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(71) Applicant: **RHODIA OPERATIONS** [FR/FR]; 25, Rue De Clichy, 75009 Paris (FR).

(72) Inventors; and
(71) Applicants *(for US only)*: **ZHOU, Lichang** [US/US]; 8 Yorkshire Village Rd., Lawrenceville, NJ 08648 (US). **HUGHES, John** [US/US]; 122 Westview Dr., Lincoln University, PA 19352 (US). **PAKENHAM, Derek** [GB/US]; 3029 E. State Street Ext., Hamilton, NJ 08619 (US).

(74) Agents: **PACHO, Jericho, B.** et al.; SOLVAY USA INC., 504 Camegie Center, Princeton, NJ 08540 (US).

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(54) **Title**: DISPERSING AIDS OR BLENDS THEREOF TO PREPARE UNIVERSAL COLORANTS FOR AQUEOUS AND NON-AQUEOUS PAINTS AND COATING

(57) **Abstract**: Disclosed are novel dispersants for universal colorant systems, novel colorant systems and related method of preparing said systems. Also disclosed are methods of dispersing at least one pigment to prepare a universal colorant system, as well as methods for preparing coatings and paints utilizing the disclosed colorant systems.

DISPERSING AIDS OR BLENDS THEREOF TO PREPARE UNIVERSAL COLORANTS FOR AQUEOUS AND NON-AQUEOUS PAINTS AND COATING

CROSS-REFERENCE TO RELATED APPLICATIONS

[0001] This application claims the benefit of US Provisional Patent Application No. 62/160,094 filed May 12, 2015, incorporated herein by reference in its entirety.

FIELD OF THE INVENTION

[001]The present invention relates to novel dispersing aids or blends thereof, as well as compositions and methods for utilizing these dispersants or blends in various paint and coatings applications.

BACKGROUND OF THE INVENTION

[002]Colorants, typically, are compositions of pigment, dispersants, carrier/solvents, and other components, which are used to add color, via pigments, to tint-based paint systems usually at the point-of-sale. Pigments are typically organic or inorganic dry powders that incorporate a mixture of primary particles, aggregates and agglomerates, which must be wetted in the carrier or solvent. Dispersants are widely used in coating industries to disperse colorants, including inorganic or organic pigments. Dispersants can be divided to small molecules and polymers with varied chemistries. Most widely used polymeric dispersants are based on acrylic acid homopolymer or copolymers. The current state-of-the art systems use polymeric dispersants specific for the system used, or through dispersants that can be used in both solvent-borne and water-borne systems (hereafter referred to as universal dispersants), but that are used with solvents (like acetates or ketones) that can be miscible in both types of paints. For the universal colorants currently on the market, they face drawbacks in that they typically have a high level of solvents added that contribute significantly to a paint's overall VOC content. However, in the current regulatory environment, the paint formulators are trying to reduce the VOC contents in new paints to a near

zero level. Current commercial dispersants, however, contain only 50% active and use solvents to reduce the actives level.

[003]Some colorants contain VOCs (volatile organic compounds) that can directly influence the total VOCs contained in a paint or coating. With VOC regulations enforcing lower limits, paint formulators currently have a difficult time meeting regulations when using traditional universal colorants.

SUMMARY OF THE INVENTION

[004]In one aspect, disclosed are dispersant aids or blends thereof for use in colorant dispersions. In another aspect, disclosed are universal colorant systems for low VOC paint and coatings formulations comprising: (i) pigment, (ii) the dispersing aid or dispersant system described herein and (iii), optionally, a carrier. Typically, the universal colorant system (herein otherwise used interchangeably with "liquid colorant compositions") is in liquid form and, in another embodiment, at least one dispersant is used as both a dispersant and carrier. In another aspect, disclosed are methods for preparing said colorant systems. In yet another aspect, disclosed are paints or coatings containing said colorant systems. In one embodiment, the paints are solvent-borne (e.g., alkyd) and/or waterborne base paints, which contain low amounts of or are substantially free of volatile organic compounds. In a further aspect, disclosed are methods for preparing said paints or coatings.

[005]The present invention includes compositions such as liquid dispersions comprising universal colorant systems, which comprise the dispersing aids or blends, as described herein. In particular the invention is also directed using the universal colorant system in low VOC paint and coatings applications.

[006]The dispersant aids or dispersant blends, in another embodiment, are components or additives for latex binders, paints and aqueous coatings, typically as to aid in dispersing generally hydrophobic compounds such as pigments and the like. The aqueous coating compositions as described herein typically include at least one latex polymer derived from at least one monomer, for example acrylic monomers. The at least one latex polymer in the aqueous coating

composition can be a pure acrylic, a styrene acrylic, a vinyl acrylic or an acrylated ethylene vinyl acetate copolymer and is more preferably a pure acrylic. The at least one latex polymer is preferably derived from at least one acrylic monomer selected from the group consisting of acrylic acid, acrylic acid esters, methacrylic acid, and methacrylic acid esters. For example, the at least one latex polymer can be a butyl acrylate/methyl methacrylate copolymer or a 2-ethylhexyl acrylate/methyl methacrylate copolymer. Typically, the at least one latex polymer is further derived from one or more monomers selected from the group consisting of styrene, alpha-methyl styrene, vinyl chloride, acrylonitrile, methacrylonitrile, ureido methacrylate, vinyl acetate, vinyl esters of branched tertiary monocarboxylic acids, itaconic acid, crotonic acid, maleic acid, fumaric acid, ethylene, and C_4-C_8 conjugated dienes.

[007]Latex paint formulations typically comprise additives, e.g., at least one pigment. In a preferred embodiment of the invention the latex paint formulation includes at least one pigment selected from the group consisting of TiO2, CaCO3, clay, aluminum oxide, silicon dioxide, magnesium oxide, sodium oxide, potassium oxide, talc, barytes, zinc oxide, zinc sulfite and mixtures thereof.

[008]In addition to the above components, the colorant systems and/or aqueous coating compositions as described herein can include one or more additives selected from the group consisting of dispersants, surfactants, rheology modifiers, defoamers, thickeners, biocides, mildewcides, colorants, waxes, perfumes and co-solvents.

[009]Compositions of the present invention may have an absence of one or more of anionic surfactant, cationic surfactant, nonionic surfactant, zwitterionic surfactant, and/or amphoteric surfactant.

[0010] As described herein, dispersing aids or dispersant blends to make universal colorant systems can be used in aqueous and non-aqueous solutions (from low polarity to high polarity solvents) that are up to 100% active with low/no VOCs. In one embodiment, the dispersing aids are up to 90% active with low/no VOCs. In one embodiment, the dispersing aids are up to 80% active with low/no

VOCs. In one embodiment, the dispersing aids are up to 60% active with low/no VOCs. In one embodiment, the dispersing aids are up to 95% active with low/no VOCs. In one embodiment, the dispersing aids are up to 98% active with low/no VOCs. In one embodiment, the dispersing aids are up to 99% active with low/no VOCs. In one embodiment, the dispersing aids are up to 93% active with low/no VOCs. In one embodiment, the dispersing aids are up to 96% active with low/no VOCs

[0011] Low VOC (Volatile Organic Content) in some embodiments mean a VOC level of less than about 100 g/L, or less than or equal to about 90 g/L, or less than or equal to about 80 g/L, or less than or equal to about 70 g/L, or less than or equal to about 60 g/L, or less than or equal to about 50 g/L, or less than or equal to about 40 g/L. No VOC means, in some embodiments, means having no added VOC compounds. In another embodiment, "no VOC" means having only minimal (trace) amounts of VOC amounting to less than or equal to 1 g/L or, in other embodiments, less than or equal to 0.5 g/L, less than or equal to 0.3 g/L, less than or equal to 0.2 g/L, less than or equal to 0.1 g/L, or less than or equal to 0.05 g/L.

[0012] The new universal colorant based on the new developed dispersing system can allow paint formulators to meet the more stringent VOC requirements without issues. The new dispersing aids include alkoxylated mono or multifunctional materials, such as EO/PO type surfactant or oligomer, or their blends, or their blends with other liquid or solid of low to high molecular weight dispersing aids. In one embodiment, one example of the new dispersing aid is a 50/50 blend of Antarox BL-225 (EO/PO surfactant) and Antarox RA-40 (EO/PO surfactant) along with 20% weight addition of Sopophor S-25 (Tristyrylphenol ethoxylate) to help with dispersing the various pigments. There is no additional water or solvent added to the new universal colorant, so it can easily be used in both solvent-based and aqueous paint formulations. The Antarox blend can be used by itself, or mixed with a dispersant, such as the Sopophor S-25, Sopophor S-40 or a polymeric dispersant to improve long term stability. Other types of alkoxylated materials include trifunctional materials such as EO/PO derivatives

from trimethylolpropane or glycerol, tetrafunctional materials such as EO/PO derivatives from pentaerythritol.

[0013] In another aspect, described herein are methods for dispersing pigments in an aqueous emulsion, comprising: contacting (i) an aqueous emulsion containing at least one pigment with (ii) the polymeric dispersant copolymer or homopolymer as described herein.

[0014] These and other features and advantages of the present invention will become more readily apparent to those skilled in the art upon consideration of the following detailed description, which describe both the preferred and alternative embodiments of the present invention.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0015] The present invention relates to, in one embodiment, the use of a particular family of dispersant copolymers for latex dispersions, binders, as well as for solvent-borne (e.g., alkyd) and/or waterborne base paints and coatings. Described herein are aqueous compositions, for example, aqueous coating compositions. The aqueous compositions are, in one embodiment, aqueous polymer dispersions which include at least one latex polymer. Paints or other aqueous coatings of the present invention typically further include at least one pigment. In another embodiment, the latex has a Tg of less than 30° C, more typically less than 20° C, still more typically in the range from 10 to -10° C, e.g., 0° C. In one embodiment, the latex has a Tg of less than 10° C, more typically less than 5° C, still more typically in the range from 5 to -10° C, e.g., 0° C.

[0016] As used herein, the term "alkyl" means a monovalent straight or branched saturated hydrocarbon radical, more typically, a monovalent straight or branched saturated (C_1-C_{40}) hydrocarbon radical, such as, for example, methyl, ethyl, n-propyl, isopropyl, n-butyl, isobutyl, tert-butyl, hexyl, octyl, hexadecyl, octadecyl, eicosyl, behenyl, tricontyl, and tetracontyl.

[0017] As used herein, the term "alkenyl" means an unsaturated straight or branched hydrocarbon radical, more typically an unsaturated straight, branched,

(C_2-C_{22}) hydrocarbon radical, that contains one or more carbon-carbon double bonds, such as, for example, ethenyl, n-propenyl, iso-propenyl.

[0018] As used herein, the term "alkoxyl" means an oxy radical that is substituted with an alkyl group, such as for example, methoxyl, ethoxyl, propoxyl, isopropoxyl, or butoxyl, which may optionally be further substituted on one or more of the carbon atoms of the radical.

[0019] As used herein, the term "alkoxyalkyl" means an alkyl radical that is substituted with one or more alkoxy substituents, more typically a (C_1-C_{22})alkyloxy-(C_1-C_6)alkyl radical, such as methoxymethyl, and ethoxybutyl.

[0020] As used herein, terms "aqueous medium" and "aqueous media" are used herein to refer to any liquid medium of which water is a major component. Thus, the term includes water per se as well as aqueous solutions and dispersions.

