Title: NONFLUORINATED SOIL RESIST AND REPELLENCY COMPOSITIONS

Abstract: A composition comprising at least one of a surfactant, and at least one of a nonfluorinated soil resist agent, and at least one of a repellent agent; a method of imparting surface effects to substrates contacted therewith; and the resulting treated substrates.
TITLE

NONFLUORINATED SOIL RESIST AND REPELLENCY COMPOSITIONS

FIELD OF THE INVENTION

The present invention comprises nonfluorinated compositions for providing soil resistance and repellency to fibrous substrates treated therewith, a method of treating substrates to impart such surface effects, and the resulting treated substrates.

BACKGROUND OF THE INVENTION

Polyfluorinated compositions are used in the preparation of a wide variety of surface treatment materials. Various materials made from perfluorinated compositions are known to be useful as surfactants or treating agents to impart surface effects to substrates. In particular, commercially successful products for providing soil resistance to fibrous substrates have traditionally contained long chained perfluoroalkyl groups.

It is known in the art that there is a relationship between chain length of perfluoroalkyls in surface treatment compositions and the surfaces properties imparted. See Honda et al., Macromolecules, 2005, Vol. 13, pp. 5699-5705, in particular p 5704. Long chain perfluoroalkyls of greater than or equal to 8 carbons align in a parallel manner in the crystalline state. Surface effects are related to the alignment in that highly ordered chains have low mobility. Shorter chain perfluoroalkyls of 2 to 6 carbons lose this alignment, have higher mobility, and have reduced contact angle measurements. Surface effect performance drops off when the chain length is shortened.

US Patent 4,883,839 of Fitzgerald et al. discloses a composition for imparting stain resistance to textile and carpet substrates comprising 1) a hydrolyzed copolymer of maleic anhydride and ethylenically unsaturated aromatic monomers, and 2) a sulfonated phenol-formaldehyde condensation product. The composition can be applied as an aqueous solution and the substrate does not suffer from yellowing to the extent that occurs with other known stain resist agents. Use of a separate fluorinated compound is taught in order to obtain soil resistance in the substrate.
US Patent 7,550,199 of Hopkins et al discloses a method for imparting stain resistance to a substrate comprising contacting the substrate with a copolymer made by reacting an amine with an alkene/maleic anhydride copolymer, and/or an alpha olefin/maleic anhydride copolymer. Use of a separate fluorinated compound is taught in order to obtain soil resistance in the substrate.

The two patents referenced above are directed to resistance to acid dye type stains, typically resulting from contact with foods and beverages. Both require the use of a separate fluorinated compound to obtain soil resistance.

In particular there is a need for surface treatment agents for providing soil resistance and repellency to substrates wherein some of the expensive fluorocarbon moieties have been replaced with less expensive and more readily biodegradable moieties. The present invention provides nonfluorinated surface treatment agents which are economical to manufacture while providing effective soil resistance and repellency to fibrous substrates.

**BRIEF SUMMARY OF THE INVENTION**

The present invention comprises a composition comprising at least one of a surfactant, at least one nonfluorinated soil resist agent, and at least one of a repellent agent, which imparts soil resistance and repellency to a substrate which has been contacted with said composition.

The present invention further comprises a composition comprising at least one of a surfactant, at least one of a nonfluorinated soil resist agent, at least one of a repellent agent, and optionally one or more of an inorganic oxide.

The present invention further comprises a method of providing soil resistance plus repellency to a substrate comprising contacting said substrate with a composition as described above.

The present invention further comprises a substrate treated in accordance with the method described above.

**DETAILED DESCRIPTION OF INVENTION**

Hereinafter trademarks are designated by upper case.

“Soil resist agent” as used herein means a nonfluorinated composition applied to, or incorporated into, a substrate which retards and limits the build-up of dirt or soil on the surface of the substrate.
“Repellent agent” as used herein means a composition applied to, or incorporated into, a substrate which enables the substrate to resist wetting by aqueous liquids.

“Repellency” as used herein means repellency to wetting by liquids.

The present invention comprises a composition comprising at least one of a surfactant, at least one of a nonfluorinated soil resist agent, and at least one of a repellent agent, which composition imparts soil resistance and repellency to a substrate which has been contacted with said composition. The present invention further comprises a composition comprising at least one of a surfactant, at least one of a nonfluorinated soil resist agent, and at least one of a repellent agent, which further contains one or more of an inorganic oxide, water, or a combination thereof.

Other embodiments of the invention include a method of treating substrates to impart soil resistance and repellency by contacting the substrate with any of the above-described compositions of the invention, and the resulting treated substrates having surface properties. The compositions and methods of the present invention employ nonfluorinated agents to provide or impart soil resistance to substrates which is comparable to or improved versus that provided or imparted by prior art fluorinated soil resist agents.

In all embodiments of the present invention, the surfactant, the nonfluorinated soil resist agent, the optional inorganic oxide, and the repellent agent are present at weight percentages of each individual component that is used to prepare the compositions of the present invention. The surfactant is present from about 0.01 % to from about 10 % by weight. The nonfluorinated soil resist agent is present from about 0.01% to from about 30 % by weight. The repellent agent is present from about 0.1 to 30 % by weight. The inorganic oxide is present from 0% to from about 30 % by weight. The remainder of the composition is water. The weight percentage of each component (surfactant, nonfluorinated soil resist agent, inorganic oxide, repellent agent) is chosen such that it is equal to any individual number within a weight range specified for each, and the sum of the combined components is equal to 100%. One skilled in the art can easily choose weight percentages for each component within the stated ranges so that the total equals 100%. For example, the surfactant is present at any of 0.01, 0.2, 0.3 and so
on, up to 10% by weight; the nonfluorinated soil resist agent is present at any of
0.1, 0.2, 0.3 and so on up to 30% by weight; the repellent agent is present at any
of 0, 1, 2, 3, 4 and so on up to 30% by weight; and the inorganic oxide is present
at any of 0, 0.1, 0.2, 0.3 and so on up to 30% by weight. The combination of any
5 individual value for the surfactant from 0.1 to 10%, of any individual value for
nonfluorinated soil resist agent from 0.1 to 30%, of any individual value for the
repellent agent from 0.1 to 30%, of any individual value for the inorganic oxide
from 0 to 30% by weight, that totals 100% by weight is included within the
present invention. For all combinations of components, if the values of the weight
10 percentages selected do not add up to 100%, the remainder of the weight % of the
composition is composed of water in an amount to make the total add up to 100%
by weight.

In particular embodiments described below, the surfactant, the
nonfluorinated soil resist agent, the repellent agent, and the inorganic oxide are
each equal to any individual value within the range cited for each of the
surfactant, the nonfluorinated soil resist agent, the repellent agent, and the
inorganic oxide, respectively. The invention includes any combination of the
individual values for the surfactant, the nonfluorinated soil resist agent, the
repellent agent, the inorganic oxide, and water, that total to 100%.

