polymer units may be directly introduced, i.e. via linearly polymerizing units, or indirectly, i.e. via a precursor as in the case of vinyl alcohol cited herein above.

Each \( \text{R}_1 \) is independently hydrogen, \( \text{Ci-C}_4 \text{alkyl} \), substituted or unsubstituted phenyl, substituted or unsubstituted benzyl, carbocyclic, heterocyclic, and mixtures thereof. Preferably \( \text{R}_1 \) is hydrogen, \( \text{Ci-C}_4 \text{alkyl} \), phenyl, and mixtures thereof, more preferably hydrogen and methyl.

Each \( \text{R}_2 \) is independently hydrogen, halogen, \( \text{Ci-C}_4 \text{alkyl} \), \( \text{Ci-C}_4 \text{alkoxy} \), substituted or unsubstituted phenyl, substituted or unsubstituted benzyl, carbocyclic, heterocyclic, and mixtures thereof. Preferred \( \text{R}_2 \) is hydrogen, \( \text{Ci-C}_4 \text{alkyl} \), and mixtures thereof.

Each \( \text{Z}_1 \) is independently hydrogen; hydroxy; halogen; \(-\text{(CH}_2\text{)}_n\text{R} \), wherein \( \text{R} \) is hydrogen, hydroxy, halogen, nitrilo, \(-\text{OR}_3 \), \(-\text{O(\text{CH}_2\text{)}\text{N(R}_3\text{)}_2} \), \(-\text{O(\text{CH}_2\text{)}\text{N+(R}_3\text{)}_3\text{X}} \), \(-\text{OCO(\text{CH}_2\text{)}\text{N(R}_3\text{)}_2} \), \(-\text{OCO(\text{CH}_2\text{)}\text{N+(R}_3\text{)}_3\text{X}} \), \(-\text{C(O)NH-(\text{CH}_2\text{)}\text{N(R}_3\text{)}_2} \), \(-\text{C(O)NH(\text{CH}_2\text{)}\text{N+(R}_3\text{)}_3\text{X}} \), \(-\text{(CH}_2\text{)}\text{N+(R}_3\text{)}_3\text{X} \), a non-aromatic nitrogen heterocycle comprising a quaternary ammonium ion, a non-aromatic nitrogen heterocycle compris-
ing an N-oxide moiety, an aromatic nitrogen containing heterocyclic wherein one or more or
the nitrogen atoms is quaternized; an aromatic nitrogen containing heterocycle wherein at
least one nitrogen is an N-oxide; -NHCHO (formamide), or mixtures thereof; wherein each R₃
is independently hydrogen, d-Csalkyl, C₂-C₆hydroxyalkyl, and mixtures thereof; X is a water
soluble anion; the index n is from 1-6; carbocyclic, heterocyclic, or mixtures thereof;
(CH₂)mCOR' wherein R' is -OR₃, -O(CH₂)nN(R₃)₂, -O(CH₂)nN+(R₃)₂X⁻, -NR₃(CH₂)nN(R₃)₂,
-NR₃(CH₂)nN+(R₃)₂X⁻, -(CH₂)nN(R₃)₂, -(CH₂)nN+(R₃)₂X⁻, or mixtures thereof, wherein R₃, X
and n are the same as defined herein above. A preferred Z₁ is -(CH₂)nN+(R₃)₂X⁻, wherein
the index n is 2-4. The index m is from 0-6, preferably 0-2, more preferably 0.

Non-limiting examples of addition polymerizing monomers comprising a heterocyclic Z₁ unit
include 1-vinyl-2-pyrrolidinone, 1-vinylimidazole, 2-vinyl-1,3-dioxolane, 4-vinyl-1-cyclohex-
e-1,2-epoxide, and 2-vinylpyridine.

The cleaning polymers and co-polymers comprise Z₁ units which have a cationic charge or
which result in a unit which forms a cationic charge in situ. When the co-polymers comprise
more than one Z₁ unit, for example, Z₁, Z₂, Z₃, Zₙ units, at least about 1% of the monomers
which comprise the co-polymers will comprise a cationic unit. Preferred cationic units include
-O(CH₂)nN+(R₃)₂X⁻ and -(CH₂)nN+(R₃)₂X⁻. When the co-polymers are formed from two
monomers, Z₁ and Z₂, the ratio of Z₁/Z₂ is preferably from about 9:1 to about 1:9.

A non-limiting example of a Z₁ unit which can be made to form a cationic charge in situ is the
-NHCHO unit. A polymer or co-polymer can be prepared comprising formamide units some
of which are subsequently hydrolyzed to form vinyl amine equivalents:

\[
\begin{align*}
\text{H} & \quad \text{NH} \\
\text{Z₁} & \quad \text{O}
\end{align*}
\]

which comprises a formamide unit and then treat the co-polymer that some of the formamide
units are hydrolyzed to form a co-polymer comprising vinyl amine units, said polymer having
the formula:

\[
\begin{align*}
\text{H} & \quad \text{NH} \quad \text{NH₂} \\
\text{Z₁} & \quad \text{O}
\end{align*}
\]

wherein Z₁ may be a cationic unit comprising or non-cationic unit comprising moiety and
a+b=x.
Another class of preferred linearly polymerizable monomers comprise cationically charged heteroaromatic Z₁ units having the formula:

\[
\begin{array}{c}
R₁ \quad R₂ \\
\text{N} \\
R₆
\end{array}
\]

a non-limiting example of which is 4-vinyl(N-alkyl)pyridine wherein R₁ and R₂ are each hydrogen and R₆ is methyl.

Another class of preferred linearly polymerizable monomers which comprises a heterocyclic ring includes Z units comprising an N-oxide, for example, the N-oxide having the formula:

\[
\begin{array}{c}
R₁ \quad R₂ \\
\text{N} \quad \text{O}
\end{array}
\]

a non-limiting example of which is 4-vinyl pyridine N-oxide.

N-alkyl vinylpyridine monomers and N-oxide vinylpyridine monomers can be suitably combined with other nonaromatic monomers, inter alia, vinyl amine. Preferred polymers include co-polymers derived from a combination of quaternized, N-oxide, and nitrogen containing heteroaromatic monomers, non-limiting examples of which include a copolymer of N-methyl vinyl pyridine and vinyl pyridine in a ratio of 4:1; a copolymer of N-methyl vinyl pyridine and vinyl pyridine in a ratio of 4:6; a co-polymer of poly(N-methyl vinyl pyridine) and vinyl pyridine N-oxide in a ratio of polymer to monomer of 4:1; poly(N-methyl vinyl pyridine) and vinyl pyridine N-oxide in a ratio of polymer to monomer of 4:6; and mixtures thereof.

As described herein above, some preferred polymer residues may be formed by treatment of the resulting polymer. For example, vinyl amine residues are preferably introduced via formamide monomers which are subsequently hydrolyzed to the free amino unit. Vinyl alcohol units are obtained by hydrolysis of residues formed from vinyl acetate monomers. Likewise, acrylic acid residues may be esterified after polymerization, for example, of units having the formula:
Or may be formed after the backbone has been formed by polymerization with acrylic acid or acrylic acid precursor monomers.

The cleaning polymers or co-polymers can comprise one or more cyclic polymer units which are derived from cyclically polymerizing monomers. Cyclically polymerizing monomers are defined herein as monomers which under standard polymerizing conditions result in a cyclic polymer residue as well as serving to linearly propagate polymerization. Preferred cyclically polymerizing monomers have the formula:

\[
\begin{array}{c}
\text{R}_4^+ X^- \\
\text{R}_4 \\
\text{R}_5
\end{array}
\]

wherein each \( R_4 \) is independently an olefin comprising unit which is capable of propagating polymerization in addition to forming a cyclic residue with an adjacent \( R_4 \) unit; \( R_5 \) is linear or branched \( \text{CrC}^\text{alkyl}, \text{benzyl}, \text{substituted benzyl}, \) and mixtures thereof; and \( X^- \) is a water soluble anion.

Non-limiting examples of \( R_4 \) units include allyl and alkyl substituted allyl units. Preferably the resulting cyclic residue is a six-member ring comprising a quaternary nitrogen atom.

\( R_5 \) is preferably \( \text{C}_1-\text{C}_4 \text{alkyl}, \) preferably methyl.