[0021] As used herein, the term "aryl" means a monovalent unsaturated hydrocarbon radical containing one or more six-membered carbon rings in which the unsaturation may be represented by three conjugated double bonds, which may be substituted one or more of carbons of the ring with hydroxy, alkyl, alkoxyl, alkenyl, halo, haloalkyl, monocyclic aryl, or amino, such as, for example, phenyl, methylphenyl, methoxyphenyl, dimethylphenyl, trimethylphenyl, chlorophenyl, trichloromethylphenyl, triisobutyl phenyl, tristyrylphenyl, and aminophenyl.

[0022] As used herein, the term "arylalkyl" means an alkyl group substituted with one or more aryl groups, more typically a (C_1-C_{18})alkyl substituted with one or more (C_6-C_{14})aryl substituents, such as, for example, phenylmethyl, phenylethyl, and triphenylmethyl.

[0023] As used herein, the term "aryloxy" means an oxy radical substituted with an aryl group, such as for example, phenyloxy, methylphenyl oxy, isopropylmethylphenyloxy.

[0024] As used herein, the terminology "(C_x-C_y)" in reference to an organic group, wherein x and y are each integers, indicates that the group may contain from x carbon atoms to y carbon atoms per group.

[0025] As used herein, the term "cycloalkenyl" means an unsaturated hydrocarbon radical, typically an unsaturated (C_5-C_{22}) hydrocarbon radical, that contains one or more cyclic alkenyl rings and which may optionally be substituted on one or more carbon atoms of the ring with one or two (C_1-C_6)alkyl groups per carbon atom, such as cyclohexenyl, cycloheptenyl, and "bicycloalkenyl" means a cycloalkenyl ring system that comprises two condensed rings, such as bicycloheptenyl.

[0026] As used herein, the term "cycloalkyl" means a saturated hydrocarbon radical, more typically a saturated (C_5-C_{22}) hydrocarbon radical, that includes one or more cyclic alkyl rings, which may optionally be substituted on one or more carbon atoms of the ring with one or two (C_1-C_6)alkyl groups per carbon atom, such as, for example, cyclopentyl, cycloheptyl, cyclooctyl, and "bicyloalkyl" means a cycloalkyl ring system that comprises two condensed rings, such as bicycloheptyl.

[0027] As used herein, an indication that a composition is "free" of a specific material means the composition contains no measurable amount, or trace amounts (e.g., less than 0.1% by weight), of that material.

[0028] As used herein, the term "heterocyclic" means a saturated or unsaturated organic radical that comprises a ring or condensed ring system, typically comprising from 4 to 16 ring atoms per ring or ring system, wherein such ring atoms comprise carbon atoms and at least one heteroatom, such as for example, O, N, S, or P per ring or ring system, which may optionally be substituted on one or more of the ring atoms, such as, for example, thiophenyl, benzothiphenyl, thianthrenyl, pyranyl, benzofuranyl, xanthenyl, pyrolidinyl, pyrrolyl, pyradinyl, pyrazinyl, pyrimadinyl, pyridazinyl, indolyl, quinonyl, carbazolyl,phenathrolinyl, thiazolyl, oxazolyl, phenoxazinyl, or phosphabenzenyl.

[0029] As used herein, the term "hydroxyalkyl" means an alkyl radical, more typically a (C_1-C_{22})alkyl radical, that is substituted with one or more hydroxyl groups, such as for example, hydroxymethyl, hydroxyethyl, hydroxypropyl, and hydroxydecyl.

[0030] As used herein the term "(meth)acrylate" refers collectively and alternatively to the acrylate and methacrylate and the term "(meth)acrylamide" refers collectively and alternatively to the acrylamide and methacrylamide, so that, for example, "butyl (meth)acrylate" means butyl acrylate and/or butyl methacrylate.

[0031] As used herein, "molecular weight" in reference to a polymer or any portion thereof, means to the weight-average molecular weight ("M_w") of the polymer or portion. M_w of a polymer is a value measured by gel permeation chromatography (GPC) with an aqueous eluent or an organic eluent (for example dimethylacetamide, dimethylformamide, and the like), depending on the composition of the polymer, light scattering (DLS or alternatively MALLS), viscometry, or a number of other standard techniques. M_w of a portion of a polymer is a value calculated according to known techniques from the amounts of monomers, polymers, initiators and/or transfer agents used to make the portion.

[0032] In one embodiment, the dispersant compositions as described exhibit a weight average molecular weight, as determined by gel permeation chromatography (GPC) and light scattering of a solution of polymer in tetrahydrofuran and compared to a polystyrene standard, of between 100 to 50,000 grams per mole ("g/mole"). In another embodiment, the polymers for use in the present invention exhibit a weight average molecular weight 200 to 25,000 grams per mole ("g/mole"). In yet another embodiment, the polymers for use in the present invention exhibit a weight average molecular weight 200 to 15,000 grams per mole ("g/mole"). In yet another embodiment, the polymers for use in the present invention exhibit a weight average molecular weight 200 to 5,000 grams per mole ("g/mole"). In yet another embodiment, the polymers for use in the present invention exhibit a weight average molecular weight 300 to 5,000 grams per mole ("g/mole"). In yet another embodiment, the polymers for use in the present invention exhibit a weight average molecular weight 300 to 2,000 grams per mole ("g/mole").

[0033] As used herein, the indication that a radical may be "optionally substituted" or "optionally further substituted" means, in general, unless further limited either explicitly or by the context of such reference, such radical may be substituted with one or more inorganic or organic substituent groups, for example, alkyl, alkenyl, aryl, arylalkyl, alkaryl, a hetero atom, or heterocyclyl, or with one or more functional groups capable of coordinating to metal ions, such as hydroxyl, carbonyl, carboxyl, amino, imino, amido, phosphonic acid, sulphonic acid, or arsenate, or inorganic and organic esters thereof, such as, for example, sulphate or phosphate, or salts thereof.

[0034] As used herein, "parts by weight" or "pbw" in reference to a named compound refers to the amount of the named compound, exclusive, for example, of any associated solvent. In some instances, the trade name of the commercial source of the compound is also given, typically in parentheses. For example, a reference to "10 pbw cocoamidopropylbetaine ("CAPB", as MIRATAINE BET C-30)" means 10 pbw of the actual betaine compound, added in the form of a commercially available aqueous solution of the betaine compound having the trade name "MIRATAINE BET C-30", and exclusive of the water contained in the aqueous solution.

[0035] As used herein, an indication that a composition is "substantially free" of a specific material, means the composition contains no more than an insubstantial amount of that material, and an "insubstantial amount" means an amount that does not measurably affect the desired properties of the composition.

[0036] As used herein, the term "surfactant" means a compound that reduces surface tension when dissolved in water.

[0037] "Surfactant effective amount" means the amount of the surfactant that provides a surfactant effect to enhance the stability of emulsions of the polymers.

[0038] In one embodiment, described herein are dispersant of a mixture of unsaturated copolymerizable monomers.

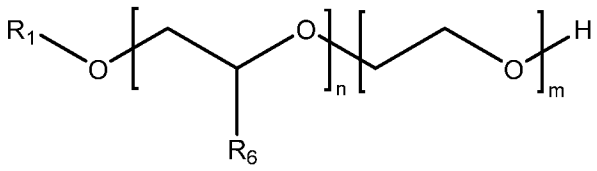
[0039] Sorbitan esters and sorbitol esters, more typically sorbitan alkyl esters, which are , typically referred to as "Span" surfactants, and include, for example, sorbitan monolaurate (Span 20), sorbitan monopalmitate (Span 40), sorbitan tristearate (Span 65), sorbitan monooleate (Span 80), and alkoxylated sorbitan esters and alkoxylated sorbitol esters, more typically alkoxylated sorbitan alkyl esters, which are typically referred to as "tween" or "polysorbate" surfactants such as, for example, polyoxyethylene (20) sorbitan monolaurate (Tween 20 or Polysorbate 20), polyoxyethylene (20) sorbitan monopalmitate (Tween 40 or Polysorbate 40) polyoxyethylene (20) sorbitan monostearate (Tween 60 or Polysorbate 60), polyoxyethylene (20) sorbitan monooleate (Tween 80 or Polysorbate 80),and polyoxyethylene (20) sorbitan trioleate (Tween 85 or Polysorbate 85).

[0040] Pigments can be organic or non-organic. Organic color pigments include but are not limited to, for example: Monoazo pigments: (C.I. Pigment Yellow 1, 3, 62, 65, 73, 74, 97, 120, 151, 154, 168, 181, 183 and 191, C.I. Pigment Brown 25; C.I. Pigment Orange 5, 13, 36, 38, 64 and 67; C.I. Pigment Red 1, 2, 3, 4, 5, 8, 9, 12, 17, 22, 23, 31, 48: 1, 48:2, 48:3, 48:4, 49, 49: 1, 51 :1, 52: 1, 52:2, 53, 53: 1, 53:3, 57: 1, 58:2, 58:4, 63, 112, 146, 148, 170, 175, 184, 185, 187, 188, 191 : 1, 208, 210, 245, 247 and 251; C.I. Pigment Violet 32); Diazo pigments: (C.I. Pigment Orange 16, 34, 44 and 72; C.I. Pigment Yellow 12, 13, 14, 16, 17, 81, 83, 106, 113, 126, 127, 155, 174, 176 and 188; Diazo condensation pigments: C.I. Pigment Yellow 93, 95 and 128; pigments: C.I. Pigment Red 144, 166, 214, 220, 221, 242 and 262; C.I. Pigment Brown 23 and 41); Anthanthrone pigments: (C.I. Pigment Red 168); Anthraquinone pigments: (C.I. Pigment Yellow 147, 177 and 199; C.I. Pigment Violet 31); Anthrapyrimidine pigments: (C.I. Pigment Yellow 108); Quinacridone pigments: (C.I. Pigment Orange 48 and 49; C.I. Pigment Red 122, 202, 206 and 209; C.I. Pigment Violet 19); Quinophthalone pigments: (C.I. Pigment Yellow 138); Diketopyrrolopyrrole pigments: (C.I. Pigment Orange 71, 73 and 81; C.I. Pigment Red 254, 255, 264, 270 and 272); Dioxazine pigments: (C.I. Pigment Violet 23 and 37; C.I. Pigment Blue 80; flavanthrone pigments: C.I. Pigment Yellow 24); Indanthrone pigments: (C.I.