20 One embodiment of the present invention comprises a composition
comprising at least one of a surfactant, at least one of a nonfluorinated soil
resist agent, and at least one of a repellent agent. Nonfluorinated soil
resist agents suitable for use in the present invention include carboxylated
polymers, an alkali metal salt of a hydrolyzed styrene/maleic anhydride
copolymer, an alkali metal sale of a hydrolyzed styrene/maleic anhydride/cumene terpolymer, a alkali metal salt of a hydrolyzed octene/maleic
25 anhydride copolymer, an ammonium salt of a hydrolyzed styrene/maleic anhydride copolymer, an ammonium salt of a hydrolyzed styrene/ maleic anhydride/cumene terpolymer; methyl methacrylate/ethyl methacrylate
copolymer, polymethylmethacrylate, poly(methylmethacrylate)/
polyethoxy ethyl methacrylate copolymer, polymethacrylic acid,
polystyrene, sulfonated polyester, polyester, and a dispersion of inorganic
particulate matter selected from amorphous silicon dioxide, colloidal
silica, amorphous silica, clay, titanium dioxide, colloidal alumina, and zirconium oxide. Mixtures of any of the above soil resist agents are also suitable for use.

Preferred soil resist agents include polymethylmethacrylate, methyl methacrylate/ethyl methacrylate copolymer, an alkali metal salt of a hydrolyzed styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer, an ammonium salt of a styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer, amorphous silicon dioxide, colloidal silica, and amorphous silica. Hydrolyzed styrene/maleic anhydride copolymer, hydrolyzed octene/maleic anhydride copolymers, hydrolyzed styrene/maleic anhydride/cumene terpolymers, and the salts of each, are commercially available or are prepared by known methods, such as disclosed in US Patents 5,707,708 and 5,834,088, each herein incorporated by reference.


Surfactants suitable for use in the composition of the present invention include surfactants selected from the group consisting of an alkali metal salt of alpha sulfonated carboxylic acids or esters; an alkali metal salt of 1-octane sulfonate; alkyl aryl sulfate; alkali metal alkyl diphenyloxide disulfonate; alkali
metal salt of dimethyl-5-sulfoisophthalate; salt of butyl naphthalene sulfonated salt of C₁₆ - C₁₈ phosphate (such as potassium); salt of condensed naphthalene formaldehyde sulfonated (such as sodium); salt of dodecyl benzene sulfonate (branched) (such as sodium); salt of alkyl sulfate (such as sodium); alpha olein sulfonate; salt of dodecyl diphenyloxide disulfonate; polyoxyethylene (20) cetyl ether; ethoxylated alcohol; alkyl dimethyl amine; polyoxyethylene tridecyl ether; dodecyl dimethyl ammonium acetate; alkali metal salts of sulfonated 1,1-oxybis, tetrapropylene benzene, and anionic surfactants. Preferred surfactants include alpha olein sulfonates and alkali metal salt of alkyl sulfate.

Suitable commercially available nonfluorinated surfactants include ALPHASTEAM-STEP MC-48 (Stepan Company, Northfield, IL), ARMEEN DM12D (AkzoNobel, Chicago, IL), BIO-TERGE PAS-8S (Stepan Company, Northfield, IL), BRIJ 58 (Uniqema, New Castle, DE), CENEGEN 7 (Yorkshire America, Charlotte, NC), DEXTROL Foamer 916 (Dexter Chemical L.L.C., Bronx, NY), DOWFAX 2A1 (Dow Chemical Co., Midland, MI), ETHAL TDA-5 (Ethox Chemicals, LLC., Greenville, SC), NOPCOSPRSE 9268A (Henkel/Cognis, Cincinnati, OH), RHODAPON SB-8208S (Ashland Chemical Company, Columbus, OH), SUL-FON-ATE AA-10 (Tennessee Chemical Co., Atlanta, GA), ULTRAFOAM FFA-3 (Phoenix Chemical Company, Inc., Calhoun, GA), UNIFROTH 0448 (Unichem, Inc., Haw River, NC), WITCO C-6094 (Witco, Houston, TX), and WITCOLATE WAQE (Witco, Houston, TX).

Repellent agents suitable for use in the present invention include amorphous silicon dioxide; dimethyl silicone; an ammonium salt of hydrolyzed styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer; carboxylated styrene acrylic copolymer emulsion: polymer wax dispersion; wax emulsion; blend of wax and anionic emulsifying agent; hyperbranched dendrimers and polymers, hyperbranched dendrimers and polymers and modified silicon component, polymers of highly branched dendrimers in a matrix of hydrocarbons; aliphatic aqueous polyurethane dispersion; aqueous acrylic polymer dispersion; copolymer of behenyl acrylate and N,N-diethyaminoethylmethacrylate; copolymer of isobornyl acrylate and N,N-diethyaminoethylmethacrylate; copolymer of hexadecyl acrylate and N,N-diethyaminoethylmethacrylate; copolymer of C₁₂ methacrylate and N,N-
diethylamineethylmethacrylate; copolymer of C₁₆ methacrylate and N-N-diethylaminomethylmethacrylate; copolymer of C₁₈ methacrylate and N-N-diethylaminomethylmethacrylate; copolymer of C₂₂ methacrylate and N-N-diethylaminomethylmethacrylate; copolymer of C₂₂ methacrylate and N-N-diethylaminomethylmethacrylate; copolymer of 2-ethylhexyl methacrylate and N,N-diethylaminomethylmethacrylate; alkyl ketene dimer; reactive silane; amino-functional polydimethylsiloxane emulsion; silicone amine; silicone polyether; silicone dialkyl quaternary compound; polydimethylsiloxane; acrylic copolymer emulsion; self-crosslinking acrylic polymer, chrome complex; and silicone polyether. Preferred repellent agents include amorphous silicon dioxide; dimethyl silicone; hyperbranched dendrimers and polymers, polymers of highly branched dendrimers in a matrix of hydrocarbons, blend of waxes and anionic emulsifying agents, and polymer wax dispersion.

Suitable commercially available repellent agents include ALBERDINGK AC 2314 (Alberdkngk Boley, Inc., Greensboro, NC); HD-4669 (C.L.Hauthaway & Sons Corp., Lynn, MA); NALAN GN (Synalloy Corp., Spartanburg, SC); RUCO-DRY DHN (Rudolf Chemie, Geretsried, Germany); RUCO-DRY ECO (Rudolf Chemie, Geretsried, Germany); ZP 9237 (Rudolf Chemie, Geretsried, Germany); RUCO-DRY DFE (Rudolf Chemie, Geretsried, Germany); RUCO EPV-2058 (Rudolf Chemie, Geretsried, Germany); SILSURF A004 (Siltech LLC, Dacula, GA); SILSURF A008 (Siltech LLC, Dacula, GA); SILSURF A012 (Siltech LLC, Dacula, GA); Starsoft SIL D (Star Technologies, Dalton, GA); SMA-1000 (Sartomer Company, Exton, PA); SMA-2625H (Sartomer Company, Exton PA); HERCON 195 (Hercules Canada, Inc., Mississauga, Canada); UNIBOND SA-220 (Unichem, Inc., Haw River, NC); UNIBOND AC-403 (Unichem, Inc., Haw River, NC); Wax Emulsion HPX3 (Manufacturers Chemicals LLC, Cleveland, TN).

The soil resist agent is present in the composition at from about 0.1 to about 30.0 % by weight. Preferably the soil resist agent is present at from about 0.1 to about 20.0 % by weight. More preferably the soil resist agent is present at from about 0.1 to about 15% by weight. The surfactant is present in the composition at from about 0.01 to about 10.0 % by weight. Preferably the
surfactant is present at from about 0.01 to about 5.0% by weight. More preferably the surfactant is present at from about 0.05 to about 4% by weight. The repellent agent is present in the composition at from about 0.1 to about 30.0% by weight. Preferably the repellent agent is present at from about 0.1 to about 20.0% by weight, more preferably at from about 0.15 to about 15% by weight, and more preferably at from about 0.2 to about 10% by weight.

