Claims

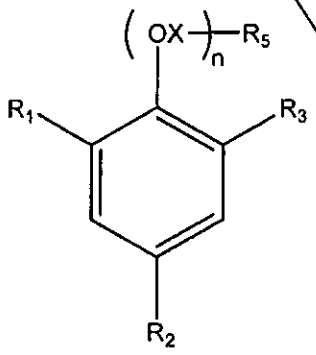
What is claimed is:

1. A coating composition comprising:

(a) at least one latex polymer;

(b) water; and

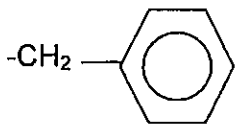
(c) at least one open time additive present in an amount effective to increase the open time of the coating composition to greater than about 4 minutes, the at least one open time additive having structural formula IIA:



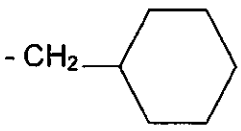
IIA

wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

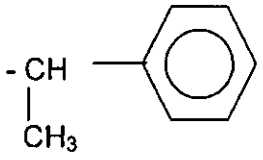
a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, -H, butyl, tert-butyl, isobutyl,



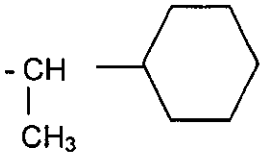
,



,



, and



;

wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is

an integer of from 1 to 100; wherein R_5 is selected from the group consisting of -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$, $-OC_6H_{13}$, -Cl, -Br, -CN, Phosphonate ($-PO_3^- M^+$), Phosphate ($PO_4^- M^+$), Sulfate ($SO_4^- M^+$), Sulfonate ($SO_3^- M^+$), carboxylate ($COO^- M^+$), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group and a quaternary ammonium ion, wherein M+ is a cation.

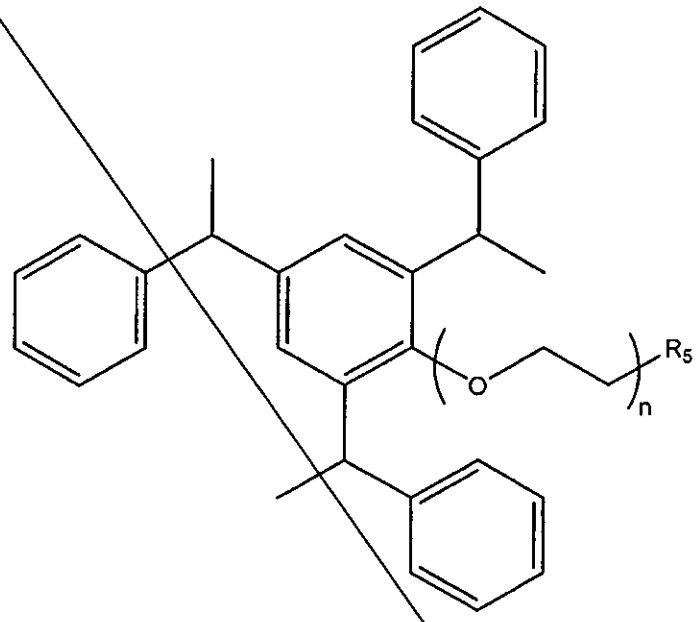
2. The coating composition of claim 1 wherein the coating composition is selected from the group consisting of a low or zero VOC paint, an adhesive, a pressure sensitive adhesive, a resin, a sealant, an ink and any combination thereof.

3. The coating composition of claim 1 wherein the open time additive is present in an amount greater than about 1% by weight of the composition.

4. The coating composition of claim 1 wherein the polymer has a glass transition temperature (Tg) of between about -10°C and about 0°C.

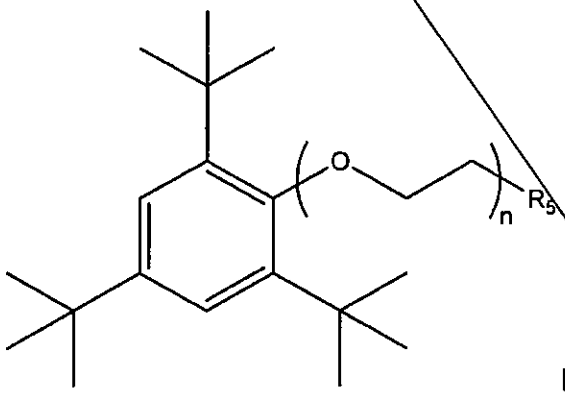
5. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 10 minutes.

6. The coating composition of claim 1, wherein the open time additive has structural formula:



IIA-1,

or



IIA-2,

wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$, $-OC_6H_{13}$,, -Cl, -Br, -CN, Phosphonate ($-PO_3^- M^+$), Phosphate ($PO_4^- M^+$), Sulfate ($SO_4^- M^+$), Sulfonate ($SO_3^- M^+$), carboxylate ($COO^- M^+$), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

