CLAIMS

1. A low VOC multifunctional additive blend for use in a polymer film-forming composition, comprising:

a. at least one low volatile component selected from a dibenzoate, a dibenzoate blend, a monobenzoate ester, a phthalate, a terephthalate, a 1,2-cyclohexane dicarboxylate ester, a citrate, an adipate, triethylene glycol dioctanoate, triethylene glycol bis(ethylhexanoate-2), or a mixture of refined diisobutyl esters of adipic acid, glutaric acid, and succinic acid, blended with;

b. at least one high volatile component selected from diethylene glycol monomethyl ether, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, benzylamine, phenoxyethanol, phenyl ethanol, benzyl alcohol, 3-phenyl propanol, 2-methyl-3-phenyl propanol, β-methylcinnamyl alcohol, or vanillin,

wherein the multifunctional additive blend does not include a blend of 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate,

wherein the low VOC multifunctional additive blend is free of a waterborne polymer.

2. The multifunctional additive blend according to claim 1, wherein the dibenzoate is selected from the group consisting of diethylene glycol dibenzoate, dipropylene glycol dibenzoate, 1,2-propylene glycol dibenzoate, triethylene glycol dibenzoate, tripropylene glycol dibenzoate and mixtures thereof, wherein the monobenzoate is selected from the group consisting of 2-ethylhexyl benzoate, isodecyl benzoate, isononyl benzoate, 3-phenyl propyl benzoate, 2-methyl-3-phenyl propyl benzoate, and mixtures thereof, wherein the terephthalate is selected from the group consisting of di-2-ethylhexyl terephthalate, dibutyl terephthalate or diisopentyl terephthalate, and mixtures thereof, wherein the 1,2-cyclohexane dicarboxylate ester is diisononyl-1, 2 cyclohexane dicarboxylate, and wherein the citrate is selected from the group consisting of acetyl tributyl citrate, tri-n-butyl citrate, and mixtures thereof.

3. The multifunctional additive blend according to claim 1, wherein the low volatile component is a dibenzoate or a dibenzoate blend and the high volatile component is benzyl alcohol.

4. The multifunctional additive blend according to claim 1, wherein the low volatile component is triethylene glycol dioctanoate or triethylene glycol bis(ethylhexanoate-2) and the high volatile component is benzyl alcohol.

5. The multifunctional additive blend according to claim 1, wherein the low volatile component is a dibenzoate or a dibenzoate blend and the high volatile component is 3-phenylpropanol.

6. The multifunctional additive blend according to claim 1, wherein the low volatile component is a dibenzoate or a dibenzoate blend and the high volatile component is 2-methyl-3-phenyl propanol.

7. A waterborne coating comprising the multifunctional additive blend according to any one of claims 1-6 and a waterborne coating composition comprising a waterborne polymer.

8. The waterborne coating according to claim 7, wherein the waterborne polymer is selected from the group consisting of a styrene-acrylic binder, a vinyl acrylic binder, a 100% acrylic binder, a vinyl acetate ethylene binder, and an alkyd based binder.

9. The waterborne coating according to claim 7, further comprising:

a pigment,

a surfactant, and

a rheology modifier,

wherein the multifunctional additive blend is present in about 0.1 to 15 wt.%, based on 100 grams of waterborne polymer.

10. A method of improving the antimicrobial properties of a waterborne coating, comprising the step of adding to a waterborne coating composition comprising a waterborne polymer an additive preblend of:

a. at least one low volatile component selected from a dibenzoate, a dibenzoate blend, a monobenzoate ester, a phthalate, a terephthalate, a 1,2-cyclohexane dicarboxylate ester, a citrate, an adipate, triethylene glycol dioctanoate, triethylene glycol bis(ethylhexanoate-2), or a mixture of refined diisobutyl esters of adipic acid, glutaric acid, and succinic acid, and

b. a high volatile component selected from diethylene glycol monomethyl ether, ethylene glycol monobutyl ether, diethylene glycol monobutyl ether, benzylamine, phenoxyethanol, phenyl ethanol, benzyl alcohol,

3-phenyl propanol, 2-methyl-3-phenyl propanol, or vanillin,

wherein the additive preblend is free of a waterborne polymer.

11. The waterborne coating according to claim 7,

wherein the waterborne polymer is chosen from vinyl polymers, polyurethanes, polyamides, polysulfides, nitrocellulose and other cellulosic polymers, polyvinyl acetate and copolymers thereof, polyacrylates and copolymers thereof, acrylics and copolymers thereof, epoxies, phenol-formaldehyde polymers, melamines, alkyds and vinyl esters of versatic acid,

wherein the multifunctional additive blend is present in about 0.1 to 15%, based on 100 grams of waterborne polymer.