An example of a cyclically polymerizing monomer is dimethyl diallyl ammonium having the formula:

\[
\begin{array}{c}
\text{N} \\
\text{N}
\end{array}
\]

which results in a polymer or co-polymer having units with the formula:

\[
\begin{array}{c}
\text{X}^+ \\
\text{N} \\
\text{X}^-
\end{array}
\]
wherein preferably the index $z$ is from about 10 to about 50,000.

The cleaning polymers or co-polymers retain a net cationic charge, whether the charge is developed in situ, or whether the polymer or co-polymer itself has a formal positive charge. Preferably the polymer or co-polymer has at least 10%, more preferably at least about 25%, more preferably at least about 35%, most preferably at least about 50% of the residues comprise a cationic charge.

The cleaning polymers or co-polymers can comprise mixtures of linearly and cyclically polymerizing monomers, for example the poly(dimethylallylammonium chloride/acrylamide) co-polymer having the formula:

\[
\begin{array}{c}
\text{Z}_2 \quad x \quad \text{Z}_3 \quad y \quad \text{N} \quad x^-
\end{array}
\]

wherein $Z_2$, $Z_3$, $x$, $y$, and $z$ are the same as defined herein above and $X^-$ is the chloride ion.

One embodiment of this invention is the composition comprising a polymer based on dimethylallylammonium chloride and a copolymer which is based upon acrylamide with a co-monomer selected from the group consisting of N,N-dialkylaminoalkyl(meth)acrylate, N,N-dialkylaminoalkylacrylate, N,N-dialkylaminoalkylacrylamide, N,N-dialkylaminoalkyl(meth)acrylamide, their quaternized derivatives and mixtures thereof.

Non-limiting examples of polymers suitable for use with the present invention include cleaning copolymers comprising: i) a first monomer selected from the group consisting of N,N-dialkylaminoalkyl(meth)acrylate, N,N-dialkylaminoalkylacrylate, N,N-dialkylaminoalkylacrylamide, N,N-dialkylaminoalkyl(meth)acrylamide, their quaternized derivatives, vinylamine or its derivatives, allylamine or its derivatives and mixtures thereof; and ii) a second monomer selected from the group consisting of acrylic acid, methacrylic acid, Ci-C$_6$alkylmethacrylate, Ci-C$_6$alkylacrylate, Ci-C$_6$hydroxyalkylacrylate, CrC$_6$hydroxyalkylmethacrylate, acrylamide, CrC$_6$alkyl acrylamide, CrC$_6$diethylacrylamide, 2-acylamido-2-methylpropane sulphonic acid or its alkali salt, methacrylamide, Ci-C$_6$diethylmethacrylamide, vinyl formamide, vinyl acetamide, vinyl alcohol, d-CSvinylalkylether, vinyl pyridine, itaconic acid, vinyl acetate, vinyl propionate, vinyl butyrate and mixtures thereof;

Cationic polysaccharides preferably cationic hydroxyethyl cellulose, cationic guar gum and cationic starches. Examples of cationic hydroxyethyl cellulose are Ucare® Polymer JR 25M, Polymer JR 400, Polymer LK 400 and Polymer LR 400 all available from Dow Chemicals Co.
USA and Celquat® H200 and CELQUAT L-200 available from National Starch and Chemical Company USA.

Examples of cationic guar gums are Jaguar® C13 and Jaguar Excel® available from Rhodia, France. Examples of cationic starches are described by D. B. Solarek in *Modified Starches, Properties and Uses published by CRC Press* (1986). Cationic starches are commercially available from National Starch and Chemical Company under the Trade Name Cato®.

The cleaning composition may optionally contain other ingredients. Non-limiting examples of these other optional ingredients include detersive builders, enzymes, enzyme stabilizers, non-limiting examples of which include propylene glycol, boric acid and/or borax, foam control agents, soil suspending agents, soil release agents, pH adjusting agents, chelating agents, phase stabilizers, solubilizers, brighteners, preservatives, antimicrobial agents, colouring agents, and mixtures thereof.

The present invention also relates to a cleaning implement that includes a substrate that has been impregnated with a non-ionic linear polymer or the cleaning composition. In addition, the invention relates to methods of cleaning hard and soft surfaces using the so-impregnated substrate.

It has been demonstrated that using the non-ionic linear polymer by incorporating it into a substrate results in significant cleaning efficiency. Because the pre-moistened disposable cleaning substrate could more efficiently prevent dirt from being re-deposited, the amount of actives in the substrate could be reduced to achieve the same amount of cleaning. Thus an aqueous glass cleaner composition would require essentially no surfactant when it is employed in the cleaning substrate of the invention to clean glass that is scrubbed with the said substrate.

In addition, the presence lower active levels in the substrate containing the cleaning composition will exhibit the concomitant effect of improve filming/streaking as less of these cleaning actives are available to be re-deposited on the surface being cleaned.

In use, the non-ionic linear polymers are applied directly onto the cleaning surface of a substrate. Thereafter, "wet" or pre-moistened substrate can be formed when the aqueous cleaning composition, which contains the non-ionic linear polymers and one or more additional components, is incorporated or adsorbed into the substrate. The data described herein evidence that the wet or pre-moistened substrates will adhere large amounts of dirt.

The term "substrate" refers to any suitable natural and/or synthetic adsorbent and/or adsorbent material that can be employed to clean hard and soft surfaces by physical contact, e.g., wiping, scrubbing, buffing, polishing, rinsing, and the like. Preferred substrates are non-
woven which means that the material is formed without the aid of a textile weaving or knitting process. The non-woven material can comprise, for example, non-woven, fibrous sheet materials or melt-blown, co-form, air-laid, spun bond, wet laid, bonded-carded web materials, and/or hydro-entangled (also known as spun-laced) materials. The substrate can include wood pulp, a blend of wood pulp, and/or synthetic fibres, e.g., polyester, RAYON, NYLON, polypropylene, polyethylene, and/or cellulose polymers. The substrate consists of a single-layered structure and is not a multilayered laminate.

The substrate can incorporate a backing member that may be pervious or impervious to a cleaning composition. The backing member provides structural support to the substrate, imparts texture to the substrate, and/or provides a prophylactic barrier. The backing member can be manufactured from any suitable material including, for example, woven or non-woven material, polymeric material, natural fibre, synthetic fibre, or mixtures thereof.

A preferred substrate is manufactured in the form of a general purpose cleaning wipe that has at least one layer of non-woven absorbent or adsorbent material. The wipe can further include wood pulp or a blend of wood pulp and a synthetic fibre, without limitation, such as polyester, RAYON, NYLON, polypropylene, polyethylene, other cellulose polymers; or a synthetic fibre or mixture of such fibres. A binder may or may not be present. Manufacturers include Kimberly-Clark, E.I. du Pont de Nemours and Company, Dexter, American Non-wovens, James River, BBA Non-wovens and PGI. Examples of such substrates are described in U.S. Pat. Spec. Nos. 6,340,663; 4,781,974; 4,615,937; 4,666,621; 5,908,707; WO 98/03713; WO 97/40814; WO 96/14835; and EP 750063.

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

The cleaning substrate's liquid loading capacity should be at least about 50% to about 1000% by weight based on the dry weight thereof; more preferably at least about 200% to about 800% of the dry weight thereof; and most preferably at least about 200% to about 500% of the dry weight thereof. This is expressed as loading 1/2-10 times the weight (or, more accurately, the mass) of the substrate. The substrate varies without limitation from about 0.01 to about 1,000 g/m², most preferably 25-120 g/m² (referred to as basis weight) and is produced as a sheet or web, which is cut, die-cut, or otherwise sized into the appropriate shape and size.

The cleaning substrate 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 dirt-attracting poly-cationic polymer or with a liquid cleaning composition containing the dirt-attracting poly-cationic polymer. 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, 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 terephthalate (PET), polyvinyl chloride (PVC), or other rigid plastics. 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, 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 interleaved, so that the removal of one wipe advances the next, and so fourth.

The cleaning wipes will preferably have a certain wet tensile strength which is without limitation about 25 to about 250 Newton/m, more preferably about 75 to about 170 N/m.