Pigment Blue 60 and 64); Isoindoline pigments: (C.I. Pigments Orange 61 and 69; C.I. Pigment Red 260; C.I. Pigment Yellow 139 and 185); Isoindolinone pigments: (C.I. Pigment Yellow 109, 1 10 and 173); Isoviolanthrone pigments: (C.I. Pigment Violet 31); Metal complex pigments: (C.I. Pigment Red 257; C.I. Pigment Yellow 117, 129, 150, 153 and 177; C.I. Pigment Green 8); Perinone pigments: (C.I. Pigment Orange 43; C.I. Pigment Red 194); Perylene pigments: (C.I. Pigment Black 31 and 32; C.I. Pigment Red 123, 149, 178, 179, 190 and 224; C.I. Pigment Violet 29); Phthalocyanine pigments: (C.I. Pigment Blue 15, 15: 1, 15:2, 15:3, 15:4, 15:6 and 16; C.I. Pigment Green 7 and 36); Pyranthrone pigments: (C.I. Pigment Orange 51; C.I. Pigment Red 216); Pyrazoloquinazolone pigments: (C.I. Pigment Orange 67; C.I. Pigment Red 251); Thio indigo pigments: (C.I. Pigment Red 88 and 181; C.I. Pigment Violet 38); Triarylcarbonium pigments: (C.I. Pigment Blue 1, 61 and 62; C.I. Pigment Green 1; C.I. Pigment Red 81, 81 : 1 and 169; C.I. Pigment Violet 1, 2, 3 and 27; C.I. Pigment Black 1 (aniline black); C.I. Pigment Yellow 101 (aldazine yellow); C.I. Pigment Brown 22. Non-Organic non-color pigments include but are not limited to, for example: white pigments: titanium dioxide (C.I. Pigment White 6), zinc white, pigment grade zinc oxide; zinc sulphide, lithopone; Black pigments: iron oxide black (C.I. Pigment Black 11), iron manganese black, spinel black (C.I. Pigment Black 27); carbon black (C.I. Pigment Black 7). Non-Organic color pigments include but are not limited to, for example: Chromatic pigments: chromium oxide, chromium oxide hydrate green; chrome green (C.I. Pigment Green 48); cobalt green (C.I. Pigment Green 50); ultramarine green; cobalt blue (C.I. Pigment Blue 28 and 36; C.I. Pigment Blue 72); ultramarine blue; manganese blue; ultramarine violet; cobalt violet; manganese violet; red iron oxide (C.I. Pigment Red 101); cadmium sulfoselenide (C.I. Pigment Red 108); cerium sulphide (C.I. Pigment Red 265); molybdate red (C.I. Pigment Red 104); ultramarine red; brown iron oxide (C.I. Pigment Brown 6 and 7), mixed brown, spinel phases and corundum phases (C.I. Pigment Brown 29, 31, 33, 34, 35, 37, 39 and 40), chromium titanium yellow (C.I. Pigment Brown 24), chrome orange; cerium sulphide (C.I. Pigment Orange 75); yellow iron oxide (C.I. Pigment Yellow 42); nickel titanium yellow (C.I. Pigment

Yellow 53; C.I. Pigment Yellow 157, 158, 159, 160, 161, 162, 163, 164 and 189); chrlow 37 and 35); chrome yellow (C.I. Pigment Yellow 34); bismuth vanidate (C.I. Pigment Yellow 184).

[0041] In some embodiments, alcohol alkoxylate surfactant is of formula (I):



(I)

[0042] wherein R_6 comprises CH_3 or C_2H_5; "n" is an integer ranging from about 1 to about 30; and "m" is an integer ranging from 1 to about 30; and "p" is an integer ranging from 0 to about 20; wherein the sum of "n" and "m" equals from 4 to 50, typically from 6 to 30. In one embodiment, n + m = an integer ranging from 6 to 30. The alcohol alkoxylate is preferably in liquid form. In one embodiment, n + m = an integer ranging from 5 to 35. In one embodiment, n + m = an integer ranging from 7 to 30. In one embodiment, n + m = an integer ranging from 10 to 30. In one embodiment, n + m = an integer ranging from 10 to 20. While not being bound to theory, it is believed that the ratio of ethoxy to propoxy (or butoxy) groups allow for the compound to remain in liquid form, which is preferred under the present invention.

[0043] R_1, in one embodiment is a linear or branched C_4-C_{20} alkyl or alkenyl group. R_1, in another embodiment is a linear or branched C_6-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_7-C_{18} alkyl or alkenyl group. In another embodiment, R_1 is a linear or branched C_8-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_9-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{10}-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{12}-C_{18} alkyl or alkenyl group.

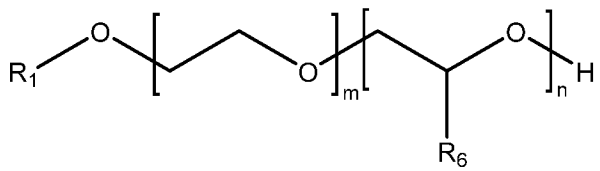
[0044] R_1, in another embodiment is a linear or branched C_6-C_{16} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{14} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{12} alkyl

or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{10} alkyl or alkenyl group.

[0045] R_1, in yet another embodiment is a linear or branched C_8-C_{16} alkyl or alkenyl group. R_1, in another embodiment, is a linear or branched C_9-C_{14} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{10}-C_{14} alkyl or alkenyl group.

[0046] In some embodiments, the ratio of "m" to "n" (m:n) is from 1:3 to 3:1, respectively. In some embodiments, the ratio of "m" to "n" (m:n) is from 1:4 to 4:1, respectively. In some embodiments, the ratio of m:n is less than or equal to 4:1. In some embodiments, the ratio of m:n is less than or equal to 3:1. While not being bound to theory, it is believed that the ratio of ethoxy to propoxy (or butoxy) groups allow for the compound to remain in liquid form, which is needed under the present invention. R_1 is previously defined herein.

[0047] In some embodiments, the alcohol alkoxylate surfactant is of formula (II):



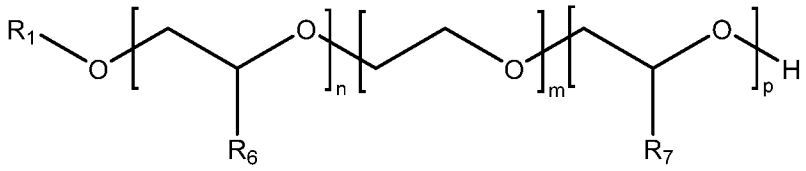
(II)

[0048] wherein R_6 comprises CH_3 or C_2H_5; "n" is an integer ranging from about 1 to about 30; and "m" is an integer ranging from 1 to about 30; and "p" is an integer ranging from 0 to about 20; wherein the sum of "n" and "m" equals from 4 to 50, typically from 6 to 30. In one embodiment, n + m = an integer ranging from 6 to 30. In one embodiment, n + m = an integer ranging from 5 to 35. In one embodiment, n + m = an integer ranging from 7 to 30. In one embodiment, n + m = an integer ranging from 10 to 30. In one embodiment, n + m = an integer ranging from 10 to 20.

[0049] In some embodiments, the ratio of "m" to "n" (m:n) is from 1:3 to 3:1, respectively. In some embodiments, the ratio of m:n is less than or equal to 4:1. In some embodiments, the ratio of m:n is less than or equal to 3:1.

[0050] The bivalent polyether group can comprise, in one embodiment, a linear chain of from 2 to 100 units, typically from 2 to 60 units, more typically from 2 to 30 units, which may be arranged alternately, randomly, or in blocks. In one embodiment, the alkoxylate units (e.g., oxyethylene units and oxypropylene units, and/or oxybutylene units of the polyether group are arranged in random sequence. In one embodiment, the alkoxylate units (e.g., oxyethylene units and oxypropylene units, and/or oxybutylene units of the polyether group are arranged in alternating sequence. In another embodiment, the alkoxylate units (e.g., oxyethylene units and oxypropylene units, and/or oxybutylene units of the polyether group are arranged in block sequence.

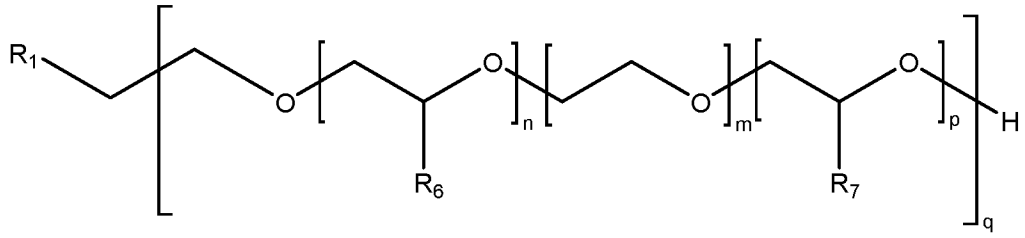
[0051] In some embodiments, the alcohol alkoxylate dispersant is of formula (III):



(III)

[0052] wherein R_6 and R_7 comprise, individually, CH_3 or C_2H_5; "n" is an integer ranging from about 0 to about 30; and "m" is an integer ranging from 1 to about 30; and "p" is an integer ranging from 0 to about 20; wherein the sum of "n", "m" and "p" equals an integer of from 4 to 60, typically from 6 to 30; wherein at least one of "n" or "p" is present. In one embodiment, ("n" or "p") + "m" = an integer ranging from 6 to 30. In one embodiment, ("n" or "p") + "m" = an integer ranging from 5 to 35. In one embodiment, ("n" or "p") + "m" = an integer ranging from 7 to 30. In one embodiment, ("n" or "p") + "m" = an integer ranging from 10 to 30. In one embodiment, ("n" or "p") + "m" = an integer ranging from 10 to 20. . While not being bound to theory, it is believed that the ratio of ethoxy to propoxy (or butoxy) groups allow for the compound to remain in liquid form, which is needed under the present invention.

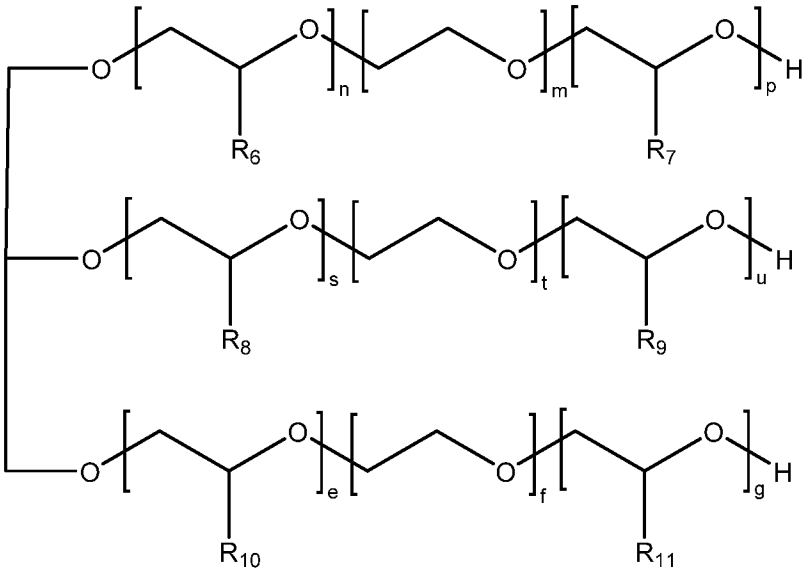
[0053] In some embodiments, the first dispersing aid is of formula (IV):



(IV)

[0054] wherein R_6 and R_7 comprise, individually, CH_3 or C_2H_5; "n" is an integer ranging from about 1 to about 30; and "m" is an integer ranging from 1 to about 30; and "p" is an integer ranging from 0 to about 20; wherein the sum of "n", "m" and "p" equals an integer of from 4 to 60, typically from 6 to 30; wherein "q" is an integer ranging from 1 to 3. In one embodiment, n + m = an integer ranging from 6 to 30. In one embodiment, n + m = an integer ranging from 5 to 35. In one embodiment, n + m = an integer ranging from 7 to 30. In one embodiment, n + m = an integer ranging from 10 to 30. In one embodiment, n + m = an integer ranging from 10 to 20. In one embodiment, R_1 is a linear or branched C_3-C_{20} alkyl or alkenyl group. In one embodiment, R_1 is a linear or branched C_2-C_{20} alkyl or alkenyl group. While not being bound to theory, it is believed that the ratio of ethoxy to propoxy (or butoxy) groups allow for the compound to remain in liquid form, which is needed under the present invention.

[0055] In some embodiments, the first dispersing aid is of formula (V):



(V)

[0056] wherein each of R_6, R_7, R_8, R_9, R_{10}, R_{11} comprise, individually, CH_3 or C_2H_5; wherein "n" is an integer ranging from about 0 to about 30; wherein "s" is an integer ranging from about 0 to about 30; wherein "e" is an integer ranging from about 0 to about 30; wherein "m" is an integer ranging from 1 to about 30; wherein "t" is an integer ranging from 1 to about 30; wherein "f" is an integer ranging from 1 to about 30; wherein "p" is an integer ranging from 0 to about 20; wherein "u" is an integer ranging from 0 to about 20; wherein "g" is an integer ranging from 0 to about 20; wherein at least one of "n" or "p" is present; wherein at least one of "s" or "u" is present; wherein at least one of "e" or "g" is present; wherein the sum of the presented "n", "m" and "p" equals an integer of from 3 to 60; wherein the sum of the presented "s", "t" and "u" equals an integer of from 3 to 60; wherein the sum of the presented "e", "f" and "g" equals an integer of from 3 to 60.