For example, typically the composition of the present invention preferably contains from about 0.15 to about 6.0% by weight soil resist agent, from about 0.01 to 2.5% by weight of the surfactant, and from about 0.1 to about 4.0% by weight of the repellent agent. The soil resist agent is typically present at about 0.2, 0.4, 0.5, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, or 6.0% by weight, and any of these amounts of soil resist agent are present in combination with any one of about 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 1.0, 1.5, 2.0, or 2.5% by weight surfactant. The repellent agent is typically present at 0.14, 0.20, 0.30, 0.40, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0, or 3.5 weight %, in combination with any one of 0.2, 0.4, 0.5, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, or 6.0 % by weight soil resist agent; and any one of 0.02, 0.05, 0.10, 0.20, 0.30, 0.40, 0.5, 0.6, 0.7, 0.8, 1.0, 1.5, 2.0, or 2.5 % by weight surfactant. The remainder of each composition is water.

A further embodiment of the present invention is a composition comprising at least one of a surfactant, at least one of a nonfluorinated soil resist agent, at least one of a repellent agent, and at least one of an inorganic oxide, wherein the inorganic oxide also acts as a soil resist agent. Inorganic oxides suitable for use in the present invention include a stable dispersion of inorganic particulate matter selected from the group consisting of clay, colloidal silica, titanium dioxide, colloidal alumina, zirconium oxide, amorphous silicon dioxide, and colloidal silica dioxide. Preferred inorganic oxides include amorphous silicon dioxide and colloidal silica dioxide. The inorganic oxide is present in the composition at from about 0 to about 30.0 % by weight. The soil resist agent and surfactant are defined as previously described.

Suitable inorganic oxides include LUDOX HS-40 commercially available from Grace Division, Columbia, MD; NALCO 1050 commercially available from Nalco, Naperville, IL; NALCO 1034A commercially available from Nalco, Naperville, IL; NALCO 2327 commercially available from Nalco, Naperville, IL;
NALCO 13573 commercially available from Nalco, Naperville, IL; and
SILTECH C-404, SILTECH C-101, SILTECH C-40, SILTECH C-20 each
commercially available from Siltech LLC, Dacula, GA.

The soil resist agent, surfactant, and repellent agent are present in the
composition at the weight percent ranges described above. The inorganic oxide is
present at from about 0% to about 30% % by weight. More preferably the
inorganic oxide is present at from about 0.1% to about 20% by weight, even more
preferably from about 0.15% to about 15% by weight, and even more preferably
from about 0.2% to about 10% by weight. For example, typically the composition
of the present invention contains inorganic oxide at about 0.3, 0.5, 1.0, 1.5, 2.0,
2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 7.0, or 8.0% by weight in combination with any
one of 0.2, 0.4, 0.5, 0.8, 1.0, 1.5, 2.0, 3.0, 4.0, 5.0, or 6.0% by weight soil resist
agent, any one of 0.02, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 1.0, 1.5,
2.0, or 2.5% by weight surfactant, and any one of 0.14, 0.20, 0.30, 0.40, 0.50, 1.0,
1.5, 2.0, 2.5, 3.0, or 3.5% by weight repellent agent. The remainder of each
composition is water.

A further embodiment of the present invention is a composition
comprising at least one of a surfactant, at least one of a nonfluorinated soil resist
agent, at least one repellent agent, at least one additional component, and
optionally at least one inorganic oxide. Additional components, designated herein
“functional additives”, may be included for purposes such as to improve stability
of the composition, for pH adjustment, or for freeze/thaw stability. Functional
additives suitable for use in the present invention include soy protein
commercially available from Protein Technologies International, Inc.; dipropylene
glycol methyl ether commercially available from Lyondell, Houston, TX; 1,3-
propanediol commercially available from E. I. du Pont de Nemours and Company,
Wilmington, DE; para-toluene sulfonic acid commercially available from Sigma
Aldrich USA, St. Louis, MO; maleic anhydride solution commercially available
from Sigma Aldrich USA, St. Louis, MO; citric acid commercially available from
Continental Chemical and other sources; or polyester polyurethane dispersion
commercially available from Bayer Material Science LLC, Pittsburgh, PA.
Preferred additional components include 1,3-propanediol, para-toluene sulfonic
acid, maleic anhydride solution, and citric acid.
The functional additive is present in the composition at from about 0 to about 10.0% by weight. Preferably the functional additive is present at from about 0.05 to about 5.0 % by weight, more preferably from about 0.05 to about 2.0 % by weight. The soil resist agent, surfactant, repellent agent, and optional inorganic oxide are each as previously described, and present in amounts as previously described.

For example, typically the composition of the present invention contains 0.05, 0.10, 0.15, 0.20, 0.50, 0.75, 1.0, or 1.2 weight % of the functional additive, in combination with any one of 0.2, 0.4, 0.5, 0.8, 1.0, 1.5, 2.0, 2.5, 3.0, 4.0, 5.0, or 6.0 % by weight soil resist agent; any one of 0.02, 0.05, 0.10, 0.20, 0.30, 0.40, 0.50, 0.60, 0.70, 0.80, 1.0, 1.5, 2.0, or 2.50 % by weight surfactant; any one of 0.1, 0.14, 0.20, 0.30, 0.40, 0.50, 1.0, 1.5, 2.0, 2.5, 3.0 or 3.5 weight % repellent; and any one of 0, 0.3, 0.5, 1.0, 1.5, 2.0, 2.5, 3.0, 3.5, 4.0, 4.5, 5.0, 6.0, 7.0 or 8.0 % by weight inorganic oxide. The remainder of each composition is water.

The compositions of the present invention are prepared by physically blending the individual components, or aqueous solutions or dispersions of the individual components. Such blending is achieved by conventional means, such as by mixing or homogenization.

Preferred compositions of the present invention generally can depend upon the particular use or substrate. Preferred embodiments of the compositions of the present invention include each of the following compositions:

1) polymethylmethacrylate, amorphous silicon dioxide, and alpha olefin sulfonate surfactant;

2) polymethylmethacrylate, sodium alkyl sulfate surfactant, amorphous silicon dioxide, and hyperbranched dendrimers and polymers;

3) polymethylmethacrylate/2 polyethoxy ethyl methacrylate, dodecyl dimethyl ammonium surfactant, and polymers of high branched dendrimers in a matrix of hydrocarbons;

4) polymethylmethacrylate, sulfonated alkyl benzene surfactant, and hyperbranched dendrimers and polymers with modified silicon component;

5) polymethylmethacrylate/2 polyethoxy ethyl methacrylate, dodecyl dimethyl ammonium surfactant, polymer wax dispersion, and amorphous silica; and
6) polymethylmethacrylate, sulfonated alkyl benzene surfactant, alpha olefin sulfonate surfactant, polymers of high branched dendrimers in a matrix of hydrocarbons, and amorphous silica.

To obtain soil resistance and repellency in carpet or textiles using a one-step application, the following compositions are preferred:

1) at least 3.2 weight % polymethylmethacrylate, at least 0.66 weight % sodium alkylsulfate surfactant, 8.0 weight % amorphous silicon dioxide, at least 3.2 weight % hyperbranched dendrimers and polymers, and 84.94 or less weight % water;

2) at least 1.6 weight % polymethylmethacrylate, at least 0.32 weight % sodium alkyl sulfate surfactant, at least 4.0 weight % amorphous silicon dioxide, at least 1.6 weight % hyperbranched dendrimers and polymers, 92.48 or less weight % water; or

3) at least 0.8 weight % polymethylmethacrylate, at least 0.16 weight % sodium alkyl sulfate surfactant, at least 2.0 weight % amorphous silicon dioxide, at least 0.8 weight % hyperbranched dendrimers and polymers, and 96.24 or less weight % water.