Another preferred substrate is manufactured in the form of clean pads for used in conjunction with handheld implements that are described, for example, in U.S. Pat. Spec. No. 6,540,424. As described in that reference, the cleaning pad consists of a cleaning surface, which comes into direct contact with dirt and debris. This surface comprises an absorbent material which has the ability to absorb fluid, including superabsorbent materials. The cleaning pad preferably has a polyethylene film backing layer that is bonded to the cleaning surface. The film backing layer can be formed of polyethylene or any suitable plastic, rubber, other elastomeric, polymeric or other flexible material.

Suitable materials for the cleaning surface of the cleaning pad are absorbent materials such as the unbonded web material described in U.S. Pat. Spec. Nos. 5,858,112 and 5,962,112. Other suitable materials are described in U.S. Pat. Spec. No. 4,720,415 and superabsorbent materials are described in U.S. Pat. Spec. Nos. 4,995,133; 5,638,569; 5,960,508; and 6,003,191.

In a preferred embodiment, the cleaning pad substrate comprises a spun-bond fibre non-woven web. The spun-bond fibres comprise bi-component fibres having a side-by-side configuration where each component comprises about 50%, by volume, of the fibre. The spun-bond
fibres will comprise first and second polypropylene components and/or a first component comprising polypropylene and a second component comprising propylene-ethylene copolymer. About 1% or more or less of titanium oxide or dioxide is added to the fibre(s) in order to improve fibre opacity.

Alternatively, the absorbent material for the cleaning pad comprises a laminate of an air-laid composite and a spun-bond fibre spun-bond web. The non-woven web comprises monocomponent spun-bond fibres of polypropylene having a basis weight of approximately 14 g per square meter. The air-laid composite comprises from about 85% to about 95% kraft pulp fluff and from about 10% to about 15% bi-component staple fibres. The bi-component staple fibres have a sheath-core configuration; the core component comprises polyethylene terephthalate and the sheath component comprises polyethylene.

The cleaning composition optionally contains at least one of the following adjuncts: stain blocking agents, stain and soil repellants, enzymes, lubricants, insecticides, miticides, anti-allergen agents, odour control agents, fragrances and fragrance release agents, brighteners or fluorescent whitening agents, oxidizing or reducing agents, polymers which leave a film to trap or adsorb bacteria, virus, mite, allergens, dirt, dust, or oil.

The cleaning composition may include additional adjuncts. Suitable adjuncts include fragrances or perfumes, waxes, dyes and/or colourants, solubilizing materials, stabilizers, thickeners, defoamers, hydrotropes, lotions and/or mineral oils, enzymes, bleaching agents, cloud point modifiers, preservatives, and other polymers. Suitable waxes include carnauba, beeswax, spermacet, candelilla, paraffin, lanolin, shellac, esparto, ouricuri, polyethylene wax, chlorinated naphthalene wax, petrolatum, microcrystalline wax, cerasine wax, ozokerite wax, and/or rezowax. Suitable solubilizing materials include hydrotropes, e.g. water soluble salts of low molecular weight organic acids, such as the sodium and/or potassium salts of xylene sulphonic acid. Suitable acids include organic hydroxy acids, citric acids, keto acid, and the like. Suitable thickeners include polyacrylic acid, xanthan gum, calcium carbonate, aluminum oxide, alginites, guar gum, methyl, ethyl, clays, and/or propylhydroxycelluloses. Suitable defoamers include silicones, aminosilicones, silicone blends, and/or silicone/hydrocarbon blends. Suitable lotions include chlorophene and/or lanolin. Suitable enzymes include lipases and proteases, and/or hydrotropes such as xylene sulphonates and/or toluene sulphonates. Suitable bleaching agents include per-acids, hypohalite sources, hydrogen peroxide, and/or sources of hydrogen peroxide.

Suitable preservatives include mildewstat or bacteriostat, methyl, ethyl and propyl parabens, short chain organic acids, e.g. acetic, lactic and/or glycolic acids, bisguanidine compounds, e.g. DANTAGARD and/or GLYDANT, and/or short chain alcohols, e.g. ethanol and/or IPA.
Suitable mildewstat or bacteriostat include mildewstats (including non-isothiazolone com-
ponents) include KathonOGC, 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 from Nipa Laboratories Ltd., DOWICIDE A, a 1,2-benzoisothia-
zolin-3-one, from Dow Chemical Co., and IRGASAN DP 200, a 2,4,4’-trichloro-2-hydroxydi-
phenylether, from Ciba Specialty Chemicals AG.

An antimicrobial agent can be included in the cleaning composition. Non-limiting examples of
useful quaternary compounds that function as antimicrobial agents include benzalkonium
chlorides and/or substituted benzalkonium chlorides, di(C6-C14)alkyl-di-short chain (C1–4alkyl
and/or hydroxyalkyl) quaternary ammonium salts, N-(3-chloroallyl)hexamineimium chlorides,
benzethonium chloride, methylbenzethonium chloride, and cetlypyridinium chloride. The
quaternary compounds useful as cationic antimicrobial actives are preferably selected from
the group consisting of dialkyldimethyl ammonium chlorides, alkylidemethylbenzalammonium
chlorides, dialkylmethylbenzlammonium chlorides, and mixtures thereof. Suitable biguanide
antimicrobial actives include polyhexamethylene biguanide hydrochloride, p-chlorophenyl
biguanide; 4-chlorobenzhydryl biguanide, halogenated hexideine such as chlorhexidine (1,1’-
hexamethylene-bis-5-(4-chlorophenyl biguanide) and its salts. Typical concentrations for bio-
cidal effectiveness of these quaternary compounds, especially in the low-surfactant composi-
tions, range from about 0.001% to about 0.8% and preferably from about 0.005% to about
0.3% of the usage composition. The weight percentage ranges for the biguanide and/or quat
compounds in the cleaning composition is selected to disinfect, sanitize, and/or sterilize most
common household and industrial surfaces.

Non-quaternary biocides are useful. Such biocides can include alcohols, peroxides, boric
acid and borates, chlorinated hydrocarbons, organo-metallics, halogen-releasing com-
pounds, mercury compounds, metallic salts, pine oil, organic sulphur compounds, iodine
compounds, silver nitrate, other silver compounds, for example, silver dicitrate, quaternary
phosphate compounds, and phenolics.

These antimicrobial, antifungal or anti-allergen materials include water-soluble, film-forming
polymers, cf. U.S. Pat. Spec. No. 6,454,876, quaternary ammonium compounds and com-
plexes therewith, cf. U.S. Pat. Spec. Nos. 6,482,392; 6,080,387; 6,284,723; 6,270,754;
6,017,561; and 6,013,615; essential oils, such as nerolidol, cf. U.S. Pat. Spec. No.
6,361,787, KATHON, see U.S. Pat. Spec. No. 5,789,364 and U.S. Pat. Spec. No. 5,589,448,
and, possibly, bleaches, such as hydrogen peroxide and alkali metal hypochlorite.
Optional miticides include boron compounds and salts, including boric acid, borates, octaborate, tetraborate, borax, and metabolate. Other optional miticides include benzylbenzoate, phenyl salicylate, diphenylamine, methyl p-naphthyl ketone, coumarin, phenethyl benzoate, benzyl salicylate, phenyl benzoate, N-fluorodichloromethylthio-cyclohexene-dicarboxyimide, p-nitrobenzoic acid methyl ester, p-chlorometaxylenol, bromocinnamic aldehyde, 2,5-dichloro-4-bromophenol, N,N-dimethyl-N'-triyl-N'- (fluorodichloromethylthio)-sulphamide, 2-phenylphenol, sodium 2-phenylphenolate, 5-chloro-2-methyl-4-isothiazoline-3-one, 2-methyl-4-isothiazonoline-3-one, benzimidazolylmethyl-carbamate, the antimicrobials listed herein, and mixtures thereof.

Optional anti-allergen metal ions include metallic salts are selected from the group consisting of zinc, stannous, stannic, magnesium, calcium, manganese, titanium, iron, copper, nickel, and mixtures thereof. Other optional anti-allergen agents include polyphenol compounds including tannins, catechins, and gallic acid, hydrogen peroxide, salicylic acid, citric acid, lactic acid, glycolic acid, ascorbic acid, gluconic acid, pyruvic acid, glucaric acid, hydroxy benzoic acid, hydroxy glutamic acid, hydroxypthalic acids, malic acid, and mixtures and salts thereof.