7. A coating composition comprising:

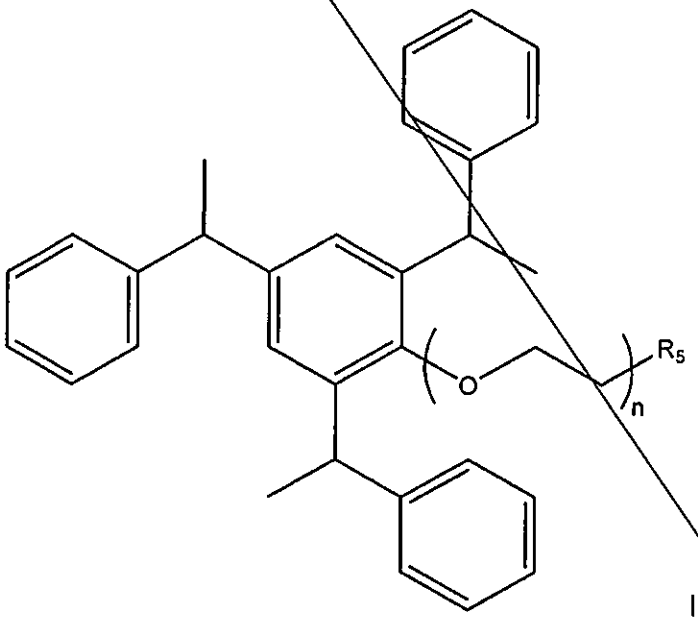
(a) at least one latex polymer;

(b) water; and

(c) an open time additive present in an amount effective to increase the open time of the coating composition to greater than about 4 minutes;

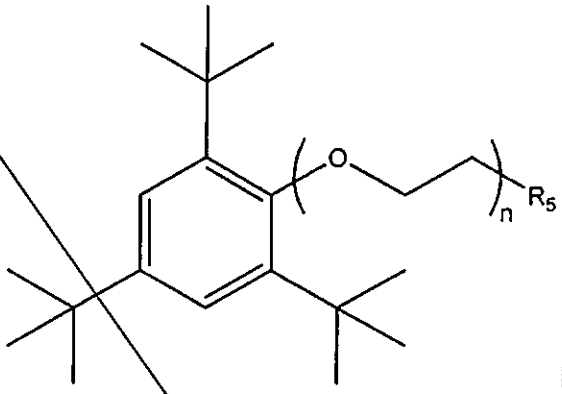
wherein the open time additive is a blend of:

(i) at least one non-ionic surfactant having structural formula:



IIIA-1,

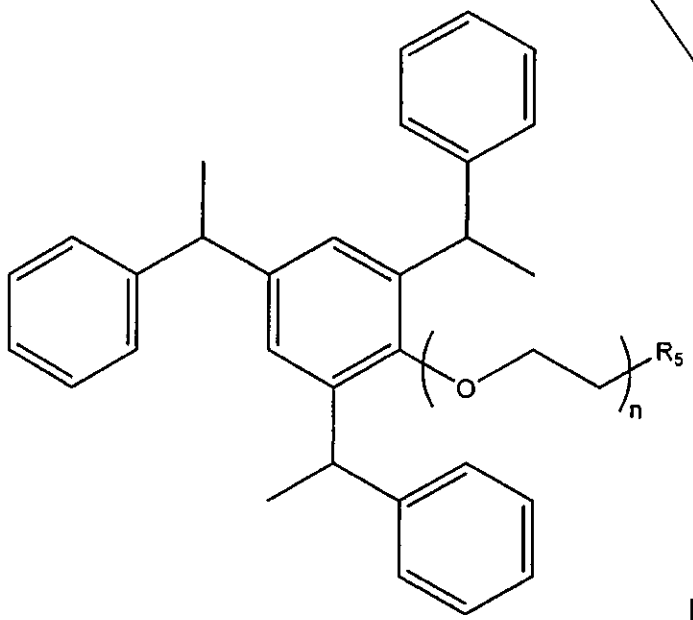
or



IIIB-1,

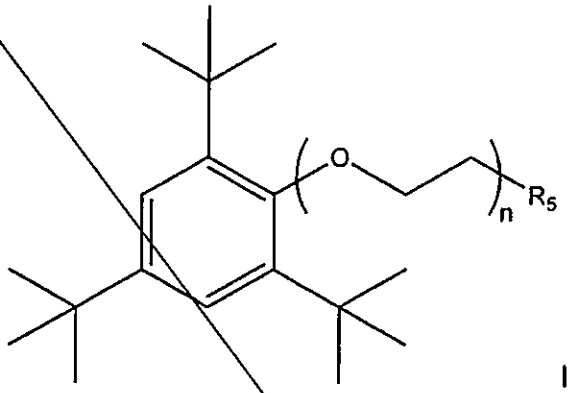
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, oxyalkyl, -Cl, -Br, -CN, -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$ and $-OC_6H_{13}$; and

(ii) at least one anionic surfactant having structural formula:



IIIA-2,

or



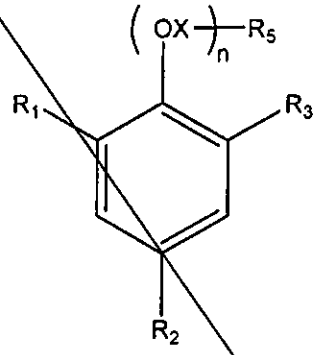
IIIB-2,

wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a quaternary ammonium ion, and any salt thereof.

8. The coating composition of claim 7 wherein the open time additive is present in an amount greater than about 1% by weight of the composition.

9. The coating composition of claim 7 wherein the coating composition is characterized by an open time of greater than about 10 minutes.