The compositions of the present invention as defined above are useful to impart surface effects to substrates without the use of fluorinated components. Such surface effects include soil resistance plus repellency. The compositions of the present invention have the advantage of providing surface effects to substrates without the presence of the expensive fluorine component, and thus are more economical.

The present invention further comprises a method of imparting or providing soil resistance plus repellency to a substrate comprising contacting said substrate with a composition of the invention as described above. The composition of the present invention is contacted with suitable substrates by a variety of customary procedures. It is understood that the composition can be diluted prior to contacting with the substrate in the present method. For use on fibrous substrates, one can apply the composition from a dispersion by brushing, dipping, spraying, padding, roll coating, foaming or the like. Other suitable application techniques include exhaustion, flex-nip, nip, skein, winch, liquid injection, immersion, or overflow flood. The composition can be applied to dyed
or undyed substrates, scoured or unscoured substrates, substrates containing pigmented yarn, and can also be applied by use of the conventional beck dyeing procedure, continuous dyeing procedures or thread-line application. The composition can be applied to installed carpet or textiles, and to installed carpet or textiles after a cleaning such as hot water extraction or low moisture cleaning.

For paper or leather substrates the method includes addition of the composition during processing, such as to the paper pulp, or to the leather processing solutions. After contacting, soil resistance and repellency are provided to the treated substrate.

The compositions used in the method of this invention are contacted with the substrate as such, or in combination with other finishes, processing aids, foaming compositions, lubricants, anti-stains, and the like. Such optional additional components include treating agents or finishes to achieve additional surface effects, or additives commonly used with such agents or finishes such as surfactants, pH adjusters, cross linkers, wetting agents, wax extenders, and other additives known by those skilled in the art. Such additional components can comprise compounds or compositions that provide surface effects such as no iron, easy to iron, shrinkage control, wrinkle free, permanent press, moisture control, softness, strength, anti-slip, anti-static, anti-snag, anti-pill, stain repellency, stain release, stain resistance, soil release, odor control, antimicrobial, sun protection, cleanability and similar effects. One or more of such treating agents or finishes are applied to the substrate before, after, or simultaneously with the composition used in the method of the present invention.

The optimal treatment for a given substrate depends on (1) the characteristics of the nonfluorinated composition of the present invention, (2) the characteristics of the surface of the substrate, (3) the amount of nonfluorinated composition applied to the surface, (4) the method of contacting of the nonfluorinated composition onto the surface, and many other factors. Some nonfluorinated compositions work well on many different substrates, while others exhibit superior performance on some substrates or require higher loading levels. One skilled in the art can optimize the recommended compositions for specific situations as detailed above.
Optionally a blocked isocyanate to further promote durability can be added to the composition of the present invention (i.e., as a blended isocyanate). An example of a suitable blocked isocyanate is HYDROPHOBAL HYDORPHOBOL XAN commercially available from Ciba Specialty Chemicals, High Point, NJ. Other commercially available blocked isocyanates are also suitable for use herein. The desirability of adding a blocked isocyanate depends on the particular application for the treating agent. For most of the presently envisioned applications, it does not need to be present to achieve satisfactory cross-linking between chains or bonding to the substrate. However, it can be useful when treating textiles. When added as a blended isocyanate, amounts up to about 20% by weight can be added.

Optionally, non-fluorinated extender compositions can also be included in the application composition to obtain some combination of benefits. Examples of such an optional additional extender polymer composition are those disclosed in US Patents 7,344,758; 7,652,112; and 7,652,112.

For fibrous substrates, the soil resist agent is present in the composition at from about 0.1 to about 30.0% by weight. Preferably the soil resist agent is present at from about 0.2 to about 20.0% by weight. The surfactant is present in the composition at from about 0.01 to about 10.0% by weight. Preferably the surfactant is present at from about 0.05 to about 5.0% by weight. The repellent agent is present in the composition at from about 0.1 to about 30.0% by weight. Preferably the repellent agent is present at from about 0.1 to about 20.0% by weight. The total number of functional additives is present in the composition at from about 0 to about 10.0% by weight.

In the case of a carpet or textile substrate, the “wet pick up” is the weight of the composition applied to the carpet or textile, based on the dry weight of the carpet or textile face fiber. A low wet pickup bath system can be interchanged with low wet pickup spray or foam systems, and a high wet pickup bath system can be interchanged with other high wet pickup systems, e.g., flex-nip system, foam, pad, or flood. The method employed determines the appropriate wet pickup and whether the application is made from one side of the carpet or textile (spray and foam applications) or both sides (flex-nip and pad). The following
Table 1 provides typical process specifications for application to carpet or textile substrates.

<table>
<thead>
<tr>
<th>Application</th>
<th>Wet Pickup Range - %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flex-nip</td>
<td>150 – 350</td>
</tr>
<tr>
<td>Flood</td>
<td>100 – 500</td>
</tr>
<tr>
<td>Foam</td>
<td>5 – 300</td>
</tr>
<tr>
<td>Pad</td>
<td>100 – 500</td>
</tr>
<tr>
<td>Spray</td>
<td>5 – 300</td>
</tr>
</tbody>
</table>

The dispersion or solution of the composition of the present invention is diluted for application. Many variations of the conditions for spray, foam, flex-nip, flood, and pad applications are known to those skilled in the art and the preceding conditions are provided as examples and are not intended to be exclusive. The dispersion or solution of the present invention is typically applied to a carpet at a wet pickup of about 5% to about 500%, and preferably cured at from about 220 °F (104 °C) to about 260 (127 °C). Alternatively, the treated carpet can be air dried. Optionally the carpet or textile can be pre-wetted before application of the dispersion or solution of the present invention. To pre-wet the carpet or textile, it is immersed in water and the excess water suctioned off.

For leather substrates, the composition of the present invention is applied by spraying onto dry or semi-wet hides, or immersion of leather into the composition of the present invention. The composition is applied during processing, or applied after completion of the normal tanning, retanning, or dying processes. It is preferred to combine the application of the composition of the present invention with the manufacturing process during the final stages of leather manufacture. For paper substrates the composition of the present invention is typically added to the paper pulp during processing.

The method of the present invention provides resistance to early soiling and repellency to the treated substrates without the use of fluorinated compounds versus use of prior art fluorochemical soil resist compositions. The method can be conducted at a mill or manufacturing facility, by a retailer, or by an installer, or
after installation or sale. In the method of the present invention the composition of the present invention can also be applied to a substrate by a pump spray or as an aerosol. When applied as an aerosol, the present invention further comprises a propellant. Any propellant that is compatible with the composition used in the method of this invention can be employed, including but not limited to hydrocarbons, inorganic gases, or combinations thereof.