Film forming polymers can reduce allergens in the air. Suitable film-forming polymers include, water-soluble polymers selected from the group consisting of starch, polyvinyl alcohols, methyl cellulose and its derivatives, polyacrylic acids, polyethylene glycols with molecular weight higher than 5000, polyethylene, polypropylene glycol with molecular weight higher than 8000, Cosmetic Toiletry Fragrances Association polyquaternium compounds 1-14, polyvinyl pyrrolidone, and mixtures thereof. Specific examples of certain preferred film forming polymers are selected from the group consisting of hydroxy-propyl starch, DAICEL MC 1310, KURARAY polyvinyl alcohol 205, N-polyvinyl-2-pyrrolidone, and mixtures thereof.

As used herein, the term "plant essential oil" or "plant essential oil compound", which shall include derivatives thereof refers to a monocyclic, carbocyclic ring structure having six members and substituted by at least one oxygenated or hydroxy functional moiety. These compounds can be added directly to the cleaning composition. Examples of plant essential oils encompassed within the present invention, include members selected from the group consisting of aldehyde C16 (pure), α-terpineol, amyl cinnamic aldehyde, amyl salicylate, anisic aldehyde, benzyl alcohol, benzyl acetate, cinnamaldehyde, cinnamic alcohol, carvacrol, carveol, citral, citronellal, citronellol, p-cymene, diethyl phthalate, dimethyl Salicylate, dipropylene glycol, eucalyptol (cineole), eugenol, iso-eugenol, galaxolide, geraniol, guaiacol, ionone, menthol, menthyl salicylate, methyl anthranilate, methyl ionone, methyl salicylate, a- phellandrene, pennyroyal oil, perillaldehyde, 1- or 2-phenyl ethyl alcohol, 1- or 2-phenyl ethyl propionate, piperonal, piperonyl acetate, piperonyl alcohol, D-pulegone, terpinen-4-ol, ter-
pinyl acetate, 4-tert-butylcyclohexyl acetate, thyme oil, thymol, metabolites of trans-anethole,
vanillin, ethyl vanillin, cedar wood oil, hexadecyltrimethylammonium chloride, aluminium
chlorohydrate, 1-propoxy-propanol-2, polyquaternium-10, silica gel, propylene glycol alginate,
ammonium sulphate, hinokitiol, L-ascorbic acid, tannic acid and derivatives, chlorohexidine,
malesic anhydride, hinoki oil, a composite of AgCl and TiO₂, diazolidinyl urea, 6-isopropyl-m-cresol,
urea, cyclodextrin, hydrogenated hop oil, polyvinyl pyrrolidone, N-methylpyrrrolidone, the sodium salt of anthraquinone,
potassium thioglycolate, and glutaraldehyde, jasmone, dihydrojasmone, lower alkyl esters of jasmonic acid, lower alkyl esters of dihydrojasmonic acid, farnesol, nerolidol, phytol, isophytol, geranyl geraniol, and the like. The essential oil can
be selected from oil is selected from the group of anise, balsam, basilicum, bay, birch, cajeput, camphor, caraway, cinnamon, clove, coreander, dill, fennell, fir, garlic,
lavender, lavendin, lemon grass, marjoran, nutmeg, peppermint, pine, rosemary, rue, sage,
spearmint, tea tree, thuja, thyme, winter green and ylang-ylang. Preferred essential oils
include a-terpineol, eugenol, cinnamic alcohol, benzyl acetate, 2-phenyl ethyl alcohol, and
benzyl alcohol.

Soil resist agents resist or repel dirt, oil, or other hydrophobic substances from the carpet.
Fluorochemical soil-resist agents may include polymers or compounds having pendant or
end groups of perfluoroalkyl moieties, fluoro-surfactants, or fluoro-intermediates. Examples
of some suitable fluoro-chemical soil-resist agents include ZONYL 7950 and ZONYL 5180,
which are available from DuPont. When employed the soil and stain resist agents are preferably
present at a level of from 0.01%-3% and preferably from 0.05%-1% of the composition.

The optional stain-resist agent may be selected from the group consisting of copolymers of
hydrolyzed maleic anhydride with alpha olefins, aromatic olefins, or vinyl ethers, poly
(vinyl methyl ether/maleic acid) copolymers, homopolymers of methacrylic acid, and co-
polymers of methacrylic acid. Suitable poly (vinyl methyl ether/maleic acid) copolymers are
commercially available, for instance, from ISP Corporation, New York USA under the product
names GANTREZ AN Copolymer (AN-1 19 copolymer, average molecular weight of 20,000;
AN-139 copolymer, average molecular weight of 41,000; AN-1 49 copolymer, average molecular
weight of 50,000; AN-1 69 copolymer, average molecular weight of 67,000; AN-1 79 copolymer,
average molecular weight of 80,000), GANTREZ S (GANTREZ S97, average molecular weight of 70,000),
Preferably, the stain-resist agent is ZELAN 338, which is available from DuPont.
Suitable anti-re-soiling polymers include soil suspending polyamine polymers. Particularly suitable polyamine polymers are alkoxylated polyamines including so-called ethoxylated polyethylene amines, i.e., the polymerized reaction product of ethylene oxide with ethylene-imine. Suitable ethoxylated polyethylene amines are commercially available from Nippon Shokubai Co. under the product names ESP-0620A (ethoxylated polyethylene amine wherein n=2 and y=20) or from BASF under the product names ES-8165 and from BASF under the product name LUTENSIT K-1 87/50.

Suitable anti-re-soiling polymers include polyamine N-oxide polymers. The polyamine N-oxide polymer can be obtained in almost any degree of polymerization. The average molecular weight is within the range of 1,000-10,000; more preferred 5,000-10,000; most preferred 5,000-25,000. Suitable polyvinyl pyridine-N-oxide polymers are commercially available from Clariant Germany under the trade name of Hoe S 4268, and from Reilly Industries Inc. under the trade name of PVNO.

Furthermore, suitable anti-re-soiling polymers include N-vinyl polymers. Suitable N-vinyl polymers include polyvinyl pyrrolidone polymers, co-polymers of N-vinylpyrrolidone and N-vinylimidazole, co-polymers of N-vinylpyrrolidone and acrylic acid, and mixtures thereof. Suitable co-polymers of N-vinylpyrrolidone and N-vinylimidazole are commercially available from BASF, under the trade name of Sokalan PG55. Suitable vinylpyrrolidone homopolymers, are commercially available from BASF under the trade names LUVISKOL K15 (viscosity molecular weight of 10,000), LUVISKOL K25 (viscosity molecular weight of 24,000), LUVISKOL K30 (viscosity molecular weight of 40,000), and other known vinyl pyrrolidone homopolymers, as described, for example in EP-A-262,897 and EP-A-256,696. Suitable co-polymers of N-vinylpyrrolidone and acrylic acid are commercially available from BASF under the trade name SOKALAN PG 310. Preferred N-vinyl polymers are polyvinyl pyrrolidone polymers, co-polymers of N-vinylpyrrolidone and N-vinylimidazole, co-polymers of N-vinylpyrrolidone and acrylic acid, and mixtures thereof, even more preferred are polyvinyl pyrrolidone polymers.

Suitable anti-re-soiling polymers include soil suspending polycarboxylate polymers. Any soil suspending polycarboxylate polymer known to those skilled in the art can be used according to the present invention such as homo- or co-polymeric polycarboxylic acids or their salts including polyacrylates and copolymers of maleic anhydride or/and acrylic acid and the like. Such soil suspending polycarboxylate polymers can be prepared by polymerizing or copolymerizing suitable unsaturated monomers, preferably in their acid form. Unsaturated monomeric acids that can be polymerized to form suitable polymeric polycarboxylates include acrylic acid, maleic acid or maleic anhydride, fumaric acid, itaconic acid, aconitic acid, mesaconic acid, citraconic acid and methylenemalonic acid. The presence in the polymeric poly-
carboxylates herein of monomeric segments, containing no carboxylate radicals such as vinylmethyl ether, styrene, ethylene, etc. is suitable provided that such segments do not constitute more than 40% by weight.