[0057] R_1, in one embodiment is a linear or branched C_3-C_{20} alkyl or alkenyl group. R_1, in one embodiment is a linear or branched C_4-C_{20} alkyl or alkenyl group. R_1, in another embodiment is a linear or branched C_6-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_7-C_{18} alkyl or alkenyl group. In another embodiment, R_1 is a linear or branched C_8-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_9-C_{18} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{10}-C_{18}

alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{12}-C_{18} alkyl or alkenyl group.

[0058] R_1, in another embodiment is a linear or branched C_6-C_{16} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{14} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{12} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_6-C_{10} alkyl or alkenyl group.

[0059] R_1, in yet another embodiment is a linear or branched C_8-C_{16} alkyl or alkenyl group. R_1, in another embodiment, is a linear or branched C_9-C_{14} alkyl or alkenyl group. R_1, in yet another embodiment is a linear or branched C_{10}-C_{14} alkyl or alkenyl group.

[0060] In some embodiments, the ratio of “m” to “n + p” (m:(n+p)) is from 1:3 to 3:1, respectively. In some embodiments, the ratio of “m” to “n + p” (m:(n+p)) is from 1:9 to 9:1, respectively. In some embodiments, the ratio of “m” to “n + p” (m:(n+p)) is from 1:8 to 8:1, respectively. In some embodiments, the ratio of “m” to “n + p” (m:(n+p)) is from 1:5 to 5:1, respectively. In some embodiments, the ratio of m:(n+p) is less than or equal to 4:1. In some embodiments, the ratio of m:(n+p) is less than or equal to 3:1.

[0061] In one embodiment, the alcohol alkoxylate or dispersing aid has a Weight Average Molecular Weight (Mw) of 200 to 25,000 g/mole. In yet another embodiment, the alcohol alkoxylate has a Mw of 200 to 15,000 g/mole. In yet another embodiment, the alcohol alkoxylate has a Mw of 200 to 5,000 g/mole. In yet another embodiment, the alcohol alkoxylate has a Mw of 300 to 5,000.

[0062] In one embodiment, the dispersant for use in the present invention exhibit a weight average molecular weight, as determined by gel permeation chromatography and light scattering of a solution of the polymer in tetrahydrofuran and compared to a polystyrene standard, of less than 15,000 grams per mole ("g/mole"). In another embodiment, the polymeric dispersant polymers for use in the present invention exhibit a weight average molecular weight of less than 13,000 g/mole. In another embodiment, the polymeric

dispersant polymers for use in the present invention exhibit a weight average molecular weight of less than 10,000 g/mole. In another embodiment, the polymeric dispersant polymers for use in the present invention exhibit a weight average molecular weight of less than 5,000 g/mole. In another embodiment, the polymeric dispersant polymers for use in the present invention exhibit a weight average molecular weight of less than 3,000 g/mole.

[0063] In one embodiment, the dispersant is in liquid form, and contains no or minimal solids. In one embodiment, the dispersant is in liquid form. In one embodiment, the colorant system composition is free of water

[0064] In another embodiment, the compositions as described herein are free of water, meaning water has been added to the composition. In another embodiment, the compositions as described herein are substantially free of water.

[0065] It is understood that while no water is added to the composition, moisture content in the composition (due to the surrounding atmosphere and conditions) can, in some embodiment, reach an amount of up to 0.5 wt% by weight of composition. In other embodiments, the moisture content can reach an amount of up to 0.1 wt% by weight of composition, while in other embodiments; the moisture content can reach an amount of up to 0.8 wt% by weight of composition. In further embodiments, the moisture content can reach an amount of up to 1 wt% by weight of composition, while in other embodiments, the moisture content can reach an amount of up to 2 wt% by weight of composition, and finally in other embodiments, the moisture content can reach an amount of up to 3 wt% by weight of composition.

[0066] In other embodiments, methods of tinting an alkyd-based base coating or a latex-based base coating are disclosed. Such methods comprise contacting an alkyd-based base coating or a latex-based base coating with a colorant system composition comprising: -a colorant component; -a first dispersing aid of formula (III) or formula (iv) or formula (v); and, optionally, at least one second dispersing aid; wherein the colorant system composition is compatible with both latex-based coatings and alkyd-based coatings.

[0067] Other dispersants can also be utilized in compositions described herein. Polymeric dispersants, for example, can be added as at least one second dispersant.

[0068] In one embodiment a polymeric dispersant is described as related to a monomeric unit comprising said polymeric dispersant, and then as a copolymer/polymer describing said polymeric dispersant.

[0069] Described herein are unsaturated monomers according to structure (D.I):

$$R^{18}\text{-}R^{14}\text{-}R^{13}\text{-}R^{12}\text{-}R^{11} \qquad \text{(D.I).}$$

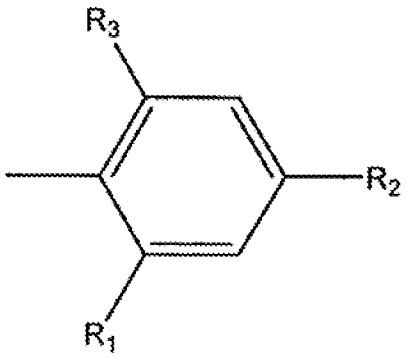
R^{12} is absent or is a bivalent linking group,

R^{13} is bivalent polyether group,

R^{14} is absent or is a bivalent linking group;

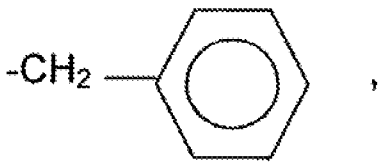
R^{18} is a moiety having a site of ethylenic unsaturation; and

R^{11} is according to structure D.XII

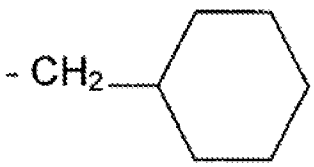


D.XII

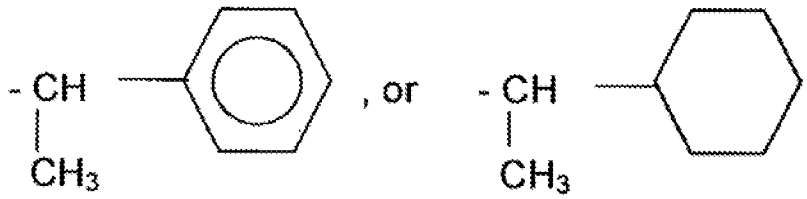
wherein R_1, R_2 and R_3 are independently selected from H, any of following structures D.XIIa, D.XIIb, D.XIIc, D.XIId:



D.XIIIa,



D.XIIIb,



D.XIIIc, D.XIIId ,

or a C_2-C_{30} branched or linear alkyl group or alkenyl group;

[0070] wherein at least one of R_1, R_2 and R_3 is the C_2-C_{30} branched or linear alkyl group or alkenyl group, and at least one of R_1, R_2 and R_3 is selected from structure D.XIIa, D.XIIb, D.XIIc, or D.XIId.

[0071] The polyether group, in one embodiment, comprises a chain of from 2 to 100 polymerized oxyethylene units and oxypropylene units, which may be arranged alternately, randomly, or in blocks. In one embodiment, R^{13} is a bivalent polyether group comprising a block of oxyethylene units and a block of oxypropylene units, more typically, a block of oxyethylene units and a block of oxypropylene units, wherein the block of oxypropylene units is disposed between and links the block of oxyethylene units. In some embodiments, the ratio of oxyethylene units to oxypropylene units is from 1:3 to 3:1, respectively. In some embodiments, the ratio of oxyethylene units to oxypropylene units is less than or equal to 4:1. In some embodiments, the ratio oxyethylene units to oxypropylene units is less than or equal to 3:1.

[0072] In another aspect, described herein are unsaturated monomers according to structure (D.I):

$$R^{18}\text{-}R^{14}\text{-}R^{13}\text{-}R^{12}\text{-}R^{11} \qquad \text{(D.I)}.$$

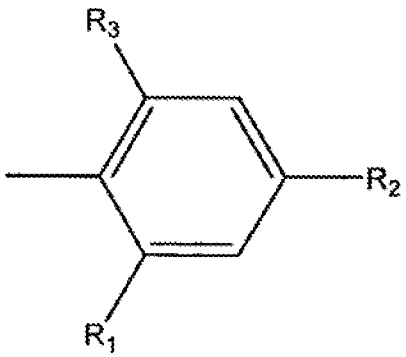
R^{12} is absent or is a bivalent linking group,

R^{13} is bivalent polyether group,

R^{14} is absent or is a bivalent linking group;

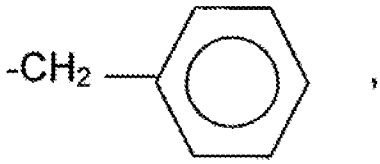
R^{18} is a moiety having a site of ethylenic unsaturation; and

R^{11} a tri-substituted aromatic group according to the structure D.XII



D.XII

wherein R_1, R_2 and R_3 are independently selected from the following structures D.XIIa, D.XIIb, D.XIIc, D.XIId:



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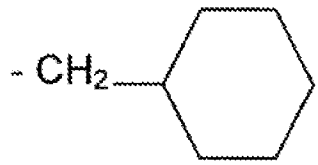
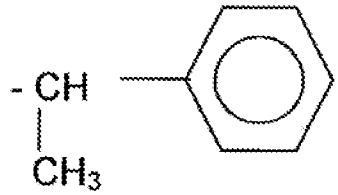
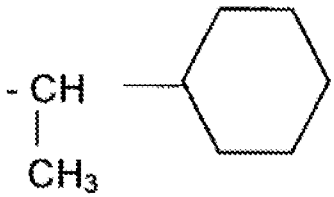


,

D.XIIIa, D.XIIIb,



, or



D.XIIIc, D.XIIId ,

or a C_2-C_{30} branched or linear alkyl group or alkenyl group;

[0073] wherein at least one of R_1, R_2 and R_3 is the C_2-C_{30} branched or linear alkyl group or alkenyl group, and at least one of R_1, R_2 and R_3 is selected from structure D.XIIa, D.XIIb, D.XIIc, or D.XIId.

[0074] In one embodiment, R_{12} is $-(CH_2)_xO-$, wherein x is an integer from 1 to 20 (e.g., use of styrenated benzyl alcohols)

[0075] In another embodiment, R_{12} is $-CH_2CH(OH)CH_2O-$ or $-CH_2CH(CH_2OH)O-$ (e.g., use of epichlorohydrin as coupling agent)

[0076] In one embodiment, R_{13} is:

$-[CH(R_{20})CH(R_{21})O]_x-$ wherein x is an integer of from 0 to 100, and R_{20} and R_{21} are independently selected from any of the following:

H; $-CH_2OH$; phenyl; $-CH_2Cl$;

a C_1-C_{30} straight or branched alkyl or alkenyl;

$-CH_2OR_{22}$ wherein R_{22} is C_1-C_{30} straight or branched alkyl or alkenyl, phenyl, or alkyl substituted phenyl; or

$R'COOCH_2-$ where R' is C_1-C_{30} straight or branched alkyl or alkenyl.