The present invention further comprises a substrate treated with or contacted with a composition providing soil resistance and repellency, said composition comprising any of the compositions of the present invention as described above. Suitable substrates for use with the composition and method of the present invention are fibrous substrates. Fibrous substrates include generally carpet, rugs, textiles, leather, paper, nonwovens, and other cellulosics. Examples of such substrates include films, fibers, yarns, fabrics, carpeting, paint brushes, paint rollers, paint applicators, and other articles made from filaments, fibers, or yarns derived from natural, modified natural, or synthetic polymeric materials or from blends of these with other fibrous materials. Specific representative examples are cotton; wool; silk; nylon including nylon 6, nylon 6,6 and aromatic polyamides; polyesters including poly(ethyleneterephthalate) and poly(trimethylene- terephthalate) (abbreviated PET and PTT, respectively); poly(acrylonitrile); polyolefins; paper; leather; jute; sisal; and other cellulosics. Further suitable substrates include nonwoven substrates, for example, spunlaced nonwovens, such as SONTARA available from E. I. du Pont de Nemours and Company, Wilmington, DE, and spunbonded-meltblown-spunbonded nonwovens. The compositions of this invention impart soil resistance properties and repellency properties to fibrous substrates. The preferred substrates of the present invention are carpeting, rugs, textiles, and nonwovens.

The compositions, methods, and substrates of the present invention provide several advantages. Compositions of the present invention impart soil resistance when applied to fibrous substrates without the use of fluorinated compounds. Compositions of the present invention also impart repellency when such treating agents are present in the composition. The methods of the present invention provide for the treatment of fibrous substrates to impart soil resistance
plus repellency. Also provided are fibrous substrates which have excellent performance when compared to those treated with existing prior art fluorinated treatment compositions. The treated substrates have a wide variety of industrial and consumer uses, such as in carpets, rugs, draperies, furnishings, fabrics, uniforms, clothing, paint applicators, and other uses, where soil resistance and other surface effects are an advantage.

**Test Methods and Materials**

The following materials, obtained from the sources listed, were used in the Examples herein.

1. **Surfactants**
   1) UNIFROTH 0448 (Unichem Inc., Haw River, NC)
   2) ULTRAFOAM FFA-3 (Phoenix Chemical Company, Inc., Calhoun, GA)
   3) DOWFAX 2A1 (Dow Chemical Co., Midland, MI)

2. **Water or oil repellent agents**
   1) RUOCO EPV 2058 (Rudolf Chemie, Geretsried, Germany)
   2) RUOCO DRY ECO (Rudolf Chemie, Geretsried, Germany)
   3) RUOCO DRY DHN (Rudolf Chemie, Geretsried, Germany)
   4) ZP 9237 (Rudolf Chemie, Geretsried, Germany)

5. ALBERDINGK AC 2314 (Alberdkngk Boley, Inc., Greensboro, NC)

6. UNIBOND AC-403 (Unichem Inc., Haw River, NC)

The following application methods and test methods were used in the Examples herein.

**Application Method A**

The treatment was applied as an aqueous composition by spray application to the carpet at 25% wet pick-up (wpu) and dried to a carpet face temperature of 250°F (121°C). The carpet was either wet or dry prior to the application treatment.
Application Method C

The treatment was applied as an aqueous composition by foam application to the carpet at 25% wet pick-up (wpu) and dried to a carpet face temperature of 250°F (121°C). The carpet was either wet or dry prior to the application treatment.

Test Method 1 - Accelerated Soiling Test

A drum mill (on rollers) was used to tumble synthetic soil onto the carpet. Synthetic soil was prepared as described in AATCC Test Method 123-2000, Section 8. Synthetic soil, 3 g, and 1 liter of clean nylon resin beads (3/16 inch (0.32 - 0.48 cm) diameter ZYTEL 101 nylon resin beads, commercially available from E. I. du Pont de Nemours and Company, Wilmington, De., were placed into a clean, empty canister. The canister lid was closed and sealed and the canister rotated on rollers for 5 minutes. The soil-coated beads were removed from the canister.

Total carpet sample size was 8 × 24 inch (20.3 × 60.9 cm). One test item and one control item were tested simultaneously. The carpet pile of all samples was laid in the same direction. Strong adhesive tape was placed on the backside of the carpet pieces to hold them together. The carpet samples were placed in the clean, empty drum mill with the tufts facing toward the center of the drum. The carpet was held in place in the drum mill with rigid wires. Soil-coated resin beads, 250 ml, and 250 ml of 5/16 in. diameter ball bearings (0.79 cm.), prepared as described above, were placed into the drum mill. The drum mill lid was closed and sealed. The drum was run on the rollers for 2½ minutes at 105 rpm. The rollers were stopped and the direction of the drum mill reversed. The drum was run on the rollers for an additional 2½ minutes at 105 rpm. The carpet samples were removed and vacuumed uniformly with 5 passes in each direction to remove excess dirt. The Delta E color difference for the soiled carpet was measured for the test and control items versus the unsoiled carpet for each item.

Color measurement of each carpet was conducted on the carpet following the accelerated soiling test. For each test sample and control sample the color of
the carpet was measured, the sample was soiled, and the color of the soiled carpet was measured. The Delta E was the difference between the color of the soiled and unsoiled samples. Color difference was measured on each item, using a Minolta Chroma Meter CR 410 Minolta Corporation, Ramsey, NJ. Color readings were taken at three different areas on the carpet sample, and the average Delta E was recorded. The control carpet for each test item was of the same color and construction as the test item.

Delta Delta E was calculated by subtracting the Delta E of the control carpet from the Delta E of the test item. A larger negative value for Delta Delta E indicated that the test carpet had better performance and less soiling than the control. A larger positive value for Delta Delta E indicated that the test carpet had poorer performance and soiled more than the control.

Test Method 3 – Water Repellency

The water repellency of a treated substrate was measured according to AATCC standard Test Method No. 193 and the DuPont Technical Laboratory Method as outlined in the TEFILON Global Specifications and Quality Control Tests information packet. The test determines the resistance of a treated substrate to wetting by aqueous liquids. Drops of water-alcohol mixtures of varying surface tensions are placed on the substrate and the extent of surface wetting is determined visually. Place a test carpet sample on a flat, non-absorbent surface. Beginning with the lowest numbered test liquid, carefully place one drop in several locations on the surface of the carpet sample. If no penetration or wetting of the carpet at the liquid-carpet interface and no wicking around the drop occurs, place drops of the next higher-numbered test liquid at an adjacent site on the carpet sample. Repeat this procedure until one of the higher number test liquids shows obvious wetting or wicking of the carpet under or around the drop within 10 seconds. The water repellency rating for a carpet sample is the numerical value of the highest-numbered test liquid which will not wet the carpet within 10 seconds. Higher ratings indicate greater repellency. The composition of water repellency test liquids is shown in Table 2.
Table 2.
Water Repellency Test Liquids

<table>
<thead>
<tr>
<th>Water Repellency Rating Number</th>
<th>Composition, Vol. % (Isopropyl Alcohol : Distilled Water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2:98</td>
</tr>
<tr>
<td>2</td>
<td>5:95</td>
</tr>
<tr>
<td>3</td>
<td>10:90</td>
</tr>
<tr>
<td>4</td>
<td>20:80</td>
</tr>
<tr>
<td>5</td>
<td>30:70</td>
</tr>
<tr>
<td>6</td>
<td>40:60</td>
</tr>
</tbody>
</table>

EXAMPLES

In the following examples all compositions used to treat substrates were aqueous solutions and contained an amount of water in weight % equal to [100% minus the total of the weight percentages of the other listed components]. Each treatment composition was prepared by mixing the components listed in water and diluting to the desired concentration. Also in the following examples the control carpet used in each example was the same type and structure as detailed for the treated carpet. The abbreviation wpu means wet pick-up.