Particularly suitable polymeric polycarboxylates to be used herein can be derived from acrylic acid. Such acrylic acid-based polymers which are useful herein are the water-soluble salts of polymerized acrylic acid. The average molecular weight of such polymers in the acid form preferably ranges from 2,000-10,000, more preferably from 4,000-7,000 and most preferably from 4,000-5,000. Water-soluble salts of such acrylic acid polymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble polymers of this type are known materials. Use of polyacrylates of this type in detergent compositions has been disclosed, for example, in U.S. Pat. Spec. No. 3,308,067.

Acrylic/maleic-based copolymers may be used as a preferred soil suspending polycarboxylic polymer. Such materials include the water-soluble salts of copolymers of acrylic acid and maleic acid. The average molecular weight of such copolymers in the acid form preferably ranges from 2,000-100,000, more preferably from 5,000-75,000, most preferably from 7,000-65,000. The ratio of acrylate to maleate segments in such copolymers range from 30:1-1:1, more preferably from 10:1-2:1. Water-soluble salts of such acrylic acid/maleic acid copolymers can include, for example, the alkali metal, ammonium and substituted ammonium salts. Soluble acrylate/maleate copolymers of this type are known materials which are described in EP-A-66 915. Particularly preferred is a copolymer of maleic/acrylic acid with an average molecular weight of 70,000. Such copolymers are commercially available from BASF under the trade name SOKALAN CP5.

Other suitable anti-re-soiling polymers include those anti-re-soiling polymers having: (a) one or more non-ionic hydrophilic components consisting essentially of (i) polyoxyethylene segments with a degree of polymerization of at least 2, or (ii) oxypropylene or polyoxypropylene segments with a degree of polymerization of from 2-10, wherein said hydrophilic segment does not encompass any oxypropylene unit unless it is bonded to adjacent moieties at each end by ether linkages, or (iii) a mixture of oxyalkylene units comprising oxyethylene and from 1 to about 30 oxypropylene units wherein said mixture contains a sufficient amount of oxyethylene units such that the hydrophilic component has hydrophilicity great enough to increase the hydrophilicity of conventional polyester synthetic fibre surfaces upon deposit of the soil release agent on such surface, said hydrophilic segments preferably comprising at least about 25% oxyethylene units and more preferably, especially for such components having about 20-30 oxypropylene units, at least about 50% oxyethylene units; or (b) one or more hydrophobic components comprising (i) C3-oxyalkylene terephthalate segments,
wherein, if said hydrophobic components comprise oxyethylene terephthalate, the ratio of oxyethylene terephthalate: C3-oxyalkylene terephthalate units is about 2:1 or lower, C4-C6-alkylene or oxy C4-C6-alkylene segments, or mixtures therein, (iii) poly (vinyl ester) segments, preferably polyvinyl acetate), having a degree of polymerization of at least 2, or (v) C1-C4-alkylether or C4-hydroxyalkyl ether substituents, or mixtures therein, wherein said substituents are present in the form of C1-C4-alkyl ether or C4-hydroxyalkyl ether cellulose derivatives, or mixtures therein, and such cellulose derivatives are amphiphilic, whereby they have a sufficient level of C1-C4-alkyl ether and/or C4-hydroxyalkyl ether units to deposit upon conventional polyester synthetic fibre surfaces and retain a sufficient level of hydroxy, once adhered to such conventional synthetic fibre surface, to increase fibre surface hydrophilicity, or a combination of (a) and (b).

The polyoxyethylene segments of (a)(i) has a degree of polymerization of from about 1 to about 200, although higher levels can be used, preferably from 3 to about 150, more preferably from 6 to about 100. Suitable oxy-C4-C6-alkylene hydrophobic segments include endcaps of polymeric soil release agents, such as M⁺ OSO₂(CH₂)nOCH₂CH₂O⁻, where M⁺ is sodium and n is an integer from 4-6, as disclosed in U.S. Pat. Spec. No. 4,721,580.

Anti-re-soiling polymers include cellulosic derivatives such as hydroxyether cellulose polymers, co-polymeric blocks of ethylene terephthalate or propylene terephthalate with polyethylene oxide or polypropylene oxide terephthalate, and the like. Such anti-re-soiling polymers are commercially available and include hydroxyethers of cellulose such as METHOCEL (Dow Chemicals). Cellulosic anti-re-soiling polymers for use herein include those selected from the group consisting of C1-C4-alkyl and C4-hydroxyalkyl cellulose; see U.S. Pat. Spec. No. 4,000,093. Anti-re-soiling polymers characterised by polyvinyl ester hydrophobic segments include graft co-polymers of polyvinyl ether, e.g., C1-C6-vinyl esters, preferably polyvinyl acetate grafted onto polyethylene oxide backbones, such as polymethylene oxide backbones, see EP-A-219 048. Commercially available anti-re-soiling polymers of this kind include the SOKALAN type of material, e.g. SOKALAN HP-220, available from BASF.

One type of preferred anti-re-soiling polymers is a co-polymer having random blocks of ethylene terephthalate and polyethylene oxide (PEO) terephthalate. The molecular weight of this anti-re-soiling polymer is in the range of from about 25,000 to about 55,000, see U.S. Pat. Spec. Nos. 3,959,230 and 3,893,929.

Another preferred anti-re-soiling polymer is a polyester with repeat units of ethylene terephthalate units which contains 10-15% of ethylene terephthalate units together with 90-85% of polyoxyethylene terephthalate units, derived from a polyoxyethylene glycol of average molecular weight 300-5,000. Examples of this polymer include the commercially available material.
ZELCON 51260 (from Dupont) and MILEASE T (from ICI), see U.S. Pat. Spec. No. 4,702,857.

Another preferred anti-re-soiling polymers agent is a sulphonated product of a substantially linear ester oligomer comprised of an oligomeric ester backbone of terephthaloyl and oxal-kyleneoxy repeat units and terminal moieties covalently attached to the backbone. These anti-re-soiling polymers are fully described in U.S. Pat. Spec. No. 4,968,451. Other suitable anti-re-soiling polymers include the terephthalate polyesters as described in U.S. Pat. Spec. No. 4,711,730, the anionic end-capped oligomeric esters as described in U.S. Pat. Spec. No. 4,721,580, and the block polyester oligomeric compounds as described in U.S. Pat. Spec. No. 4,702,857.

Preferred anti-re-soiling polymers include the soil release agents that are disclosed in U.S. Pat. Spec. No. 4,877,896, which discloses anionic, especially sulphoaroyl, end-capped terephthalate esters.

Another preferred anti-re-soiling agent is an oligomer with repeat units of terephthaloyl units, sulfoisoterephthaloyl units, oxyethyleneoxy and oxy-1,2-propylene units. The repeat units form the backbone of the oligomer and are preferably terminated with modified isothionate end-caps. A particularly preferred anti-re-soiling agent of this type comprises about one sulphoisophthaloyl unit, 5 terephthaloyl units, oxyethyleneoxy and oxy-1,2-propyleneoxy units in a ratio of from about 1.7 to about 1.8, and two end-cap units of sodium 2-(2-hydroxyethoxy)-ethanesulphonate. Said anti-re-soiling agent comprises from about 0.5% to about 20%, by weight of the oligomer, of a crystalline-reducing stabilizer, preferably selected from the group consisting of xylene sulphonate, cumene sulphonate, toluene sulphonate, and mixtures thereof. See U.S. Pat. Spec. No. 5,415,807.

The cleaning composition may include a builder detergent which increase the effectiveness of the surfactant. The builder detergent can function as a softener and/or a sequestering and buffering agent in the cleaning composition. When employed, the builder detergent comprises at least about 0.001 % and about 0.015% of the cleaning composition. A variety of builder detergents can be used and they include phosphate-silicate compounds, zeolites, alkali metal, ammonium and substituted ammonium polycarboxylates, trialkali salts of nitrilotriacetic acid, carboxylates, polycarboxylates, carbonates, bicarbonates, polyphosphates, aminopoly-carboxylates, polyhydroxysulphonat.es, and starch derivatives.