[0077] In another aspect, the invention is directed to polymeric dispersant (co)polymer of a mixture of unsaturated copolymerizable monomers, the unsaturated copolymerizable monomers comprising, based on total weight of monomers:

[0078] A. about 0 to 60 weight percent, preferably 5 to 30 weight percent or 10 to 45 weight percent, of at least one C_3-C_8 alpha beta-ethylenically unsaturated acidic monomer, preferably a C_3-C_8 alpha beta-ethylenically unsaturated carboxylic acid monomer;

[0079] B. about 15 to 70 weight percent, typically 20 to 50 weight percent, of at least one non-ionic, copolymerizable C_2-C_{12} alpha, beta-ethylenically unsaturated monomer; and

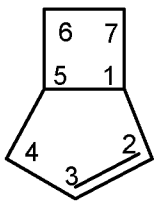
[0080] C. about 0.01 to 50 weight percent (wt%), or in another embodiment 0.05 to 30 weight percent, or in another embodiment 0.5 to 10 weight percent, or in another embodiment 1 to 10 weight percent, or in another embodiment 0.5 to 9 weight percent, or in another embodiment 0.5 to 7 weight percent, or in another embodiment 4 to 10 weight percent, of at least one non-ionic ethylenically unsaturated hydrophobic monomer as described herein.

[0081] The polymeric dispersant (co)polymer can, in one embodiment, be a homopolymer or, in another embodiment, be a copolymer comprising two or more different monomeric units.

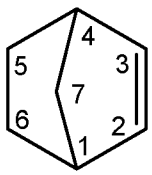
[0082] The aqueous coating composition is a stable fluid that can be applied to a wide variety of materials such as, for example, paper, wood, concrete, metal, glass, ceramics, plastics, plaster, and roofing substrates such as asphaltic coatings, roofing felts, foamed polyurethane insulation; or to previously painted, primed, undercoated, worn, or weathered substrates. The aqueous coating composition of the invention can be applied to the materials by a variety of techniques well known in the art such as, for example, brush, rollers, mops, air-assisted or airless spray, electrostatic spray, and the like.

[0083] Other dispersant and/or additives can be utilized in the present invention, including but not limited to: methanol, ethanol, or propanol, (C_1-C_3)glycols, for example, ethylene glycol, or propylene glycol, and/or alkylether diols, for example, ethylene glycol monoethyl ether, propylene glycol monoethyl ether and diethylene glycol monomethyl ether. Other examples include, alkyl polyglycol ethers such as ethoxylation products of lauryl, tridecyl, oleyl, and stearyl alcohols; alkyl phenol polyglycol ethers such as ethoxylation products of octyl- or nonylphenol, diisopropyl phenol, triisopropyl phenol.

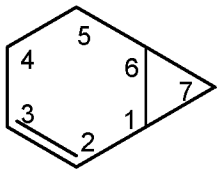
[0084] Suitable bicycloheptyl- and bicycloheptenyl- moieties may be derived from, for example, terpenic compounds having core (non-substituted) 7 carbon atom bicyclic ring systems according to structures (XII) - (XVII):



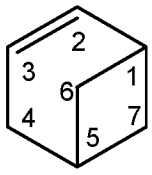
(XII) [3.2.0]



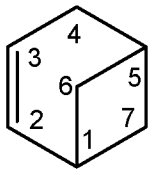
(XIII) [2.2.1]



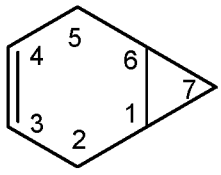
(XIV) [4.1.0]



(XV) [3.1.1]

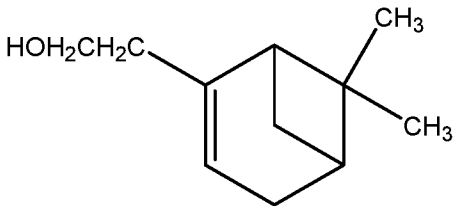


(XVI) [3.1.1]



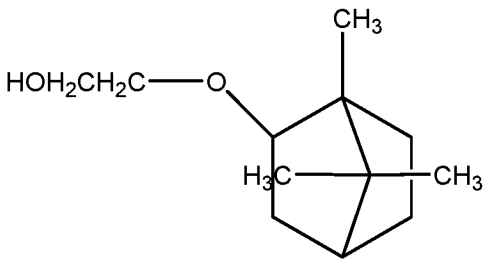
(XVII) [4.1.0]

[0085] For example, a bicycloheptenyl intermediate compound (XVIII), known as "Nopol":



(XVIII)

[0086] is made by reacting β-pinene with formaldehyde, and a bicycloheptyl intermediate compound (XIX), known as "Arbanol:



(XIX)

[0087] is made by isomerization of α-pinene to camphene and ethoxyhydroxylation of the camphene.

[0088] In one embodiment, the composition of the present invention comprises at least one dispersant and a liquid carrier.

[0089] In one embodiment, the liquid carrier comprises a water miscible organic liquid. Suitable water miscible organic liquids include saturated or unsaturated monohydric alcohols and polyhydric alcohols, such as, for example, methanol, ethanol, isopropanol, cetyl alcohol, benzyl alcohol, oleyl alcohol, 2-butoxyethanol, and ethylene glycol, as well as alkylether diols, such as, for example, ethylene glycol monoethyl ether, propylene glycol monoethyl ether and diethylene glycol monomethyl ether.

[0090] As used herein, terms "aqueous medium" and "aqueous media" are used herein to refer to any liquid medium of which water is a major component. Thus, the term includes water per se as well as aqueous solutions and dispersions.

[0091] The copolymer blends of the invention can be used in accordance with the prior art for known dispersants, using the dispersants according to the invention in place of their prior-art counterparts. Thus, for example, they can be used in the preparation or processing of paints, printing inks, inkjet inks, paper coatings, leather colors and textile colors, pastes, pigment concentrates, ceramics, cosmetic preparations, particularly if they contain solids such as pigments and/or fillers. They can also be employed in connection with the preparation or processing of casting and/or molding compounds based on synthetic, semi-synthetic or natural macromolecular compounds, such as polyvinyl chloride, saturated or unsaturated polyesters, polyurethanes, polystyrenes, polyacrylates, polyamides, epoxy resins, polyolefins such as polyethylene or polypropylene, for example. By way of example it is possible to use the copolymer blends for preparing casting compounds, PVC plastisols, gelcoats, polymer concrete, printed circuit boards, industrial paints, wood and furniture varnishes, vehicle finishes, marine paints, anti-corrosion paints, can coatings and coil coatings, decorating paints and architectural paints, where binders and/or solvents, pigments and optionally fillers, the copolymer blends, and typical auxiliaries are mixed. Examples of typical binders are resins based on polyurethanes, cellulose nitrates, cellulose acetobutyrates, alkyds, melamines, polyesters, chlorinated rubbers, epoxides and (meth)acrylates. Examples of water-based coatings are cathodic or anodic electrodeposition coatings for car bodies, for example. Further examples are renders, silicate paints, emulsion paints, aqueous paints based on water-thinnable alkyds, alkyd emulsions, hybrid systems, 2-component systems, polyurethane dispersions and acrylate dispersions.

[0092] Current comparisons are tested against a commercially available dispersant D23 (tri-styryl phenol ethoxylate - 16 EO), as well as D24, an anionic phosphate ester. The new universal colorant shows improved color development and better rub-up performance when compared to the D23 and D24 in an aqueous paint formulation. In addition, unlike commercially available dispersants, it can be used in solvent based systems based on solubility testing results in low polarity to high polarity solvents (including but not limited to, e.g.,

xylene to isopropanol). The improved color development comes from better dispersing and wetting of the organic pigment while stabilizing the dispersions in various mediums.

[0093] As described above, latex paints and coatings may contain various adjuvants.

[0094] The aqueous coating compositions of the invention include less than 2 % by weight and preferably less than 1.0% by weight of anti-freeze agents based on the total weight of the aqueous coating composition. For example, the aqueous coating compositions may be substantially free of anti-freeze agents.

[0095] The aqueous coating composition typically includes at least one pigment. The term "pigment" as used herein includes non-film-forming solids such as pigments, extenders, and fillers. The at least one pigment is preferably selected from the group consisting of TiO2 (in both anastase and rutile forms), clay (aluminum silicate), CaCO3 (in both ground and precipitated forms), aluminum oxide, silicon dioxide, magnesium oxide, talc (magnesium silicate), barytes (barium sulfate), zinc oxide, zinc sulfite, sodium oxide, potassium oxide and mixtures thereof. Suitable mixtures include blends of metal oxides such as those sold under the marks MINEX (oxides of silicon, aluminum, sodium and potassium commercially available from Unimin Specialty Minerals), CELITES (aluminum oxide and silicon dioxide commercially available from Celite Company), ATOMITES (commercially available from English China Clay International), carbon black, and ATTAGELS (commercially available from Engelhard). More preferably, the at least one pigment includes TiO2, CaCO3 or clay. Generally, the mean particle sizes of the pigments range from about 0.01 to about 50 microns. For example, the TiO2 particles used in the aqueous coating composition typically have a mean particle size of from about 0.15 to about 0.40 microns. The pigment can be added to the aqueous coating composition as a powder or in slurry form. The pigment is preferably present in the aqueous coating composition in an amount from about 5 to about 50 percent by weight, more preferably from about 10 to about 40 percent by weight.

[0096] The coating composition can optionally contain additives such as one or more film-forming aids or coalescing agents. Suitable firm-forming aids or coalescing agents include plasticizers and drying retarders such as high boiling point polar solvents. Other conventional coating additives such as, for example, dispersants, additional surfactants (i.e. wetting agents), rheology modifiers, defoamers, thickeners, additional biocides, additional mildewcides, colorants such as colored pigments and dyes, waxes, perfumes, co-solvents, and the like, can also be used in accordance with the invention. For example, non-ionic and/or ionic (e.g. anionic or cationic) surfactants can be used to produce the polymer latex. These additives are typically present in the aqueous coating composition in an amount from 0 to about 15% by weight, more preferably from about 1 to about 10% by weight based on the total weight of the coating composition.

[0097] The aqueous coating composition typically includes less than 10.0% of anti-freeze agents based on the total weight of the aqueous coating composition. Exemplary anti-freeze agents include ethylene glycol, diethylene glycol, propylene glycol, glycerol (1,2,3-trihydroxypropane), ethanol, methanol, 1-methoxy-2-propanol, 2-amino-2-methyl-1-propanol, and FTS-365 (a freeze-thaw stabilizer from Inovachem Specialty Chemicals). More preferably, the aqueous coating composition includes less than 5.0% or is substantially free (e.g. includes less than 0.1%) of anti-freeze agents. Accordingly, the aqueous coating composition of the invention preferably has a VOC level of less than about 100 g/L and more preferably less than or equal to about 50 g/L.

[0098] The balance of the aqueous coating composition of the invention is water. Although much of the water is present in the polymer latex dispersion and in other components of the aqueous coating composition, water is generally also added separately to the aqueous coating composition. Typically, the aqueous coating composition includes from about 10% to about 85% by weight and more preferably from about 35% to about 80% by weight water. Stated differently, the total solids content of the aqueous coating composition is typically from about 15% to about 90%, more preferably, from about 20% to about 65%.

[0099] The coating compositions are typically formulated such that the dried coatings comprise at least 10% by volume of dry polymer solids, and additionally 5 to 90% by volume of non-polymeric solids in the form of pigments. The dried coatings can also include additives such as plasticizers, dispersants, surfactants, rheology modifiers, defoamers, thickeners, additional biocides, additional mildewcides, colorants, waxes, and the like, that do not evaporate upon drying of the coating composition.