Example 1

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.66 weight % sodium alkyl sulfate surfactant, 8.0 weight % amorphous silicon dioxide, 3.2 weight % RUCO ECO, and the remainder water. Carpet used in this example consisted of a level loop carpet (30 oz/sq.yd., 1.01 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 3.
Table 3 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Water repellency</th>
<th>Delta Delta E vs. Untreated carpet drum soil test soil resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>3</td>
<td>-5.0</td>
</tr>
<tr>
<td>Comparative Untreated Control</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Example 2

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 1.32 weight % polymethylmethacrylate, 0.28 weight % sodium alkyl sulfate surfactant, 3.6 weight % amorphous silicon dioxide, 1.44 weight % RUCO ECO, and the remainder water. Carpet used in this example consisted of a residential carpet (30 oz/sq.yd., 1.01 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 4.

Table 4 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Water repellency</th>
<th>Delta Delta E vs. Untreated carpet drum soil test soil resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>2</td>
<td>-8.1</td>
</tr>
<tr>
<td>Comparative Untreated Control</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Example 3

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 6.4 weight % polymethylmethacrylate, 1.12 weight % sodium alkyl sulfate surfactant, 2.4 weight % preparation of RURO EPV 2058, and the remainder water. Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A with a spray application at 25 % wpu and was dried to a carpet face temperature of 250° F (121° C). Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 5.

<table>
<thead>
<tr>
<th>Example</th>
<th>Water repellency</th>
<th>Delta Delta E vs. Untreated carpet Drum soil test Soil resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>3</td>
<td>3</td>
<td>-1.1</td>
</tr>
<tr>
<td>Comparative Untreated Control</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Example 4

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 1.6 weight % polymethylmethacrylate, 0.32 weight % sodium alkyl sulfate surfactant, 4.0 weight % amorphous silicon dioxide, 1.6 weight % RUCO ECO, and the remainder water. The carpet used in this example consisted of a level loop carpet (30 oz/sq.yd., 1.01 kg/sq.m.). The control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 6.

Example 5

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.8 weight % polymethylmethacrylate, 0.16 weight % sodium alkyl sulfate surfactant, 2.0 weight % amorphous silicon dioxide, 0.8 weight % RUCO ECO, and the remainder water. The carpet used in this example consisted of a level loop carpet (30 oz/sq.yd., 1.01 kg/sq.m.). The control carpet for this example did not receive a treatment. The test composition was applied to the carpet according
to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 6.

Table 6 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Water repellency</th>
<th>Delta Delta E vs. Untreated carpet drum soil test soil resistance</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td>2</td>
<td>-4.3</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>-3.6</td>
</tr>
<tr>
<td>Comparative Untreated</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Example 6
This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 6.0 weight % poly(methylmethacrylate)/2 polyethoxy ethyl methacrylate, 0.08 weight % dodecyl dimethyl ammonium surfactant, 2.4 weight % preparation of ZP 9237, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Example 7
This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 6.0 weight % poly(methylmethacrylate)/2 polyethoxy ethyl methacrylate, 0.08 weight % dodecyl dimethyl ammonium surfactant, 1.2 weight % ZP 9237, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.
Example 8

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.92 weight % poly(methacrylate)/2 polyethoxy ethyl methacrylate, 0.016 weight % dodecyl dimethyl ammonium surfactant, 0.48 weight % RUCO Dry DHN, and 0.8 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Example 9

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.80 weight % polymethylmethacrylate, 0.024 weight % sulfonated alkyl benzene surfactant, 1.0 weight % RUCO Dry ECO, 2.0 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Example 10

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.032 weight % sulfonated alkyl benzene surfactant, 1.0 weight % RUCO Dry ECO, 0.6 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.
Example 11

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.032 weight % sulfonated alkyl benzene surfactant, 0.48 weight % RU CO Dry DHN, 0.80 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Example 12

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.88 weight % poly(methylmethacrylate)/2 polyethoxy ethyl methacrylate, 0.016 weight % dodecyl dimethyl ammonium surfactant, 0.48 weight % polymer wax dispersion, 0.8 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Example 13

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.1 weight % sulfonated alkyl benzene surfactant, 1.08 weight % RU CO EPV 2058, 1.2 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.
Example 14

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.1 weight % sulfonated alkyl benzene surfactant, 1.08 weight % ALBERDINGK AC 2314, 1.2 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 7.

Table 7 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>Water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td>-7.8</td>
<td>4</td>
</tr>
<tr>
<td>7</td>
<td>-7.7</td>
<td>4</td>
</tr>
<tr>
<td>8</td>
<td>-6.9</td>
<td>4</td>
</tr>
<tr>
<td>9</td>
<td>-6.0</td>
<td>3</td>
</tr>
<tr>
<td>10</td>
<td>-5.7</td>
<td>3</td>
</tr>
<tr>
<td>11</td>
<td>-5.0</td>
<td>3</td>
</tr>
<tr>
<td>12</td>
<td>-3.6</td>
<td>2</td>
</tr>
<tr>
<td>13</td>
<td>-3.1</td>
<td>3</td>
</tr>
<tr>
<td>14</td>
<td>-2.9</td>
<td>1</td>
</tr>
<tr>
<td>Comparative Untreated</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

Example 15

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.032 weight % sulfonated alkyl benzene surfactant, 0.02 weight % alpha olefin sulfonate surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 8.
Example 16

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.104 weight % sulfonated alkyl benzene surfactant, 0.072 weight % sodium alkyl sulfate surfactant, 1.12 weight % RUCO EPV 2058, 1.2 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 8.

Example 17

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2-weight % polymethylmethacrylate, 0.104 weight % sulfonated alkyl benzene surfactant, 0.1 weight % alpha olefin sulfonate surfactant, 1.12 weight % RUCO EPV 2058, 1.2 weight % amorphous silicon dioxide, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 8.

Table 8 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Soil resistance</th>
<th>Repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>15</td>
<td>-3.1</td>
<td>3</td>
</tr>
<tr>
<td>16</td>
<td>-2.7</td>
<td>3</td>
</tr>
<tr>
<td>17</td>
<td>-2.4</td>
<td>3</td>
</tr>
<tr>
<td>Comparative Untreated</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Example 18

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % sodium alkyl sulfate surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 19

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % alpha olefin sulfonate surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 20

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % DOWFAX 2A1 surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 21

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % sodium lauryl sulfate surfactant, 0.56 weight % RU CO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

**Example 22**

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.032 weight % sodium butyl naphthalate sulfonate surfactant, 0.56 weight % RU CO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

**Example 23**

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.032 weight % surfactant, 0.56 weight % RU CO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

**Example 24**

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % alkyl aryl sulfate surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 25

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.028 weight % polyoxyethylene (20) cetyl ether surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 26

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % ULTRAFOAM FFA-3 surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Example 27

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, 0.56 weight % RU CO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 9.

Table 9 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta E untreated carpet soil resistance</th>
<th>water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>18</td>
<td>-4.2</td>
<td>3</td>
</tr>
<tr>
<td>19</td>
<td>-7.7</td>
<td>3</td>
</tr>
<tr>
<td>20</td>
<td>-2.4</td>
<td>3</td>
</tr>
<tr>
<td>21</td>
<td>-4.6</td>
<td>3</td>
</tr>
<tr>
<td>22</td>
<td>-5.6</td>
<td>3</td>
</tr>
<tr>
<td>23</td>
<td>-2.1</td>
<td>3</td>
</tr>
<tr>
<td>24</td>
<td>-3.3</td>
<td>3</td>
</tr>
<tr>
<td>25</td>
<td>-3.9</td>
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</tr>
<tr>
<td>26</td>
<td>-1.9</td>
<td>3</td>
</tr>
<tr>
<td>27</td>
<td>-8.8</td>
<td>3</td>
</tr>
<tr>
<td>Comparative Untreated</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Example 28

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, and 1.52 weight % UNIBOND AC-403, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet to the carpet according to Application
Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 10.