Builder detergents can include polycarboxylates and polycarboxylates. The polycarboxylate and poly-carboxylate compounds include sodium, potassium, lithium, ammonium, and substituted ammonium salts of ethylenediamine tetraacetic acid, ethylenediamine triacetic acid, ethyl-
enediamine tetrapropionic acid, diethylenetriamine pentaacetic acid, nitrilotriacetic acid, ox-
disuccinic acid, iminodisuccinic acid, mellitic acid, polyacrylic acid or polymethacrylic acid
and copolymers, benzene polycarboxylic acids, gluconic acid, sulphamic acid, oxalic acid,
phosphoric acid, phosphonic acid, organic phosphonic acids, acetic acid, and citric acid.
These builder detergents can exist either partially or totally in the hydrogen ion form.
The builder agent can include sodium and/or potassium salts of EDTA and substituted am-
monium salts. The substituted ammonium salts include ammonium salts of methylamine, di-
ethylamine, butylamine, butylenediamine, propylamine, triethylamine, trimethylamine,
monoethanolamine, diethanolamine, triethanolamine, isopropanolamine, ethylenediamine
tetraacetic acid and propanolamine.
Buffering and pH adjusting agents, when used, include organic acids, mineral acids, alkali
metal and alkaline earth salts of silicate, metasilicate, polysilicate, borate, carbonate, carb-
amate, phosphate, polyphosphate, pyrophosphates, triposphates, tetrphosphates, ammo-
nia, hydroxide, monoethanolamine, monopropanolamine, diethanolamine, dipropanolamine,
triethanolamine, and 2-amino-2methylpropanol. Preferred buffering agents for compositions
of this invention are nitrogen-containing materials. Some examples are amino acids, such as
lysine or lower alcohol amines, such as mono-, di-, and tri-ethanolamine. Other preferred ni-
trogen-containing buffering agents are tri(hydroxymethyl)aminomethane, 2-amino-2-ethyl-
1,3-propanediol, 2-amino-2-methylpropanol, 2-amino-2-methyl-1,3-propanol, disodium glu-
tamate, N-methyldiethanolamide, 2-dimethylamino-2-methylpropanol (DMAMP), 1,3-bis(me-
thyamine)-cyclohexane, 1,3-diamino-propanol, N,N'-tetra-methyl-1,3-diamino-2-propanol,
N,N-bis(2-hydroxyethyl)glycine (bicine) and N-tris(hydroxymethyl)methyl glycine (tricine).
Other suitable buffers include ammonium carbamate, citric acid and acetic acid. Mixtures of
any of the above are acceptable. Useful inorganic buffers/alkalinity sources include ammo-
nia, the alkali metal carbonates and alkali metal phosphates, e.g., sodium carbonate, sodium
polyphosphate. For additional buffers see McCutcheon's Emulsifiers and Detergents, North
WO 95/07971.
The wipe or cleaning pad can be used for cleaning, disinfectant, or sanitization on inani-
mate, household surfaces, including floors, counter tops, furniture, windows, walls, and
automobiles. Other surfaces include stainless steel, chrome, and shower enclosures. The
wipe or cleaning pad can be packaged individually or together in canisters, tubes, etc. The
package may contain information printed on said package comprising instructions to use the
more abrasive side to remove soil followed by using the less abrasive side to wipe the soil
away. The wipe or cleaning pad can be used with the hand, or as part of a cleaning imple-
ment attached to a tool or motorized tool, such as one having a handle. Examples of tools using a wipe or pad are described in U.S. Pat. Spec. No. 6,611,986; WO 00/71012; U.S. Publ. Pat. App. No. 2002/0129835; U.S. Pat. Spec. No. 6,192,543; WO 00/71012; and WO 00/27271.

5 Another embodiment of the invention is a method of incorporation of a cleaning composition into a single layer absorbent material producing a pre-moistened cleaning disposable substrate that comprises the steps of:

a) Obtaining a single layered absorbent material; and
b) Incorporating therein a cleaning composition, said composition comprising:

i) from about 0.001% to about 2% by weight of linear, non-ionic polyacrylamide;
ii) from about 0.25% to about 15% by weight of a non-volatile organic solvent;
iii) from about 0.001% to about 15% by weight of at least one detersive surfactant;
iv) optionally from about 0% to about 5% by weight of other cleaning polymers; and
v) balance amount of water.

15 Another embodiment of the invention is a method of removing dirt and debris from a hard or soft surface that comprises the steps of:

A) providing a pre-moistened cleaning disposable substrate said substrate comprising:

a) A single layered absorbent material; and
b) A cleaning composition, said composition comprising:

i) from about 0.001 % to about 2% by weight of polyacrylamide;
ii) from about 0.25% to about 15% by weight of a non-volatile organic solvent;
iii) from about 0.001% to about 15% by weight of at least one detersive surfactant;
iv) optionally from about 0% to about 5% by weight of other cleaning polymers; and
v) balance amount of water; and

B) Engaging the dirt and debris laden dry hard or soft surface with a surface of the pre-moistened cleaning disposable substrate with sufficient force to remove dirt from the dirt laden hard or soft surface, whereby dirt is prevented from being re-deposited onto said hard or soft surface once the dirt is removed.

It is understood that the surface (hard or soft) as described herein is not the human body.
The following examples describe certain embodiments of this invention, but the invention is not limited thereto. It should be understood that numerous changes to the disclosed embodiments could be made in accordance with the disclosure herein without departing from the spirit or scope of the invention. These examples are therefore not meant to limit the scope of the invention. Rather, the scope of the invention is to be determined only by the appended claims and their equivalents. In these examples, all parts given are by weight unless otherwise indicated.

**Examples**

**Materials and Methods**

**Preparation of Test Soil Mixture**

AATCC carpet soil (1 g, TM-122, Textile Innovators, Windsor, NC USA) and black charm research clay (3 g, Textile Innovators, Windsor, NC USA) are mixed together in a beaker. Deionized water (15 g) is added to the soil mixture and agitated while heating to 75°C. Once the mixture is at 75°C, aqueous sugar solution (4 g, 50 wt%), melted vegetable shortening (Crisco®, 1 g), isopropanol (120 g) and vegetable oil (CRISCO, 1 g) are added. The soil mixture is kept at 75°C for one hour after which it is cooled to ambient temperature and added to a spraying apparatus.

**White Ceramic Tile Treatment Procedure**

White ceramic tiles are pre-cleaned. The CIE Lab and gloss value of each tile is measured. The sprayer containing the soil mixture is held approximately 30 cm from the tile to be treated. The tile is sprayed with approximately 20 (1 sec.) bursts toward the tile to build a base. Spraying is stopped for 2 min. between every 10 bursts to allow drying and prevent running. This is continued until the desired coating level is reached. The tile is allowed to sit and dry at room temperature overnight. The tile is baked at 105°C for 4 hours. The tile is allowed to cool. The CIE Lab and gloss value of each tile is measured. The soiled tiles are placed on a Gardener Scrub Instrument. The cellulose sponges are wrapped with plastic wrap and placed in the holder. The treated pre-moistened substrate of the invention or a commercially available wipe is placed around the sponge in the holder. The Gardner machine is set for four cycles. The sponge passes over the soiled tiles for four cycles. The CIE Lab and gloss value of each tile is measured at the end of the fourth cycle.
Black Enamel Panel Treatment Procedure

Black enamel panels (12 x 18 inch = 12 x 18 x 2.54 cm) are pre-cleaned. The CIE gloss value of each panel is measured. Black charm research clay (0.5 g per panel) is sprinkled on the entire surface of each panel. The treated panel is sprayed with water and wet soil is spread evenly over the panel. Each test panel is allowed to dry. The treated pre-moistened substrate of the invention or a commercially available wipe is passed over the soiled panels four times. The CIE gloss value of each cleaned panel is measured at the end of the fourth pass.