[00100] EXPERIMENTS

[00101] Initial Experiments With Various Chemicals

[00102] Initial experimentation started with testing various samples to determine which had low viscosity when mixed with the phthalo blue 15:4 pigment, and relatively low particle size.

[00103] Table 1: Initial Samples

Sample ID	Description
D1	C8-10 molecule with 5 mol EO and 8 mol PO
D2	C8-10 molecule with 5 mol EO and 4 mol PO
D3	C12-16 molecule with 8.5 mol EO and 7 mol PO
D4	C12-16 molecule with 6.4 mol EO and 10.1 mol PO
D5	C7-9 molecule with 5.7 mol EO and 6 mol PO
D6	C12 molecule with 6 mol EO and 7 mol PO
D7	Octylphenol molecule with 9 mol EO
D8	Nonylpenol molecule with 9 mol EO
D9	Nopol with 6.5 mol EO and 18.5 mol PO
D10	C13 molecule with 3 mol EO -
D11	C13 molecule with 6 mol EO
D12	C13 molecule with 7 mol EO
D13	C13 molecule with 10 mol EO
D14	C13 molecule with 15 mol EO
D15	C10 molecule with 6 mol EO
D16	Linear C10-16 molecule with 7 mol EO
D17	Linear C12-15 molecule with 7 mol EO
D18	TSP molecule with 10 mol EO

[00104] Table 1 gives the samples used in the initial evaluations performed with dispersing phthalo blue 15:4.

[00105] Samples in Table 1 were then made into a dispersion with the following formulation:

[00106] Dispersant – 100 grams

[00107] Phthalo Blue 15:4 pigment – 50 grams

[00108] The samples were mixed at 1,000 cps on the high speed Dispermat for 30 minutes, then allowed to sit for 10 minutes to de-aerate.

[00109] As stated above, D23 is a TSP with 16 EO (Control), and D24 is an anionic phosphate ester

[00110] Table 2: Viscosity Results

Sample	**Dispersant**	**Amount Dispersant (g)**	**Amount Pigment (g)**	**Viscosity @12 rpm** (rpm)	**Viscosity @ 60 rpm** (rpm)
S1	D2	50	25	1650	819.8
S2	D9	50	25	3699	2340
S3	D18	50	25	34443	EEEE
S4	D3	50	25	2200	1260
S5	D6	50	25	1750	1050
S6	D11	50	25	16846	5299
S7	D13	50	25	35842	EEEE
S8	D8	50	25	26244	EEEE
S9	D1	50	25	2749	1400
S10	D10	50	25	22245	6229
S11	D15	50	25	30793	8969
S12	D7	50	25	14547	6959
S13	D12	50	25	17146	5159
S14	D4	50	25	3299	1510
S15	D5	35.5	17.8	3999	1820

[00111]

[00112] Based on the dispersion samples shown in Table 2, the best performing dispersants for low viscosity dispersions were based on the EO/PO mixtures. In order to have a low viscosity, and mixture of ethylene oxide and propylene oxide had to be added to the chemical by ethoxylation. In the tables discussed herein, the result “EEEE” signifies that the results could not be measured (too viscous to be measured).

[00113] Table 2: Dispersants Tested

Sample ID	Description
D19	Lauryl alcohol with 4.5 mol EO and 7 mol PO
D20	Diethylene glycol with 23 EO and 28 PO
D21	Tridecyl/lauryl alcohol with 33 EO
D22	Sorbitan monooleate with 20 mol EO
D23	Tri-Styryl Phenol 16 EO, 0 PO
D24	Anionic Phosphate Ester

[00114]

[00115] The following tables examined at other chemistries to determine if additional performance gains can be achieved.

[00116] Table 3: Second Round Viscosity Results

Chemical	Samples						
Column1	S-1217-33A	S-1217-33B	S-1217-33C	S-1217-33D	S-1217-33E	S-1217-33F	S-1217-33G
DiH2O	47.06 g						
D2		100 g		49.4 g	50 g	43.4 g	50 g
D19			100 g	49.4 g	50 g	43.4 g	50 g
D23	7.94 g						
D24				10 g			
D20					8.8 g		
D21						22.0 g	
D22							8.8 g
Phthalo Blue 15:4	45 g	50 g	50 g	50g	50 g	50 g	50 g

[00117]

[00118] Table 3 shows the results from testing various dispersants along with blends of dispersants. Comparisons were completed against commercial dispersants D23 and D24.

[00119] Table 4: Second Round Viscosity Results

Sample ID	Viscosity @12 rpm (rpm)	Viscosity @ 60 rpm (rpm)	Viscosity Milled @ 12 rpm (rpm)	Viscosity Milled at 60 rpm (rpm)
33A	1100	569.9	2599	1320
33B	2349	1080	40841	EEEE
33C	2349	1130	28444	8518

33D	2799	1180	22245	6009
33E	1050	739.8	10348	3269
33F	899.9	699.9	2749	1370
33G	1450	809.8	11498	3249

[00120] Viscosity results showed that the sample with the commercial dispersant D23 had the lowest viscosity, followed by the sample with the mixture of D2, D19 and D21 dispersants. This result was unexpected due to the high amount of EO found in the aggregate.

[00121] Table 5: Color Development Results

Sample	Color Strength (%)	ΔL	Δa	Δb
S1217-33A	100.0	0.00	0.00	0.00
S1217-33B	120.5	-1.08	-1.81	-2.28
S1217-33C	113.5	-0.66	-1.54	-1.69
S1217-33D	109.9	-0.19	-1.64	-1.48
S1217-33E	120.3	-0.76	-1.75	-1.90
S1217-33F	121.0	-1.72	-1.44	-1.93
S1217-33G	114.4	-0.31	-1.68	-1.50

[00122] Samples of the dispersions were added in at to a latex acrylic paint, Behr Premium Plus #3052, at 4% on total weight. Paints were then mixed up on a Red Devil Paint Shaker for 30 minutes to fully disperse the dispersion.

[00123] Table 5 shows the differences in the color strength of the various paints when compared to the control (S1217-33A). Surprisingly, all of the samples had better color development than the control. In addition, the S1217-33F sample had the best color strength and lowest Δb value in all the samples. This indicates that the sample has a greater bluish undertone than yellow undertone, providing a better overall color development for a blue paint.

[00124] Testing was completed to determine what the optimum level of mixture between the D2 and the D19 dispersant should be to improve viscosity while reducing particle size of the pigment after a dispersion has been made. Comparison to an existing commercial product was included.

[00125] Table 6: Variations in Dispersant Ratio

Sample ID	Amount D2	Amount D19	Amount D23	DiH2O	Amount Phthalo Blue 15:4	Amount Stainless Steel Beads	Pigment/ Liquid Ratio
S-1217-28A	100 g	0 g	0 g	0 g	50 g	50 g	0.50
S-1217-28B	75 g	25 g	0 g	0 g	50 g	50 g	0.50
S-1217-28C	50 g	50 g	0 g	0 g	50 g	50 g	0.50
S-1217-28D	25 g	75 g	0 g	0 g	50 g	50 g	0.50
S-1217-28E	0 g	100 g	0 g	0 g	50 g	50 g	0.50
S-1217-28F	0 g	0 g	7.94 g	47.06 g	45 g	50 g	0.81

[00126] Table 6 shows the ratios tested between D2 and D19 dispersants, as well as the control, D23, that was used.

[00127] Table 7: Viscosity Results from Formulations Found in Table 6

Sample ID	Viscosity @12 rpm (rpm)	Viscosity @ 60 rpm (rpm)	Viscosity Milled @ 12 rpm (rpm)	Viscosity Milled at 60 rpm (rpm)
S-1217-28A	2000	909.8	19569	6169
S-1217-28B	1400	749.8	22595	9448
S-1217-28C	1100	669.9	9448	3179
S-1217-28D	1150	749.8	7998	2439
S-1217-28E	899.8	679.9	6699	2489
S-1217-28F	1100	479.9	249.9	130

[00128] The viscosity results on the dispersions that were made in Table 6 are shown in Table 7. The samples with the greater amount of D19 showed lower viscosities than the samples with higher amounts of D2, but still not quite as fluid as the control. However, the control contains 47% water in the dispersion formulation, whereas the other dispersions are water and solvent free.

[00129] Table 8: Color Development Results

Sample	S-1217-	S-1217-	S-1217-	S-1217-	S-1217-	S-1217-

ID	28A	28B	28C	28D	28E	28F
Tint Base level (g)	97.3	97.3	97.3	97.3	97.3	98
Colorant Strength (g)	2.7	2.7	2.7	2.7	2.7	2
Tint Strength (%)	132.08	124.53	123.9	125.8	117.72	100
L	66.27	66.85	67.1	66.87	67.22	68.5
a	-22.22	-22.06	-22.08	-21.93	-21.76	-20.69
B	-33.33	-32.93	-32.7	-32.72	-32.45	-30.81
ΔL	-2.21	-1.6	-1.43	-1.71	-1.23	0
Δa	-1.53	-1.44	-1.54	-1.44	-1.07	0
ΔB	-2.56	-2.08	-2.05	-2.09	-1.58	0
ΔE	3.7	2.99	2.93	3.08	2.24	0
Rub Up ΔE	1.14	1.48	1.45	1.39	1.7	3.34

[00130] The color development results in Table 8 show a surprising increase in color development with the D2/D19 blended dispersants compared to the conventional dispersant. Samples were weighted out based on equivalent pigment loading so the same amount of pigment was added to the each sample of paint.

[00131] Not only was tint strength improved, but all the developmental samples had lower Δb values, indicating better blue tone in the paint. In addition, when doing Rub Up testing, the control had double the ΔE value than the developmental samples, indicating better pigment flow.

[00132] Unique to these developmental dispersants for universal colorants, they are soluble in a variety of solvents, ranging from highly polar to non-polar aromatic solvents.

[00133] Table 9: Solubility Chart

Sample	Solvent	1%	5%	10%
D2	Xylene	Soluble		Slightly

				hazy
	Isopropanol	Soluble		
	Acetone	Soluble		
	MIAK	Soluble		
	PM Acetate	Soluble		
	Water	Soluble		
D19	Xylene	Slightly soluble	Hazy	Miscible
	Isopropanol	Soluble		
	Acetone	Soluble		
	MIAK	Slightly soluble	Soluble	
	PM Acetate	Soluble		
	Water	Soluble	Slight Haze	Hazy
50/50 Blend D2/D19	xylene	Soluble		Slightly hazy
	Isopropanol	Soluble		
	Acetone	Soluble		
	MIAK	Slightly insoluble	Soluble	
	PM Acetate	Soluble		
	Water	Soluble		

[00134]

[00135] Table 9 shows the solubility chart of both the separate component and the 50/50 blend of D2/D19 in various liquids. These developmental dispersants are usable in non-polar to highly-polar solvents, as well as water.

[00136] Blend of Dispersants with Polymerics

[00137] The second phase of the development of new dispersants included adding a solid polymeric dispersant to the D2/D19 blend. This would then be tested against conventional dispersants in color development tests.

[00138] Table 10: Polymeric Dispersants Evaluated

Label of Dispersant	Dispersant Chemistry
PD-1	Tristyrylphenol with 40 EO

PD-2	Developmental sample – block copolymer dispersant
PD-3	eicosa(propoxy)deca(ethoxy)diethylamine
PD-4	Tristyrylphenol with 25 EO
PD-5	Sodium polyacrylate

[00139] Table 10 shows the polymeric dispersants used to test the performance of the novel blended D2/D19 dispersant. PD-3 is trademarked as Solsperse 24000 SC sold by Lubrizol. PD-1 and PD-4 are dispersants sold by Solvay (Princeton, NJ).