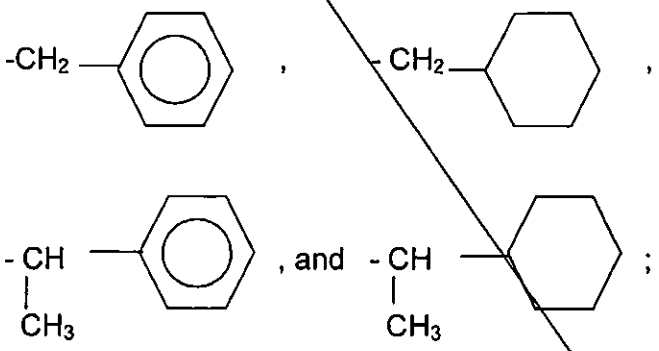
10. A method for increasing open time for a low VOC coating composition comprising adding to the composition an effective amount of an open time additive, wherein the open time additive comprises at least one compound according to structural formula:



IIA

wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

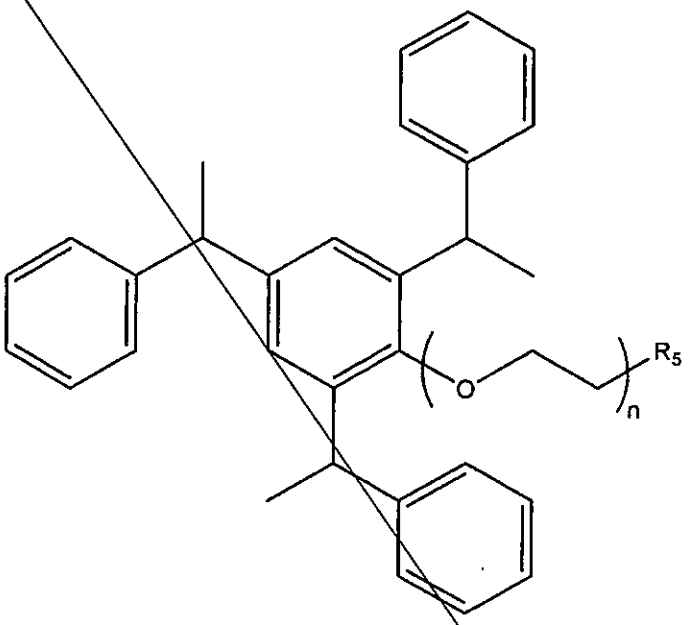
a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, -H, butyl, tert-butyl, isobutyl,



wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, -OH, -OCH_3, -OC_2H_5, -OC_3H_7, -OC_4H_9, -OC_5H_{11}, -OC_6H_{13}, -Cl, -Br, -CN, alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a nonionic group, a quaternary ammonium ion, any any salt thereof.

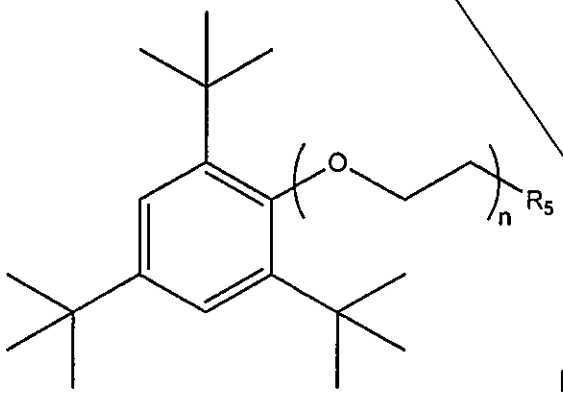
11. The method of claim 10 wherein the open time additive is a blend of:

(i) at least one non-ionic surfactant having structural formula:



IIIA-1,

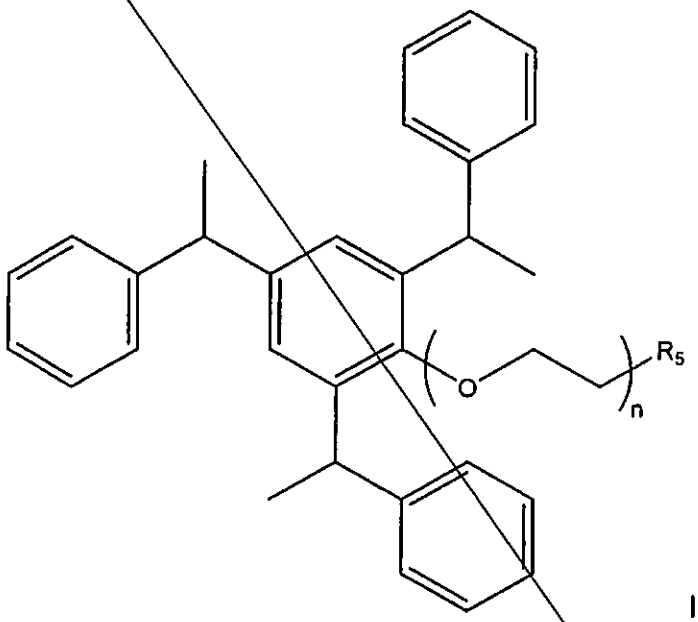
or



IIIB-1,

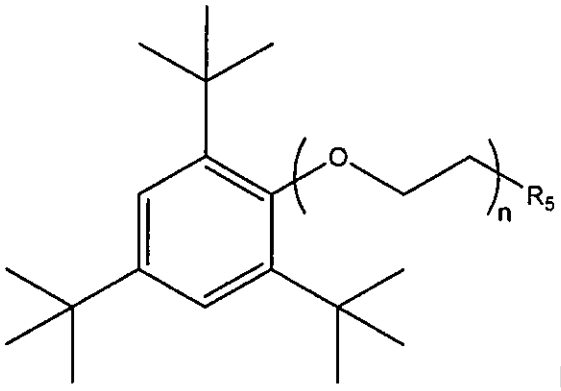
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, oxyalkyl, -Cl, -Br, -CN, -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$-OC_4H_9, $-OC_5H_{11}$, and $-OC_6H_{13}$; and