Measurement of Tiles and Panels

CIE Lab measurements on the ceramic surfaces are measured at the start, after soil treatment, and after cleaning with the wipe of the invention or a commercially available wipe in three locations on each tile with three tiles per test wipe formulation. Measurements are made on a Minolta CM-2600d with D65 illuminant and 10°observer. Gloss values were determined at 8 degrees using SCE (Specular Excluded) and SCI (Specular Included). Soil removal and gloss retention are determined using the following equations:

Soil Removal (%) = \((\delta E_d - \delta E_f)/\delta E_f\) \times 100

\[
\delta E_d = [(L_d - L_c)^2 + (a_d - a_c)^2 + (b_d - b_c)^2]^{1/2}
\]

\[
\delta E_f = [(L_f - L_c)^2 + (a_f - a_c)^2 + (b_f - b_c)^2]^{1/2}
\]

(c: clean tile; d: soiled tile; f: final after cleaning with wipe)

Gloss Retention (%) = \(100 - (I_g - F_g)/I_g\) \times 100

(I: initial reading, F: final reading and g: gloss)
Results

Example 1

Cleaning Formulation with Alkylpolyglucoside Component

Formulation A : Alkylpolyglucoside Formula

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier; Trade Name</th>
<th>A</th>
<th>A1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Alkylpolyglucoside</td>
<td>GLUCOPON 425N</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>1-butoxy-2-propanol</td>
<td>Aldrich</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Polymer 1</td>
<td>Ciba</td>
<td>0</td>
<td>0.02</td>
</tr>
<tr>
<td>Preservative</td>
<td>KATHON CG/ICP</td>
<td>0.0002</td>
<td>0.0002</td>
</tr>
<tr>
<td>Water to</td>
<td>De-ionized</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>7.29</td>
<td>5.55</td>
</tr>
<tr>
<td>Loading on wipe</td>
<td></td>
<td>325%</td>
<td>370%</td>
</tr>
</tbody>
</table>

Polymer 1 is polyacrylamide, molecular weight = 10,000,000-1 5,000,000 g, linear and non-cross linked; wipe is a polyester/wood pulp non-woven type.

The formulation is carried out on a 100 g scale. To a beaker equipped with a magnetic stirrer is added de-ionized water (90 g). Polymer 1 (0.02 g) is added and mixed until it is fully dissolved. At this point, Polymer 1 is fully swollen. The alkylpolyglucoside (0.03 g) is added and mixed until fully dissolved. The 1-butoxy-2-propanol (1 g) is added and mixed until fully dissolved. The preservative (0.0002 g) is added and mixed until fully dissolved. Enough de-ionized water is added to bring the total formulation weight 100 g.
Example 2
Cleaning Formulation with Quaternary Ammonium Biocide Component

**Formulation B : Quaternary Ammonium Biocide Formula**

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier, Trade Name</th>
<th>B</th>
<th>B₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary biocide</td>
<td>BARQUAT 4250</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>EDTA</td>
<td>Versene 100</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>1-butoxy-2-propanol</td>
<td>Aldrich</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Amine oxide surfactant</td>
<td>Ammonyx LO</td>
<td>0.12</td>
<td>0.12</td>
</tr>
<tr>
<td>Non-ionic surfactant</td>
<td>SURFONIC L24-9</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>Aldrich</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Potassium Citrate</td>
<td>Aldrich</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Polymer 1</td>
<td>Ciba</td>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td>Water to De-ionized</td>
<td>De-ionized</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>11.35</td>
<td>11.31</td>
</tr>
<tr>
<td>Loading on wipe</td>
<td></td>
<td>300%</td>
<td>272%</td>
</tr>
</tbody>
</table>

Polymer 1 is polyacrylamide, molecular weight = 10,000,000-1 5,000,000 g, linear and non-cross linked; wipe is a polyester/wood pulp non-woven type.

The formulation is carried out on a 100 g scale. To a beaker equipped with a magnetic stirrer is added de-ionized water (90 g). Polymer 1 (0.02 g) is added and mixed until it is fully dissolved. At this point, Polymer 1 is fully swollen. The quaternary biocide (0.15 g) is added and mixed until fully dissolved. The EDTA (0.11 g) is added and mixed until fully dissolved. The 1-butoxy-2-propanol (1.5 g) is added and mixed until fully dissolved. The amine oxide surfactant (0.12 g) is added and mixed until fully dissolved. The non-ionic surfactant (0.40 g) is added and mixed until fully dissolved. The isopropyl alcohol (1 g) is added and mixed until fully dissolved. The potassium citrate (0.1 g) is added and mixed until fully dissolved. Enough de-ionized water is added to bring the total formulation weight 100 g.
Example 3
Cleaning Formulation with Quaternary Ammonium Biocide Component

Formulation C: Quaternary Ammonium Biocide Formula

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier, Trade Name</th>
<th>C</th>
<th>C₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quaternary biocide</td>
<td>BARQUAT 4250</td>
<td>0.15</td>
<td>0.15</td>
</tr>
<tr>
<td>EDTA</td>
<td>VERSENE 100</td>
<td>0.038</td>
<td>0.038</td>
</tr>
<tr>
<td>1-butoxy-2-propanol</td>
<td>Lab</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Amine oxide</td>
<td>Ammonyx LO</td>
<td>0.075</td>
<td>0.075</td>
</tr>
<tr>
<td>Non-ionic</td>
<td>SURFONIC L24-9</td>
<td>0.25</td>
<td>0.25</td>
</tr>
<tr>
<td>Isopropyl alcohol</td>
<td>Aldrich</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ammonium Chloride</td>
<td>Aldrich</td>
<td>0.1</td>
<td>0.1</td>
</tr>
<tr>
<td>Polymer 1</td>
<td>Ciba</td>
<td></td>
<td>0.02</td>
</tr>
<tr>
<td>Water to</td>
<td>De-ionized</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>8.73</td>
<td>8.30</td>
</tr>
<tr>
<td>Loading on wipe</td>
<td></td>
<td>254%</td>
<td>290%</td>
</tr>
</tbody>
</table>

Polymer 1 is polyacrylamide, molecular weight = 10,000,000-1 5,000,000 g, linear and non-cross linked; wipe is a polyester/wood pulp non-woven type.

The formulation is carried out on a 100 g scale. To a beaker equipped with a magnetic stirrer is added de-ionized water (90 g). Polymer 1 (0.02 g) is added and mixed until it is fully dissolved. At this point, Polymer 1 is fully swollen. The quaternary biocide (0.15 g) is added and mixed until fully dissolved. The EDTA (0.038 g) is added and mixed until fully dissolved. The 1-butoxy-2-propanol (1.5 g) is added and mixed until fully dissolved. The amine oxide surfactant (0.075 g) is added and mixed until fully dissolved. The non-ionic surfactant (0.25 g) is added and mixed until fully dissolved. The isopropyl alcohol (2 g) is added and mixed until fully dissolved. The ammonium chloride (0.1 g) is added and mixed until fully dissolved. Enough de-ionized water is added to bring the total formulation weight 100 g.
Example 4

Cleaning Formulation with Dodecylbenzene Sulphonate Sodium Salt Component

Formulation D: Dodecylbenzene Sulphonate Sodium Salt Formula

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Supplier, Trade Name</th>
<th>D</th>
<th>D₁</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dodecylbenzene sulphonate Sodium Salt</td>
<td>CALSOFT LAS-40</td>
<td>0.6</td>
<td>0.6</td>
</tr>
<tr>
<td>2-butoxyethanol</td>
<td>Aldrich</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Polymer 1</td>
<td>Ciba</td>
<td></td>
<td>0.025</td>
</tr>
<tr>
<td>Tetrapotassium pyrophosphate (TKPP)</td>
<td>Aldrich</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Ethanol</td>
<td>Aldrich</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Water to</td>
<td>De-ionized</td>
<td>100</td>
<td>100</td>
</tr>
<tr>
<td>pH</td>
<td></td>
<td>11</td>
<td>11</td>
</tr>
<tr>
<td>Loading on wipe</td>
<td></td>
<td>300%</td>
<td>300%</td>
</tr>
</tbody>
</table>

Polymer 1 is polyacrylamide, molecular weight = 10,000,000-15,000,000 g, linear and non-cross linked; wipe is a polyester/wood pulp non-woven type.

The formulation is carried out on a 100 g scale. To a beaker equipped with an overhead stirrer is added de-ionized water (90 g). The solid builder (TKPP, 2 g) is added and mixed until fully dissolved. Polymer 1 (0.025 g) is added and mixed until it is fully dissolved. At this point, Polymer 1 is fully swollen. The surfactant (0.60 g) is added and mixed until fully dissolved. The 1-butoxy-2-propanol (2 g) is added and mixed until fully dissolved. The ethanol (2 g) is added and mixed until fully dissolved. Enough de-ionized water is added to bring the total formulation weight 100 g.