Example 29

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, 1.2 weight % carboxylated styrene acrylic copolymer emulsion, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 10.

Table 10 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>28</td>
<td>-4.4</td>
<td>2</td>
</tr>
<tr>
<td>29</td>
<td>-5.9</td>
<td>1</td>
</tr>
</tbody>
</table>

Example 30

This example investigated the soil resist performance and repellency of carpet constructed with unscoured solution pigmented polytrimethylene terephthalate (PTT) fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of an unscoured level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 11.
Table 11 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
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<tr>
<td>30</td>
<td>-3.1</td>
<td>3</td>
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<td>Untreated Control</td>
<td></td>
<td>0</td>
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</table>

Example 31

This example investigated the soil resist performance and repellency of carpet constructed with 80% polypropylene and 20% nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (50oz/sq.yd., 1.68 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 12.

Table 12 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>Water repellency</th>
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<tr>
<td>31</td>
<td>-4.6</td>
<td>1</td>
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<tr>
<td>Untreated Control</td>
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<td>0</td>
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</table>

Example 32

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared of 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.02 weight % UNIFROTH 0448, 0.56 weight % RUCO EPV, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the
carpet according to Application Method C. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 13.

Table 13 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
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<tbody>
<tr>
<td>32</td>
<td>-5.0</td>
<td>3</td>
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<tr>
<td>Untreated Control</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Example 33

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 0.96 weight % polymethylmethacrylate, 0.028 weight % sulfonated alkyl benzene surfactant, 0.22 weight % alpha olefin sulfonate surfactant, 0.56 weight % RUCO EPV 2058, 0.80 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (28 oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method C. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 14.

Table 14 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
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</thead>
<tbody>
<tr>
<td>33</td>
<td>-2.9</td>
<td>3</td>
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<tr>
<td>Untreated Control</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

Example 34

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.08 weight % sulfonated alkyl benzene surfactant, 0.22 weight % alpha olefin sulfonate surfactant, 1.2 weight % RUCO EPV 2058, 5.0 weight % amorphous silica, and the remainder water.
Carpet used in this example consisted of a level loop carpet (28oz/sq.yd., 0.94 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 15.

Table 15 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>34</td>
<td>-3.6</td>
<td>1</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>0</td>
</tr>
</tbody>
</table>

**Example 35**

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared containing 3.2 weight % polymethylmethacrylate, 0.08 weight % sulfonated alkyl benzene surfactant, 0.22 weight % alpha olefin sulfonate surfactant, 1.2 weight % RUCO EPV 2058, 5.0 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (30 oz/sq.yd., 1.0 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 16.

Table 16 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>35</td>
<td>-2.6</td>
<td>1</td>
</tr>
<tr>
<td>Untreated Control</td>
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<td>0</td>
</tr>
</tbody>
</table>

**Example 36**

This example investigated the soil resist performance and repellency of carpet constructed with nylon fiber. An aqueous composition was prepared
containing 4.0 weight % polymethylmethacrylate, 0.1 weight % sulfonated alkyl benzene surfactant, 0.12 weight % alpha olefin sulfonate surfactant, 1.6 weight % RUO EPV 2058, 4.0 weight % amorphous silica, and the remainder water. Carpet used in this example consisted of a level loop carpet (30 oz/sq.yd., 1.0 kg/sq.m.). Control carpet for this example did not receive a treatment. The test composition was applied to the carpet according to Application Method A. Carpet samples were evaluated according to Test Methods 1 and 3. The resulting data are shown in Table 17.

Table 17 – Soil Resistance and Repellency

<table>
<thead>
<tr>
<th>Example</th>
<th>Delta Delta E vs. untreated carpet soil resistance</th>
<th>water repellency</th>
</tr>
</thead>
<tbody>
<tr>
<td>36</td>
<td>-4.0</td>
<td>2</td>
</tr>
<tr>
<td>Untreated Control</td>
<td></td>
<td>0</td>
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</tbody>
</table>

For Tables 3 to 17, the Delta Delta E values were negative numbers. This indicated that the test carpet had better performance and less soiling than the control for each example. Thus, treatment with the compositions of the present invention provided or imparted soil resistance to the treated substrates. For Tables 3 to 17, the repellency value was higher for the examples compared to the control, thus indicating repellence for substrates treated by the examples of the present invention.
CLAIMS

What is claimed is:

1. A composition comprising at least one of a surfactant, and at least one of a nonfluorinated soil resist agent, and at least one of a repellent agent, which imparts soil resistance and repellency to a substrate which has been contacted with said composition.

2. The composition of claim 1 wherein the soil resist agent is selected from the group consisting of an alkali metal salt of a hydrolyzed styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer; an alkali metal salt of a hydrolyzed octene/maleic anhydride copolymer; an ammonium salt of a hydrolyzed styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer; methyl methacrylate/ethyl methacrylate copolymer; polymethylmethacrylate; polymethacrylic acid; polystyrene; sulfonated polyester; polyester; carboxylated polymer; and a dispersion of inorganic particulate matter selected from the group consisting of clay, colloidal silica, titanium dioxide, colloidal alumina, zirconium oxide, amorphous silicon dioxide, and colloidal silica dioxide, and mixtures thereof.

3. The composition of claim 1 wherein the surfactant is selected from the group consisting of an alkali metal salt of alpha sulfonated carboxylic acid or ester; an alkali metal salt of 1-octane sulfonate; alkyl aryl sulfate; alkali metal alkyl diphenyloxide disulfonate; alkali metal salt of dimethyl-5-sulfoisophthalate; sodium butyl naphthalene sulfonate; C_{16} - C_{18} phosphate salt; condensed naphthalene formaldehyde sulfonated salt; salt of dodecyl benzene sulfonate (branched); salt of alkyl sulfate; alpha olefin sulfonate; salt of dodecyl diphenyloxide disulfonate; polyoxyethylene (20) cetyl ester; ethoxylated alcohol; alkyl dimethyl amine; polyoxyethylene tridecyl ether; salt of dodecyl ammonium acetate; and alkali metal salt of sulfonated 1,1 oxybis, tetrapropylene benzene.

4. The composition of claim 1 wherein the repellent agent is selected from the group consisting of dimethyl silicone, amorphous silicon dioxides; an ammonium salt of hydrolyzed styrene/maleic anhydride copolymer or of a hydrolyzed styrene/maleic anhydride/cumene terpolymer; polymer wax dispersion; wax emulsion; blend of wax and anionic emulsifying agent;
hyperbranched dendrimers and polymers; hyperbranched dendrimers and polymers and modified silicon component; and polymers of highly branched dendrimers in a matrix of hydrocarbons; aliphatic aqueous polyurethane dispersion; aqueous acrylic polymer dispersion; dispersion; aqueous acrylic polymer dispersion; copolymer of behenyl acrylate and N,N-diethyaminoethylmethacrylate; copolymer of isobornyl acrylate and N,N-diethymaninothethylmethacrylate; copolymer of hexadecyl acrylate and N-N-diethyaminoethylmethacrylate; copolymer of C_{12} methacrylate and N,N-diethyaminoethytmethacrylate; copolymer of C_{16} methacrylate and N-N-diethyaminoethylmethacrylate; copolymer of C_{18} methacrylate and N-N-diethyaminoethylmethacrylate; copolymer of C_{22} methacrylate and N-N-diethyaminoethylmethacrylate; copolymer of C_{22} methacrylate and N-N-diethyaminoethylmethacrylate; copolymer of 2-ethylhexyl methacrylate and N,N-diethyaminoethylmethacrylate; alkyl ketene dimer; reactive silane; amino-functional polydimethylsiloxane emulsion; silicone amine; silicone polyether; silicone dialkyl quaternary compound; polydimethylsiloxane; acrylic copolymer emulsion; self crosslinking acrylic polymer, chrome complex; and silicone polyether.