(ii) at least one anionic surfactant having structural formula:



IIIA-2,

or



IIIB-2,

wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate,

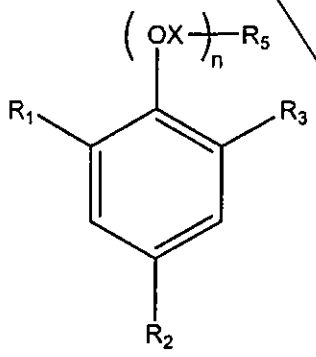
phosphonate, phosphate, sulfate, sulfonate, carboxylate, a quaternary ammonium ion, and any salt thereof.

12. A low VOC or zero VOC latex coating composition comprising:

(a) at least one latex polymer;

(b) water; and

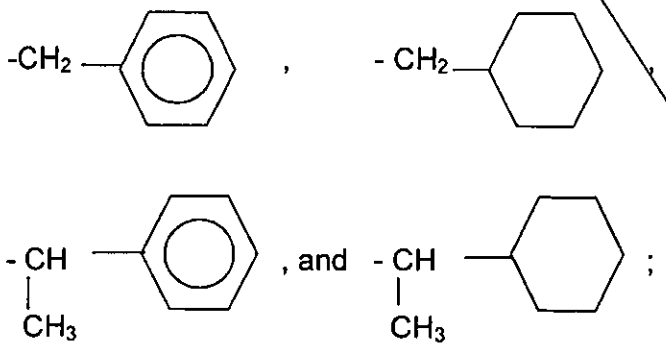
(c) at least one drying time additive present in an amount effective to decrease the drying time of the coating composition, the drying additive having structural formula IIA:



IIA

wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

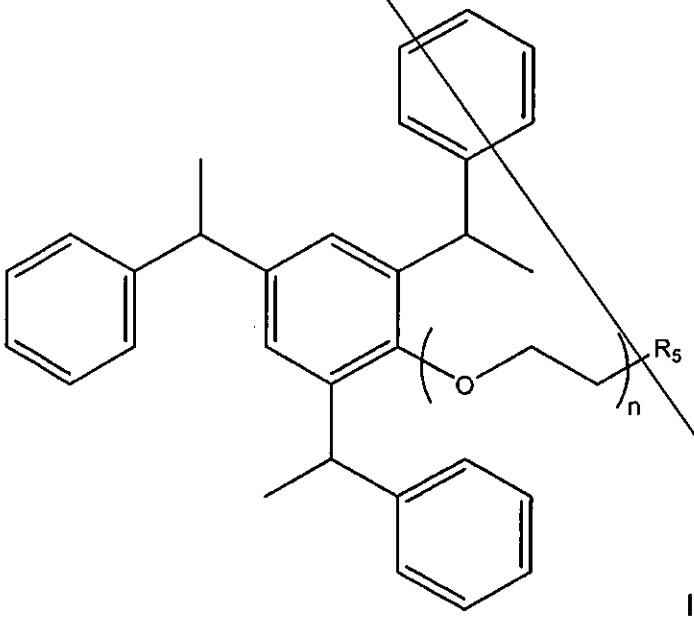
a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, -H, butyl, tert-butyl, isobutyl,



wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer

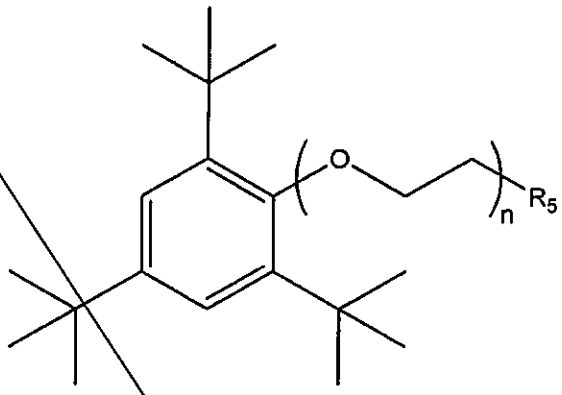
of from 1 to 100; wherein R_5 is selected from the group consisting of -OH, -OCH_3, -OC_2H_5, -OC_3H_7, -OC_4H_9, -OC_5H_{11}, -OC_6H_{13}, -Cl, -Br, -CN, Phosphonate (-$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group and a quaternary ammonium ion, wherein M+ is a cation.