Example 5

Preparation and Testing of Pre-moistened Cleaning Wipe Using Alkylpolyglucoside Formulation

The formulation of Example 1 is applied to a polyester/wood pulp, non-woven, dry towelette or wipe using a padding machine. The percentage weight up take is noted and is based of
the dry weight of the towelette or wipe. The pre-moistened cleaning wipe of the invention is used to clean soiled white ceramic tile as per the aforementioned procedure.

<table>
<thead>
<tr>
<th>Wipe containing formulation</th>
<th>Formulation Uptake [wt.-%]</th>
<th>Soil Removal [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>’Chlorox®</td>
<td>NA</td>
<td>28</td>
</tr>
<tr>
<td>A</td>
<td>325</td>
<td>44</td>
</tr>
<tr>
<td>A1</td>
<td>370</td>
<td>89</td>
</tr>
</tbody>
</table>

XHLOROX: Disinfectant Wipes

These data demonstrate that the pre-moistened disposable cleaning substrates of the invention are used to clean surfaces with outstanding results.

Example 6

Preparation and Testing of Pre-moistened Cleaning Wipe Using Alkylpolyglucoside Formulation

The formulation of Example 1 is applied to a polyester/wood pulp, non-woven, dry towelette using a padding machine. The percentage weight up take is noted and is based of the dry weight of the towelette or wipe. The pre-moistened cleaning wipe of the invention is used to clean soiled black enamel panels as per the aforementioned procedure.

<table>
<thead>
<tr>
<th>Wipe containing formulation</th>
<th>Formulation Uptake [wt.-%]</th>
<th>Soil Removal [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chlorox®</td>
<td>NA</td>
<td>47</td>
</tr>
<tr>
<td>A</td>
<td>325</td>
<td>26</td>
</tr>
<tr>
<td>A1</td>
<td>370</td>
<td>44</td>
</tr>
</tbody>
</table>

These data demonstrate that the pre-moistened disposable cleaning substrates of the invention are used to clean surfaces with outstanding results.

Example 7

Preparation and Testing of Pre-moistened Cleaning Wipe Using Quaternary Ammonium Biocide Formulation

The formulation of Example 2 is applied to a polyester/wood pulp, non-woven, dry towelette using a padding machine. The percentage weight up take is noted and is based of the dry weight of the towelette or wipe. The pre-moistened cleaning wipe of the invention is used to clean soiled black enamel panels as per the aforementioned procedure.
LYSOL: Sanitizing Wipes

These data demonstrate that the pre-moistened disposable cleaning substrates of the invention are used to clean surfaces with outstanding results.

Example 8

5 Preparation and Testing of Pre-moistened Cleaning Wipe Using Dodecylbenzene Sulphonate Sodium Salt Formulation

The formulation of Example 4 is applied to a polyester/wood pulp, non-woven, dry towelette using a padding machine. The percentage weight up take is noted and is based of the dry weight of the towelette. The pre-moistened cleaning wipe of the invention is used to clean soiled black enamel panels as per the aforementioned procedure.

<table>
<thead>
<tr>
<th>Wipe containing formulation</th>
<th>Formulation Uptake [wt.-%]</th>
<th>Soil Removal [%]</th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Lysol®</em></td>
<td>NA</td>
<td>&lt; 50</td>
</tr>
<tr>
<td>B</td>
<td>300</td>
<td>57</td>
</tr>
<tr>
<td>B1</td>
<td>272</td>
<td>87</td>
</tr>
</tbody>
</table>

These data demonstrate that the pre-moistened disposable cleaning substrates of the invention are used to clean surfaces with outstanding results.

Example 9


The cleaning compositions listed in U.S. Pat. Spec. No. 4,820,450, Examples 1-20, U.S. Pat. Spec. No. 6,251,849, Tables 1 and 4-7, U.S. Pat. Spec. 6,653,274, Examples 1 and 3, U.S. Publ Pat. Application 2005/0192199, Tables 1-4 and 6, are formulated to include 0.1% by weight of Polymer 1 of the invention. These cleaning formulations are applied to a polyester/wood pulp, non-woven, dry towelette using methods known to those skilled in the art. The percentage weight up take is noted and is based of the dry weight of the towelette or wipe.
The pre-moistened cleaning wipe or substrate of the invention is thus obtained. These pre-moistened disposable cleaning substrates are used to clean a variety of hard and soft surfaces with outstanding results.
Claims

1. A pre-moistened, disposable cleaning substrate for cleaning surfaces, said substrate comprising:
   a) A single layered substrate; and
   b) A cleaning composition, said composition comprising:
      i) 0.001 %-5% by weight of linear, non-ionic polyacrylamide;
      ii) 0.25%-1.5% by weight of a non-volatile organic solvent;
      iii) 0.001 %-1.5% by weight of at least one detersive surfactant;
      iv) optionally 0.001 %-5% by weight of other cleaning polymers; and
      v) balance amount of water.

2. A pre-moistened cleaning disposable substrate according to claim 1 wherein said polyacrylamide of component (b) i) has a weight average molecular weight from about 5,000,000 to about 25,000,000 amu.

3. A cleaning substrate according to claim 1 wherein the polyacrylamide of component b) i) is present in the cleaning composition in a concentration from 0.001-2% by weight based on the weight of the composition.

4. A pre-moistened cleaning disposable substrate according to claim 1 wherein said substrate is a cleaning wipe.

5. A method of incorporation of a cleaning composition into a single layer absorbent material producing a pre-moistened disposable cleaning substrate that comprises the steps of:
   a) Obtaining a single layered absorbent material; and
   b) Incorporating therein a cleaning composition, said composition comprising:
      i) 0.001 %-5% by weight of linear, non-ionic polyacrylamide;
      ii) 0.25%-1.5% by weight of a non-volatile organic solvent;
      iii) 0.001 %-1.5% by weight of at least one detersive surfactant;
      iv) optionally 0.001 %-5% by weight of other cleaning polymers; and
      v) balance amount of water.
INTERNATIONAL SEARCH REPORT

A. CLASSIFICATION OF SUBJECT MATTER

According to International Patent Classification (IPC) or to both national classification and IPC:

- INV. C11D3/20
- C11D3/37
- C11D3/43
- C11D17/04
- A47L13/17

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols):

- A24D
- C11D
- A47L

Electronic data base consulted during the international search (name of data base and, where practical, search terms used):

- EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

<table>
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<tr>
<th>Category</th>
<th>Citation of document, with indication, where appropriate, of the relevant passages</th>
<th>Relevant to claim No</th>
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<td>X</td>
<td>US 5 686 088 A (RITRA SEKHAR [US] ET AL)</td>
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<td>11 November 1997 (1997-11-11) column 3, lines 55-57 - column 4, lines 3-13,23-33</td>
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<td>column 10, lines 52-67; claims 1,2; examples I-III</td>
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<td>X</td>
<td>WO 01/45615 A (PROCTER &amp; GAMBLE [US])</td>
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<td></td>
<td>28 June 2001 (2001-06-28) claims 1,8; examples 79-88,116</td>
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<td>Y</td>
<td>WO 2006/028912 A (PROCTER &amp; GAMBLE [US]; PANANDIKER RAJAN KESHAV [US]; KUPNESKI</td>
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<td></td>
<td>MICHAEL) 16 March 2006 (2006-03-16) page 25, paragraph 2 - page 26, paragraph 2</td>
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<td>; claims 1,7; examples 1-8</td>
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X Further documents are listed in the continuation of Box C

See patent family annex

- Special categories of cited documents:
  - "A" document defining the general state of the art which is not considered to be of particular relevance
  - "E" earlier document but published on or after the international filing date
  - "I" document which may throw doubts on prior art claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
  - "O" document referring to oral disclosure, use, exhibition or other means
  - "P" document published prior to the international filing date but later than the priority date claimed
  - "T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
  - "X" document of particular relevance, the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
  - "Y" document of particular relevance, the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art
  - "S" document member of the same patent family

Date of the actual completion of the international search: 5 February 2008

Date of mailing of the International search report: 18/02/2008

Name and mailing address of the ISA:

European Patent Office, P B 5818 Patentlaan 2 NL- 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx 31 651 epo nl.
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Authorized officer: LOISELET-TAISNE, S
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<td>US 5 507 968 A (PALAIKIS LIANA V [US])</td>
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