[00140] Table 11: Initial Formulations with Polymerics

Chemical	**Formulations** (grams)				
	S1240-24A	**S1240-24B**	**S1240-24C**	**S1240-25A**	**S-1240-25B**
D2	50.0	50.0	50.0	50.0	50.0
PD-1	5.0	xxx	xxx	xxx	xxx
PD-2	xxx	5.0	xxx	xxx	xxx
PD-3	xxx	xxx	5.0	xxx	xxx
PD-4	xxx	xxx	xxx	5.0	xxx
PD-5	xxx	xxx	xxx	xxx	5.0
D19	50.0	50.0	50.0	50.0	50.0
Notes		Insoluble, unable to test			Insoluble, unable to test

[00141] The PD-2 and PD-5 samples were insoluble in the novel dispersant blend. However, the other polymerics were soluble either at room temperature, or when the temperature was heated up to 50oC and mixed for 15 minutes. The experimental dispersants were then mixed in with phthalo blue 15:2 pigment to create a pigmented dispersion.

[00142] Table 12: Pigment Dispersions made with Polymerics

Chemical	**Formulations** (grams)		
	S1240-25C	**S1240-25D**	**S1240-25A**
S1240-24A	100.0	xxx	xxx

S1240-24C	xxx	100.0	xxx
S1240-25A	xxx	xxx	100.0
Phthalo Blue 15:4	50.0	50.0	50.0

[00143] Pigment dispersions were developed from the initial dispersants seen in Table 11. The samples were prepared by adding the dispersants into a stainless steel beaker, mixing at 1500 rpm on a high speed Dispermat, then slowly adding the phthalo blue 15:4 to the mixing dispersant. Once all the pigment was added, the samples were then poured into a plastic container and stainless steel beads were added. The containers were closed and placed on a Red Devil paint shaker for 30 minutes to mill the pigment as small as possible.

[00144] Once the pigment dispersion was made, it was added to Behr Premium Plus latex acrylic paint in the following formulation:

[00145] Table 13: Paint Formulation

Paint	Dispersion
48 grams	2 grams

[00146] Once added, the paint was then mixed up on the Red Devil paint shaker for 30 minutes to fully disperse the pigment throughout the paint.

[00147] Once mixed, the paint was then allowed to de-aerate for 1 hour, then drawdowns were completed using a 3 mil drawdown bar. After allowing 24 hours to fully dry, the drawdowns were then tested for color development.

[00148] Table 14: Color Development Results

Test	Formulations		
	S1240-25C	S1240-25D	S1240-25A
L	67.81	69.85	67.81
a*	23.18	21.37	23.21
b*	31.24	28.54	31.24
ΔL	-2.04	Control	-2.04
Δa*	-1.81	Control	-1.75
Δb*	-2.69	Control	-2.59

ΔE	3.83	Control	3.67
Tristimulus Color Strength (%)	126.44	100	125.36

[00149] Results shown in Table 14 indicate that the two polymerics based on the Tristyrylphenol chemistry performed better than the sample with the commercially available Solsperse 24000. Color development was improved by at least 25% over the Solsperse with better blue tone.

[00150] However, the Solsperse 24000 SC dispersant is traditionally used only for high performance solvent based paint/coatings systems and typically does not work at all in waterborne paints. With the addition of the Solsperse 24000 to the D1/D19 blend, the polymeric dispersant was successfully used in a waterborne paint. This is another surprising discovery of the D2/D19 blend.

[00151] The next test involved adding the dispersions to a long-oil alkyd paint (100% solvent-based paint) to determine if the blended dispersions would have decent performance properties in a solvent-based system

[00152] Table 15: Color Development Results in Long-Oil Alkyd Paint

Test	**Formulations**		
	S1240-25C	**S1240-25D**	**S1240-25A**
L	75.24	73.68	75.82
a*	-17.17	-20.03	-16.35
b*	-21.59	-24.38	-20.8
ΔL	1.55	Control	2.13
Δa*	2.88	Control	3.68
Δb*	2.79	Control	3.57
ΔE	4.28	Control	5.55
Tristimulus Color Strength (%)	96.86	100	95.43

[00153] The results in Table 15 indicates that the paint sample with the Solsperse 24000 based dispersion performed slightly better than the other two, but all worked within a Solvent-based paint system. This indicates that the

D1/D19 based blends, with the polymeric dispersants added to them allows for use in both aqueous and non-aqueous systems. The ability to be used in both aqueous and non-aqueous systems allows for a paint manufacturer to use one dispersion to be used for both systems, eliminating the need for separate systems for aqueous and non-aqueous paints.

[00154] Next examples show the results when tested in a waterborne latex acrylic Behr paint compared to the newest commercial dispersants with an untreated phthalo blue 15:2 pigment.

[00155] Table 16: Formulations with Phthalo Blue 15:2

Chemicals	**Formulations**				
	S1240-48A	**S1240-48B**	**S1240-48C**	**S1240-48D**	**S1240-48E**
Water	xxx	xxx	46.0 grams	41.5 grams	xxx
S1240-24A	100 grams	xxx	xxx	xxx	xxx
S1240-25A	xxx	100 grams	xxx	xxx	xxx
Tego 755 W	xxx	xxx	9 grams	xxx	xxx
Disperbyk 2015	xxx	xxx	xxx	13.5 grams	xxx
D1/D19 50/50 blend	xxx	xxx	xxx	xxx	100 grams
Phthalo Blue 15:2	34.65 grams	36.56 grams	34.21 grams	45 grams	44.10 grams
Notes			Reacted with pigment	Reacted with pigment	

[00156] In the formulations seen in Table 16, a lower amount of phthalo blue 15:2 was used due to an increase in viscosity much more rapidly than when observed with phthalo blue 15:4 pigment. Both of the commercial dispersants, the Tego 755W and the Disperbyk 2015 had reactions with the phthalo blue 15:2 pigment that was not seen with the experimental polymeric dispersants.

[00157] These dispersions were then added to the waterborne latex acrylic Behr paint in the following ratios (which are based on consistent amount of pigment in the paint):

[00158] Table 17: Dispersion Calculations

Chemical	Formulation			
	S1240-51A	**S1240-51B**	**S1240-51C**	**S1240-51D**
Behr 3052 Paint	47 grams	47.1 grams	48 grams	47.5 grams
S1240-48A	3.0 grams	xxx	xxx	xxx
S1240-48B	xxx	2.9 grams	xxx	xxx
S1240-48C	xxx	xxx	2.0 grams	xxx
S1240-48E	xxx	xxx	xxx	2.5 grams

[00159]

[00160] Note that the paints shown in Table 17 are based on the amount of pigment added to the paint in a consistent manner. The paint, with dispersion, was mixed on the Red Devil paint shaker for 60 minutes, and then allowed to sit for 60 minutes before testing to allow for de-aeration of the paint.

[00161] Table 18: Color Development Results for Commercial Comparisons

Test	Samples			
	S1240-51A	**S1240-51B**	**S1240-51C**	**S1240-51D**
% Color Strength	105.49	105.12	100	101.73
L	62.69	62.83	64.81	64.04
a	-15.67	-15.63	-15.23	-15.53
B	-35.11	-34.98	-32.85	-33.8
ΔL	-2.12	-1.97	xxx	-0.76
Δa	-0.44	-0.4	xxx	-0.3
ΔB	-2.26	-2.13	xxx	-0.94
ΔE	3.12	2.92	xxx	1.24

[00162] Table 18 shows the results of the color development testing on the paint samples. The dispersion with the Disperbyk 2015 was eliminated from testing due to a visible, and rapid, reaction of the dispersant with the untreated phthalo blue 15:2 pigment. The same type of reaction was observed with the Tego 755W dispersant, but not in as rapid a development, and testing continued with the Tego sample before the reaction was observed. Neither of the experimental polymeric dispersants showed reaction with the pigment.

[00163] All of the experimental dispersants, when added to the waterborne latex acrylic paint showed improved color development compared to the Tego dispersed paint. The experimental polymeric dispersants showed an improved color development compared to the blended experimental dispersant.

[00164] These results indicate a novel and unique chemistry that allows for use in both aqueous and non-aqueous systems while providing better color development compared to conventional dispersants and without any reactivity issues with untreated pigment.

[00165] It should be apparent embodiments other than those expressly described above come within the spirit and scope of the present invention. Thus, the present invention is not defined by the above description but by the claims appended hereto.

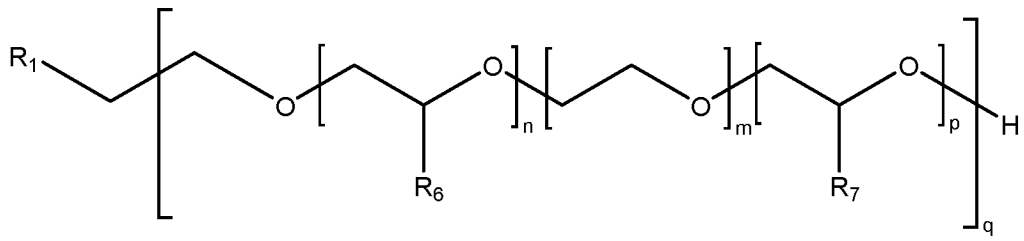
CLAIMS

What is claimed is:

1. A colorant system composition comprising:

-a colorant component;

-a first dispersing aid of formula (IV):



(IV)

wherein R_6 and R_7 comprise, individually, CH_3 or C_2H_5;
wherein "n" is an integer ranging from about 0 to about 30;
wherein "m" is an integer ranging from 1 to about 30;
wherein "p" is an integer ranging from 0 to about 20;
wherein "q" is an integer ranging from 1 to 3;
wherein R_1 is a linear or branched C_2-C_{20} alkyl or alkenyl group;
wherein at least one of "n" or "p" is present;
wherein the sum of the presented "n", "m" and "p" equals an integer of from 4 to 60; and
wherein the first dispersing aid is in substantially liquid form; and

-optionally, at least one second dispersing aid;

wherein the colorant system composition is compatible with both latex-based coatings and alkyd-based coatings.

2. The composition of claim 1 wherein the sum of the presented "n", "m" and "p" equals an integer of from 6 to 30.

3. The composition of claim 1 wherein R_1 is a linear or branched C_3-C_{18} alkyl or alkenyl group, or a linear or branched C_6-C_{18} alkyl or alkenyl group, or a linear or branched C_{10}-C_{18} alkyl or alkenyl group, or a linear or branched C_6-C_{16} alkyl or alkenyl group, or a linear or branched C_6-C_{14} alkyl or alkenyl group, or a linear or branched C_6-C_{12} alkyl or alkenyl group.

4. The composition of claim 1 wherein the weight average molecular weight (Mw) of the first dispersing aid is from about 200 g/mole to about 25,000 g/mole.

5. The composition of claim 1 wherein the weight average molecular weight (Mw) of the first dispersing aid is from about 300 g/mole to about 10,000 g/mole.

6. The composition of claim 1 wherein the weight average molecular weight (Mw) of the first dispersing aid is from about 300 g/mole to about 5,000 g/mole.

7. The composition of claim 1 wherein the ratio of “m” to “n + p” (m:(n+p)) is from 1:9 to 9:1, respectively.

8. The composition of claim 1 wherein the ratio of “m” to “n + p” (m:(n+p)) is from 1:4 to 4:1, respectively.

9. The composition of claim 1 wherein the at least one second dispersing aid is least one of a polymeric dispersant, polycarboxylate, sodium polyacrylate, glycol, diethylene glycol, glycerine, C_6-C_{18} alcohol ethoxylate and its sulfate or phosphate salts, sorbitan monoleate, tristyryl phenol ethoxylate, nopol-containing surfactant, or eicosa(propoxy)deca(ethoxy)diethylamine.