13. The coating composition of claim 12, wherein the drying time additive has structural formula:



IIA-1,

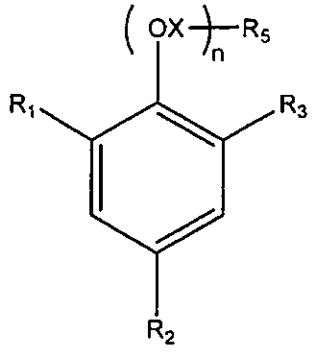
or



IIA-2,

wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$, $-OC_6H_{13}$,, -Cl, -Br, -CN, Phosphonate ($-PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

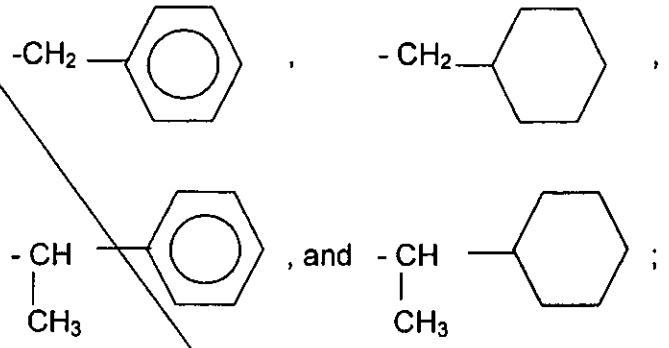
14. A method for decreasing drying time for a low VOC or zero VOC coating composition comprising adding to the composition an effective amount of a drying time additive, wherein the drying time additive comprises at least one compound according to structural formula:



IIA

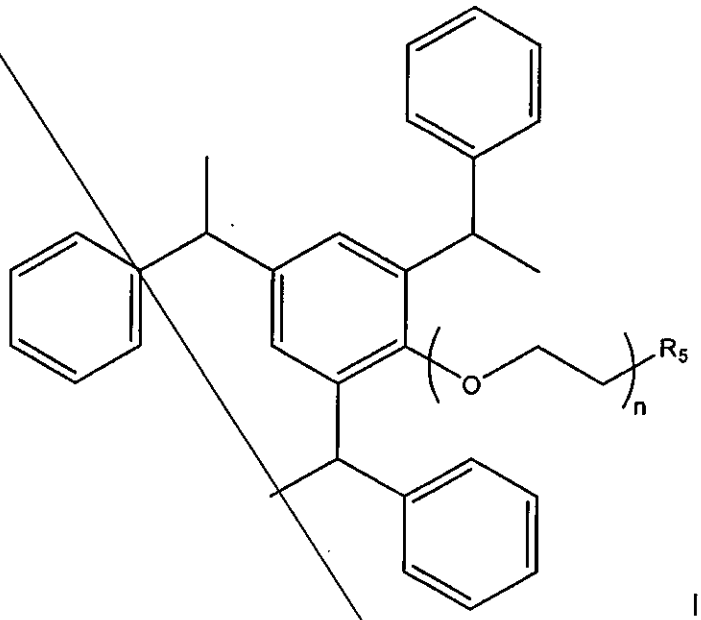
wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

butyl, tert-butyl, isobutyl,



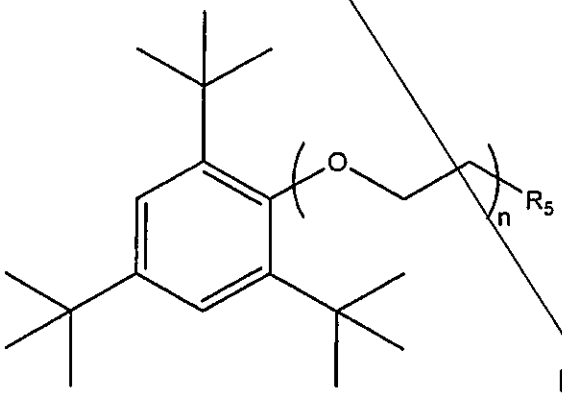
wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$, $-OC_6H_{13}$, -Cl, -Br, -CN, alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a nonionic group, a quaternary ammonium ion, any any salt thereof.

15. The method of claim 14 wherein the drying time additive has structural formula:



IIA-1,

or



IIA-2,

wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of -OH, $-OCH_3$, $-OC_2H_5$, $-OC_3H_7$, $-OC_4H_9$, $-OC_5H_{11}$, $-OC_6H_{13}$, -Cl, -Br, -CN, Phosphonate ($-PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

What is claimed is:

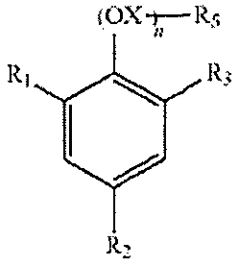
1. A low VOC coating composition comprising:

(a) at least one latex polymer;

(b) water; and

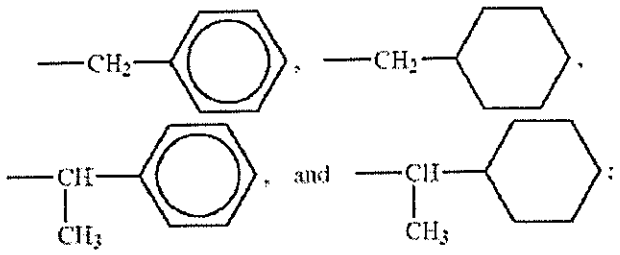
(c) at least one open time additive present during formulation of the coating composition in an amount effective to increase the open time of the coating composition to greater than about 4 minutes, the at least one open time additive having structural formula IIA:

IIA



wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, —H, butyl, tert-butyl, isobutyl,



wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group and a quaternary ammonium ion, wherein M+ is a cation,

wherein the open time additive is present in an amount greater than about 1% by weight of the polymer.