5. The composition of claim 1 further comprising at least one of

A. an inorganic oxide selected from the group consisting of clay, colloidal silica, titanium dioxide, colloidal alumina, zirconium oxide, amorphous silicon dioxide, and colloidal silica dioxide,

B. a functional additive selected from the group consisting of soy protein; dipropylene glycol methyl ether, 1,3-propanediol; para-toluene sulfonic acid; maleic anhydride solution; citric acid; or polyester polyurethane, dispersion.

C. water.

6. The composition of claim 1 comprising:

1) polymethylmethacrylate, amorphous silicon dioxide, and alpha olefin sulfonate surfactant;
2) polymethylmethacrylate, sodium alkyl sulfate surfactant, amorphous silicon dioxide, and hyperbranched dendrimers and polymers; 
3) polymethylmethacrylate/2 polyethoxyl ethyl methacrylate, dodecyl dimethyl ammonium surfactant, and polymers of high branched dendrimers in a matrix of hydrocarbons; 
4) polymethylmethacrylate, sulfonated alkyl benzene surfactant, and hyperbranched dendrimers and polymers with modified silicon component; 
5) polymethylmethacrylate/2 polyethoxyl ethyl methacrylate, dodecyl dimethyl ammonium surfactant, polymer wax dispersion, and amorphous silica; or 
6) polymethylmethacrylate, sulfonated alkyl benzene surfactant, alpha olefin sulfonate surfactant, polymers of high branched dendrimers in a matrix of hydrocarbons, and amorphous silica.

7. The composition of claim 1 wherein the soil resist agent is present in the composition at from about 0.1 to about 30.0 % by weight; the surfactant is present in the composition at from about 0.01 to about 10.0 % by weight; and the repellent agent is present in the composition at from about 0.1 to about 30.0 % by weight.

8. The composition of claim 5 wherein the inorganic oxide is present at from about 0% to about 30% % by weight, and wherein the functional additive is present at from 0% to 10% by weight.

9. A method of imparting soil resistance and repellency to a substrate comprising contacting said substrate with a composition of claim 1 or 5.

10. A fibrous substrate having soil resistance and repellency which has been contacted with a composition of claim 1 or 5.
**INTERNATIONAL SEARCH REPORT**

**A. CLASSIFICATION OF SUBJECT MATTER**

INV. D06M15/263 C09D133/00 D06M13/463 D06M11/79

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

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

D06M C09D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

EPO-Internal, WPI Data

**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

<table>
<thead>
<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 6 043 299 A (MICCICHE ROBERT P [US] ET AL) 28 March 2000 (2006-03-28) column 1, lines 8-13 column 3, line 17 - column 4, line 27; example 1 -----</td>
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<td>US 3 716 488 A (KOLSKY R ET AL) 13 February 1973 (1973-02-13) column 7, line 65 - column 8, line 36; example 1 -----</td>
<td>1-10</td>
</tr>
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</table>

[X] Further documents are listed in the continuation of Box C. [X] 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 application or patent but published on or after the international filing date
  - "L" 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: 14 January 2013

Date of mailing of the international search report: 21/01/2013

Name and mailing address of the ISA/

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV RIJWijk
Tel. (+31-70) 340-0340,
Fax: (+31-70) 340-3016

Authorized officer: Blas, Valérie
<table>
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<th>Category</th>
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<th>Relevant to claim No.</th>
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INTERNATIONAL SEARCH REPORT

Box No. II  Observations where certain claims were found unsearchable (Continuation of Item 2 of first sheet)

This international search report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

1. ☐ Claims Nos.: because they relate to subject matter not required to be searched by this Authority, namely:

2. ☒ Claims Nos.: 1-10(partially) because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:

   see FURTHER INFORMATION sheet PCT/ISA/210

3. ☐ Claims Nos.: because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box No. III  Observations where unity of invention is lacking (Continuation of Item 3 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

1. ☐ As all required additional search fees were timely paid by the applicant, this international search report covers all searchable claims.

2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of additional fees.

3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:

4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

☐ The additional search fees were accompanied by the applicant’s protest and, where applicable, the payment of a protest fee.

☐ The additional search fees were accompanied by the applicant’s protest but the applicable protest fee was not paid within the time limit specified in the invitation.

☐ No protest accompanied the payment of additional search fees.
Continuation of Box II.2

Claims Nos.: 1-10 (partially)

Present claim 1 relates to an extremely large number of possible compositions and the initial phase of the search revealed a very large number of documents relevant to the issue of novelty (see also Re Item V). So many documents were retrieved that it is impossible to determine which parts of claim 1 may be said to define the subject-matter for which protection might legitimately be sought (Article 6 PCT). Furthermore, all the claimed compositions do not provide both soil resistance and repellency properties to substrates which have been contacted with said compositions, these properties are strongly depending on the compounds and amounts used. Moreover, most of the examples are carried out with compounds only defined by trademarks and are therefore also not clear. Consequently, support and disclosure in the sense of Article 6 and 5 PCT is to be found however for only a very small proportion of the compositions claimed, see example 12. The non-compliance with the substantive provisions is to such an extent, that the search was performed taking into consideration the non-compliance in determining the extent of the search of claims 1-10 (PCT Guidelines 9.19 and 9.23). The search of claims 1-10 was restricted to those claimed compositions which appear to be supported and clearly disclosed in the examples, and a generalisation of their structural formulae, i.e. an aqueous composition comprising water, poly(methylmethacrylate)/2 polyethoxy ethyl methacrylate as soil resist agent, a dodecyl dimethyl ammonium surfactant, a polymer wax dispersion as repellent agent and amorphous silica. Substrates have been limited to textile materials.

The applicant's attention is drawn to the fact that claims relating to inventions in respect of which no international search report has been established need not be the subject of an international preliminary examination (Rule 66.1(e) PCT). The applicant is advised that the EPO policy when acting as an International Preliminary Examining Authority is normally not to carry out a preliminary examination on matter which has not been searched. This is the case irrespective of whether or not the claims are amended following receipt of the search report or during any Chapter II procedure. If the application proceeds into the regional phase before the EPO, the applicant is reminded that a search may be carried out during examination before the EPO (see EPO Guideline C-VI, 8.2), should the problems which led to the Article 17(2) declaration be overcome.
<table>
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<tr>
<th>Patent document cited in search report</th>
<th>Publication date</th>
<th>Patent family member(s)</th>
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<tr>
<td></td>
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<td>US 6843209 A</td>
<td>28-03-2000</td>
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<td>US 2006062968 A1</td>
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<td>CA 963610 A1</td>
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<td>CH 522073 A</td>
<td>30-04-1972</td>
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<td>09-03-1972</td>
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