10. The composition of claim 1 wherein the composition is characterized by a VOC (Volatile Organic Content) of less than about 100 g/L.

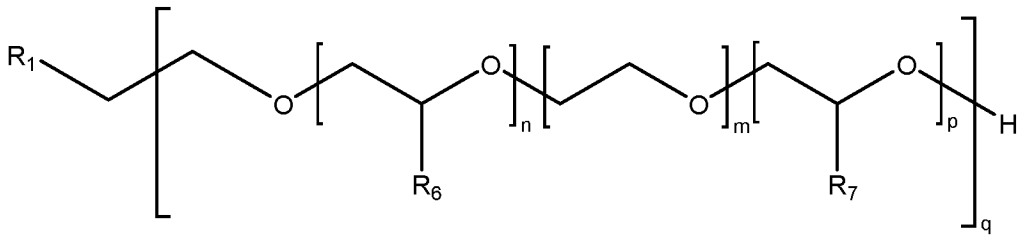
11. The composition of claim 1 wherein the composition is characterized by a VOC (Volatile Organic Content) of less than about 60 g/L.

12. The composition of claim 1 wherein the composition is characterized by a VOC (Volatile Organic Content) of less than about 50 g/L.

13. A method of tinting an alkyd-based base coating or a latex-based base coating comprising contacting an alkyd-based base coating or a latex-based base coating with a colorant system composition comprising:

-a colorant component;

-a first dispersing aid of formula (IV):



(IV)

wherein R_6 and R_7 comprise, individually, CH_3 or C_2H_5;
wherein "n" is an integer ranging from about 0 to about 30;
wherein "m" is an integer ranging from 1 to about 30;
wherein "p" is an integer ranging from 0 to about 20;
wherein "q" is an integer ranging from 1 to 3;
wherein R_1 is a linear or branched C_2-C_{20} alkyl or alkenyl group;
wherein at least one of "n" or "p" is present;
wherein the sum of the presented "n", "m" and "p" equals an integer of from 4 to 60; and
wherein the first dispersing aid is in substantially liquid form; and

-optionally, at least one second dispersing aid;

wherein the colorant system composition is compatible with both latex-based coatings and alkyd-based coatings.

14. The method of claim 13 wherein the sum of the presented "n", "m" and "p" equals an integer of from 6 to 30.

15. The method of claim 13 wherein R_1 is a linear or branched C_3-C_{18} alkyl or alkenyl group, or a linear or branched C_6-C_{18} alkyl or alkenyl group, or a linear or branched C_{10}-C_{18} alkyl or alkenyl group, or a linear or branched C_6-C_{16} alkyl or alkenyl group, or a linear or branched C_6-C_{14} alkyl or alkenyl group, or a linear or branched C_6-C_{12} alkyl or alkenyl group.

16. The method of claim 13 wherein the weight average molecular weight (Mw) of the first dispersing aid is from about 300 g/mole to about 5,000 g/mole.

17. The method of claim 13 wherein the ratio of "m" to "n + p" (m:(n+p)) is from 1:3 to 3:1, respectively.

18. The method of claim 13 wherein the at least one second dispersing aid is at least one of a polymeric dispersant, polycarboxylate, sodium polyacrylate, glycol, diethylene glycol, glycerine, C_6-C_{18} alcohol ethoxylate and its sulfate or phosphate salts, sorbitan monoleate, tristyryl phenol ethoxylate, nopol-containing surfactant, or eicosa(propoxy)deca(ethoxy)diethylamine.

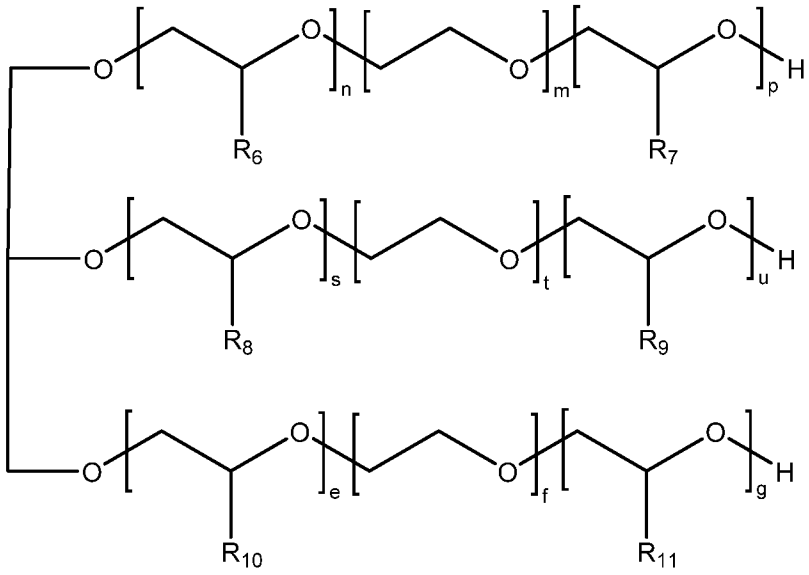
19. The method of claim 13 wherein the composition is characterized by a VOC (Volatile Organic Content) of less than about 100 g/L.

20. The method of claim 13 wherein the composition is characterized by a VOC (Volatile Organic Content) of less than about 50 g/L.

21. A colorant system composition comprising:

-a colorant component;

-a first dispersing aid of formula (V):



(V)

wherein each of R_6, R_7, R_8, R_9, R_{10}, R_{11} comprise, individually, CH_3 or C_2H_5;

wherein "n" is an integer ranging from about 0 to about 30;

wherein "s" is an integer ranging from about 0 to about 30;

wherein "e" is an integer ranging from about 0 to about 30;

wherein "m" is an integer ranging from 1 to about 30;

wherein "t" is an integer ranging from 1 to about 30;

wherein "f" is an integer ranging from 1 to about 30;

wherein "p" is an integer ranging from 0 to about 20;

wherein "u" is an integer ranging from 0 to about 20;

wherein "g" is an integer ranging from 0 to about 20;

wherein at least one of "n" or "p" is present;

wherein at least one of "s" or "u" is present;

wherein at least one of "e" or "g" is present;

wherein the sum of the presented "n", "m" and "p" equals an integer of

from 3 to 60;

wherein the sum of the presented "s", "t" and "u" equals an integer of from 3 to 60;

wherein the sum of the presented "e", "f" and "g" equals an integer of from 3 to 60; and

wherein the first dispersing aid is in substantially liquid form; and

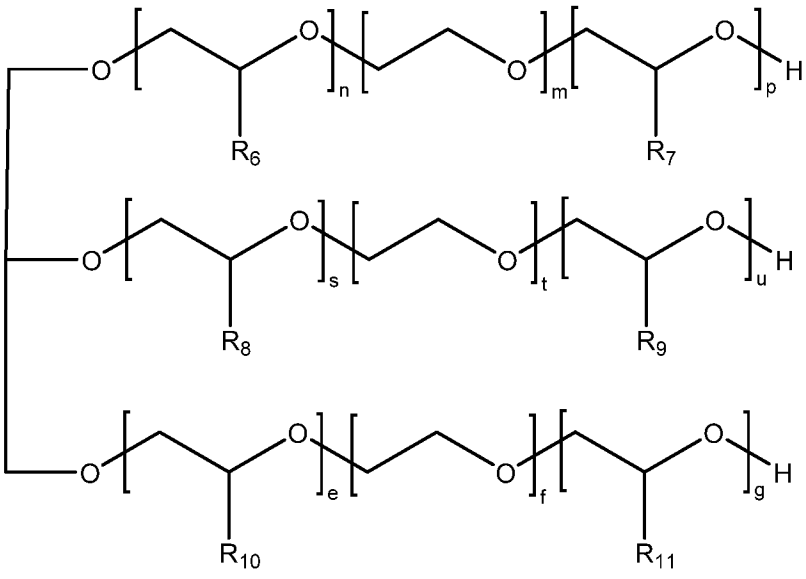
-optionally, at least one second dispersing aid;

wherein the colorant system composition is compatible with both latex-based coatings and alkyd-based coatings.

22. A method of tinting an alkyd-based base coating or a latex-based base coating comprising contacting an alkyd-based base coating or a latex-based base coating with a colorant system composition comprising:

-a colorant component;

-a first dispersing aid of formula (V):



(V)

wherein each of R_6, R_7, R_8, R_9, R_{10}, R_{11} comprise, individually, CH_3 or C_2H_5;

wherein "n" is an integer ranging from about 0 to about 30;

wherein "s" is an integer ranging from about 0 to about 30;
wherein "e" is an integer ranging from about 0 to about 30;
wherein "m" is an integer ranging from 1 to about 30;
wherein "t" is an integer ranging from 1 to about 30;
wherein "f" is an integer ranging from 1 to about 30;
wherein "p" is an integer ranging from 0 to about 20;
wherein "u" is an integer ranging from 0 to about 20;
wherein "g" is an integer ranging from 0 to about 20;
wherein at least one of "n" or "p" is present;
wherein at least one of "s" or "u" is present;
wherein at least one of "e" or "g" is present;
wherein the sum of the presented "n", "m" and "p" equals an integer of from 3 to 60;
wherein the sum of the presented "s", "t" and "u" equals an integer of from 3 to 60;
wherein the sum of the presented "e", "f" and "g" equals an integer of from 3 to 60; and
wherein the first dispersing aid is in substantially liquid form; and

-optionally, at least one second dispersing aid;

wherein the colorant system composition is compatible with both latex-based coatings and alkyd-based coatings.

INTERNATIONAL SEARCH REPORT

International application No.
PCT/US2016/031997

A. CLASSIFICATION OF SUBJECT MATTER

C09D 175/16(2006.01)I, C08G 18/67(2006.01)I, C08G 18/73(2006.01)I

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)
C09D 175/16; B41M 5/00; C09D 11/02; C08L 25/06; C08K 5/06; C08K 5/20; C08L 71/02; B41J 2/01; C08G 18/67; C08G 18/73

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched
Korean utility models and applications for utility models
Japanese utility models and applications for utility models

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)
eKOMPASS(KIPO internal) & keywords: universal colorant, low VOC, dispersant, alkoxylated, ethylene oxide, propylene oxide, copolymer, viscosity, alkyd-based paint, latex-based paint, color strength

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 2010-0113685 A1 (COWARD, M. R. et al.) 06 May 2010 See paragraphs [0022], [0028], [0030]; claims 1, 6, 9, 10, 13.	1-22
A	US 6454846 B2 (YATAKE, M.) 24 September 2002 See column 2, line 13-column 3, line 10; claims 1-9.	1-22
A	US 2003-0037699 A1 (YATAKE, M.) 27 February 2003 See paragraphs [0015], [0028], [0029], [0035], [0049]-[0051]; claims 1, 3.	1-22
A	US 2010-0068642 A1 (PLUEG, C. et al.) 18 March 2010 See paragraphs [0083]-[0088]; claims 1, 3, 4.	1-22
A	JP 3589408 B2 (SEIKO EPSON CORP.) 17 November 2004 See abstract; claims 1, 14-18.	1-22

☐ 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 application or patent but published on or after the international filing date
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"O" document referring to an 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
"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
08 August 2016 (08.08.2016)	**08 August 2016 (08.08.2016)**

Name and mailing address of the ISA/KR
International Application Division
Korean Intellectual Property Office
189 Cheongsa-ro, Seo-gu, Daejeon, 35208, Republic of Korea
Facsimile No. +82-42-481-8578

Authorized officer
CHO, KI YUN
Telephone No. +82-42-481-5655

INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.
PCT/US2016/031997

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		EP 1127927 B1	27/04/2005
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