2. The coating composition of claim 1 further comprising at least one pigment.

3. The coating composition of claim 1 wherein n is an integer of from about 3 to about 80.

4. The coating composition of claim 1 wherein n is an integer of from about 10 to about 40.

5. The coating composition according to claim 1 wherein the open time additive is present in an amount greater than about 2% by weight of the polymer.

6. The coating composition according to claim 1, wherein the open time additive is present in an amount greater than about 8% by weight of the polymer.

7. The coating composition according to claim 1, wherein the open time additive is present in an amount greater than about 10% by weight of the polymer.

8. The coating composition according to claim 1, wherein the open time additive is present in an amount greater than about 20% by weight of the polymer.

9. The coating composition of claim 1 wherein the polymer has a glass transition temperature (Tg) of between about −20° C. and about 50° C.

10. The coating composition of claim 1 wherein the polymer has a glass transition temperature (Tg) of between about −20° C. and about 12° C.

11. The coating composition of claim 1 wherein the polymer has a glass transition temperature (Tg) of between about −10° C. and about 10° C.

12. The coating composition of claim 1 wherein the polymer has a glass transition temperature (Tg) of between about −10° C. and about 0° C.

13. The coating composition of claim 1 wherein the polymer has a mean particle size of less than about 200 nm.

14. The coating composition of claim 1 wherein the polymer has a mean particle size of less than about 150 nm.

15. The coating composition of claim 1 wherein the polymer has a mean particle size of less than about 125 nm.

16. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 6 minutes.

17. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 8 minutes.

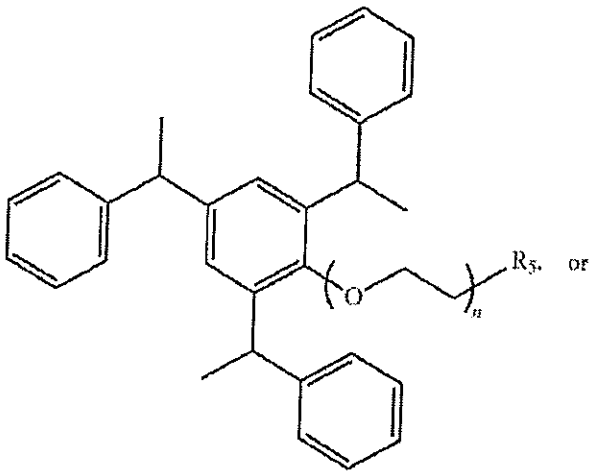
18. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 10 minutes.

19. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 12 minutes.

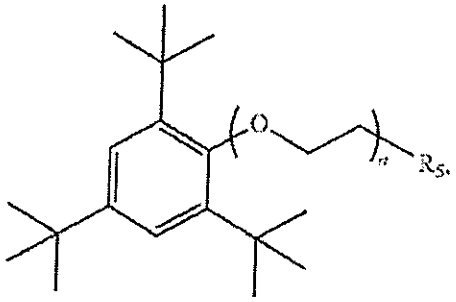
20. The coating composition of claim 1 wherein the coating composition is characterized by an open time of greater than about 14 minutes.

21. The coating composition of claim 1, wherein the open time additive has structural formula:

IIA-1



IIA-2



wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

22. A low VOC coating composition comprising:

(a) at least one latex polymer;

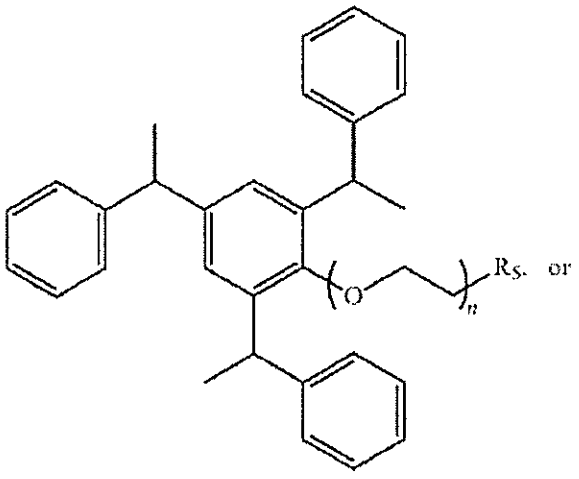
(b) water; and

(c) an open time additive present during formulation of the coating composition in an amount effective to increase the open time of the coating composition to greater than about 4 minutes;

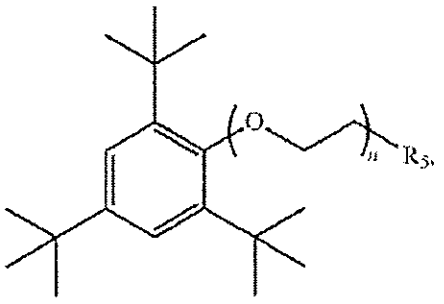
wherein the open time additive is a blend of:

(i) at least one non-ionic surfactant having structural formula:

IIIA-1



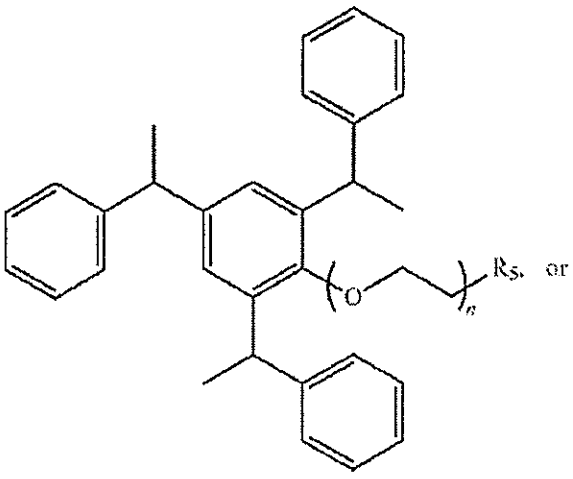
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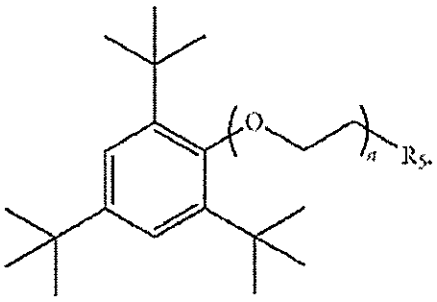
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, oxyalkyl, —Cl, —Br, —CN, —OH, $—OCH_3$, $—OC_2H_5$, $—OC_3H_7$, $—OC_4H_9$, $—OC_5H_{11}$ and $—OC_6H_{13}$; and

(ii) at least one anionic surfactant having structural formula:

IIIA-2



IIIB-2



wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a quaternary ammonium ion, and any salt thereof,

wherein the open time additive is present in an amount greater than about 0.5% by weight of the polymer.

23. The coating composition of claim 22 wherein n is an integer of from about 3 to about 80.

24. The coating composition of claim 22 wherein n is an integer of from about 4 to about 60.

25. The coating composition of claim 22 wherein n is an integer of from about 8 to about 60.

26. The coating composition of claim 22 wherein the open time additive is present in an amount greater than about 1% by weight of the polymer.

27. The coating composition according to claim 22, wherein the open time additive is present in an amount greater than about 2% by weight of the polymer.

28. The coating composition according to claim 22, wherein the open time additive is present in an amount greater than about 7.5% by weight of the polymer.

29. The coating composition according to claim 22, wherein the open time additive is present in an amount greater than about 8% by weight of the polymer.

30. The coating composition according to claim 22, wherein the open time additive is present in an amount greater than about 10% by weight of the polymer.

31. The coating composition according to claim 22, wherein the open time additive is present in an amount greater than about 20% by weight of the polymer.

32. The coating composition of claim 22 wherein the polymer has a glass transition temperature (Tg) of between about −20° C. and about 50° C.

33. The coating composition of claim 22 wherein the polymer has a glass transition temperature (Tg) of between about −10° C. and about 10° C.

34. The coating composition of claim 22 wherein the polymer has a glass transition temperature (Tg) of between about −10° C. and about 0° C.

35. The coating composition of claim 22 wherein the polymer has a mean particle size of less than about 200 nm.

36. The coating composition of claim 22 wherein the polymer has a mean particle size of less than about 150 nm.

37. The coating composition of claim 22 wherein the polymer has a mean particle size of less than about 125 nm.

38. The coating composition of claim 22 wherein the coating composition is characterized by an open time of greater than about 6 minutes.

39. The coating composition of claim 22 wherein the coating composition is characterized by an open time of greater than about 8 minutes.

40. The coating composition of claim 22 wherein the coating composition is characterized by an open time of greater than about 10 minutes.

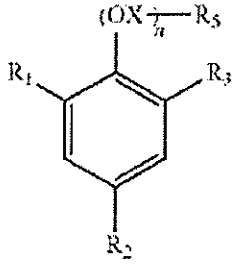
41. The coating composition of claim 22 wherein the coating composition is characterized by an open time of greater than about 12 minutes.

42. The coating composition of claim 22 wherein the coating composition is characterized by an open time of greater than about 14 minutes.

43. A method for increasing open time for a low VOC coating composition comprising adding to the composition.

during formulation of the composition, an effective amount of an open time additive, wherein the open time additive comprises at least one compound according to structural formula:

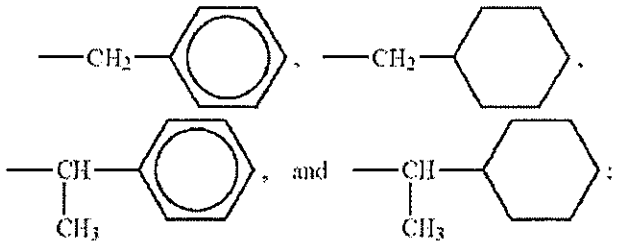
IIA



wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl,

—H, butyl, tert-butyl, isobutyl,



wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a nonionic group, a quaternary ammonium ion, and any salt thereof,

wherein the effective amount is an amount of the additive greater than about 1% by weight of the polymer.

44. The method of claim 43 wherein the effective amount is an amount of the additive greater than about 1.3% by weight of the polymer.

45. The method of claim 43 wherein the effective amount is an amount of the additive greater than about 8% by weight of the polymer.

46. The method of claim 43 wherein the step of adding the open time additive increases the open time of the composition to greater than about 6 minutes.

47. The method of claim 43 wherein the step of adding the open time additive increases the open time of the composition to greater than about 8 minutes.

48. The method of claim 43 wherein the step of adding the open time additive increases the open time of the composition to greater than about 10 minutes.