12. The waterborne coating according to claim 11, wherein the vinyl polymers are selected from the group consisting of vinyl acetate, vinylidene chloride, diethyl fumarate, diethyl maleate, and polyvinyl butyral; wherein the polyvinyl acetate and copolymers thereof are selected from the group consisting of ethylene vinyl acetate and vinyl acetate-ethylene; wherein the polyacrylates and copolymers thereof are selected from the group consisting of methyl methacrylate, ethyl methacrylate, butyl methacrylate, cyclohexyl methacrylate, allyl methacrylate, benzyl methacrylate, methyl acrylate, ethyl acrylate, butyl acrylate, and 2-ethylhexyl acrylate, wherein the acrylics and copolymers thereof are

selected from the group consisting of 100% acrylic acid, methacrylic acid, vinyl acrylics, styrenated acrylics, and acrylic-epoxy hybrids.

13. The waterborne coating according to claim 7, wherein the waterborne coating is a direct-to-metal coating.

14. The waterborne coating according to claim 13, wherein the high volatile component of the multifunctional additive blend is benzyl alcohol and the low volatile component is a dibenzoate.

15. The waterborne coating according to claim 14, wherein the dibenzoate is propylene glycol dibenzoate.

16. The waterborne coating according to any one of claims 13-15, further comprising sodium benzoate.

17. The waterborne coating according to any one of claims 13-15, further comprising benzoic acid.

18. A method of improving the properties of a waterborne coating or other waterborne polymer film-forming composition of any of claims 1-6, comprising the step of:

adding during formulation of the coating or composition the low VOC multifunctional additive blend

wherein the method provides a low VOC content to the formulation.

19. A colorant dispersion for use in a waterborne coating, comprising a colorant dispersed in the low VOC multifunctional additive according to any one of claims 1-6.

20. The multifunctional additive blend according to claim 1, consisting essentially of:

a. benzyl alcohol and a dibenzoate blend, wherein the ratio by weight of benzyl alcohol to dibenzoate blend is 1:1; or

b. benzyl alcohol and a dibenzoate blend, wherein the ratio by weight of benzyl alcohol to dibenzoate blend is 1:2; or

c. benzyl alcohol and a dibenzoate blend, wherein the ratio by weight of benzyl alcohol to dibenzoate is 1:3; or

d. benzyl alcohol and triethylene glycol bis(ethylhexanoate-2), wherein the ratio by weight of benzyl alcohol to triethylene glycol bis(ethylhexanoate-2) is 1:1, wherein the dibenzoate blend comprises a mixture of diethylene glycol dibenzoate and dipropylene glycol dibenzoate or a mixture of diethylene glycol dibenzoate, dipropylene glycol dibenzoate and 1,2-propylene glycol dibenzoate.

21. The multifunctional additive blend according to claim 1, consisting essentially of: benzyl alcohol and triethylene glycol dioctanoate, wherein the ratio by weight of benzyl alcohol to triethylene glycol dioctanoate is 1:1.

22. The multifunctional additive blend according to any one of claims 1-6,
wherein the ratio by weight of the at least one high volatile component to the at least one low volatile component ranges from 10:1 to 1:10.

23. The multifunctional additive blend according to claim 22,
wherein the ratio by weight of the at least one high volatile component to the at least one low volatile component is 1:1.

24. A waterborne colorant, comprising:

a. a pigment or colorant,

b. a dispersant,

c. the low VOC multifunctional additive blend according to any one of claims 1-6, and

d. water.

25. A solvent-borne colorant, comprising:

a. a pigment or colorant,

b. a dispersant,

c. the low VOC multifunctional additive blend according to any one of claims 1-6, and

d. a solvent.

26. Use of the low VOC multifunctional additive blend according to any one of claims 1-6 in waterborne polymer film-forming compositions comprising: architectural coatings, industrial coatings, OEM coatings, interior and exterior paints, metal coatings, direct-to-metal coatings, marine coatings, film coatings, vinyl film compositions, wood coatings, wood treatments, paper coatings, fabric coatings, textile coatings, wallpaper coatings, decorative coatings, textile coatings, construction coatings, cement coatings, concrete coatings, floor coatings, varnishes, inks, graphic inks, waterborne colorants, solvent-borne colorants, adhesive compositions, glues, sealants or caulks.

27. An adhesive composition comprising the low VOC multifunctional additive blend according to any one of claims 1-6.

28. A sealant composition comprising the low VOC multifunctional additive blend according to any one of claims 1-6.

29. An ink composition comprising the low VOC multifunctional additive blend according to any one of claims 1-6.