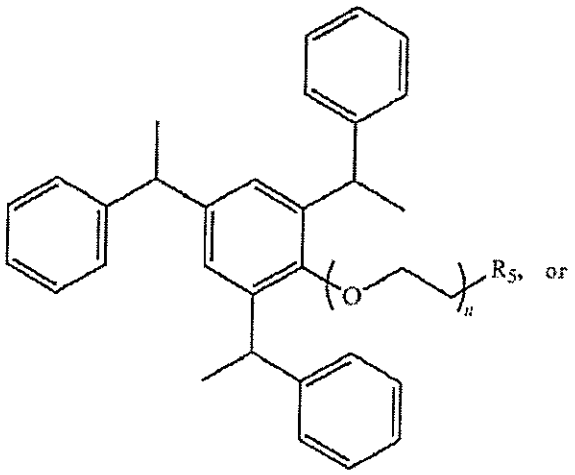
49. The method of claim 43 wherein the step of adding the open time additive increases the open time of the composition to greater than about 12 minutes.

50. The method of claim 43 wherein the step of adding the open time additive increases the open time of the composition to greater than about 14 minutes.

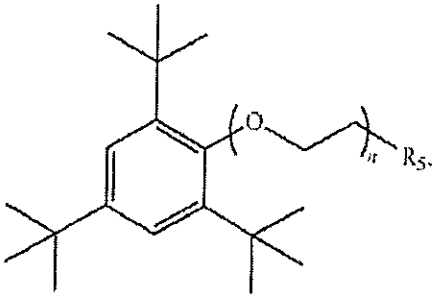
51. The method of claim 43 wherein the open time additive is a blend of:

(i) at least one non-ionic surfactant having structural formula:

IIIA-1



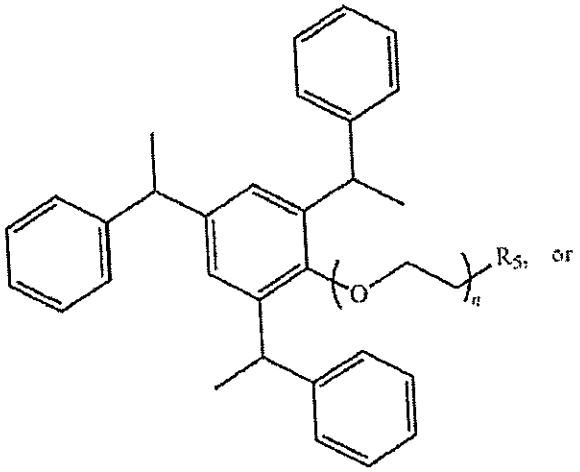
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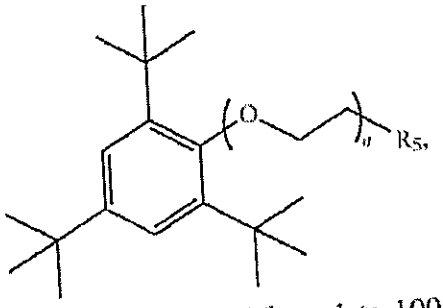
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, oxyalkyl, —Cl, —Br, —CN, —OH, —OCH_3, —OC_2H_5, —OC_3H_7—OC_4H_9, —OC_5H_{11}, and —OC_6H_{13}; and

(ii) at least one anionic surfactant having structural formula:

IIIA-2



IIIB-2



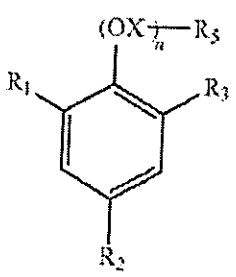
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a quaternary ammonium ion, and any salt thereof.

52. A low VOC or zero VOC latex coating composition comprising:

(a) at least one latex polymer;

(b) water; and

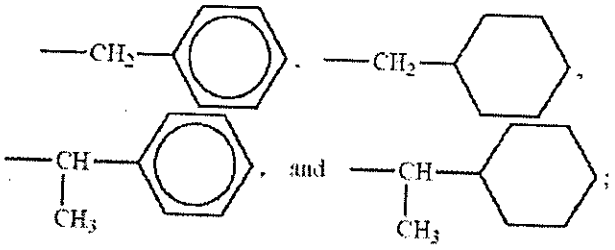
(c) at least one drying time additive present during formulation of the coating composition in an amount effective to decrease the drying time of the coating composition, the drying additive having structural formula IIA:



IIA

wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, —H, butyl, tert-butyl, isobutyl,

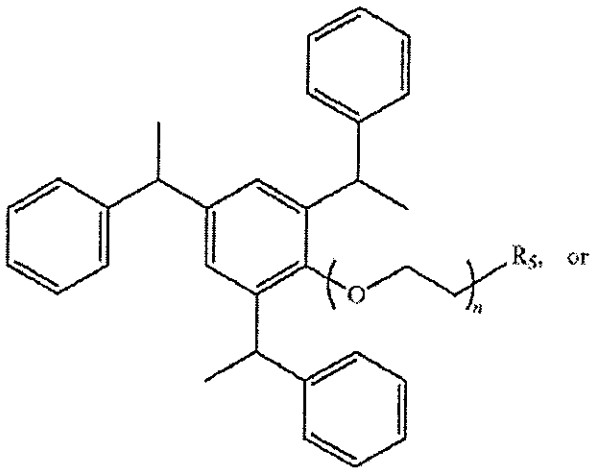


wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group and a quaternary ammonium ion, wherein M+ is a cation,

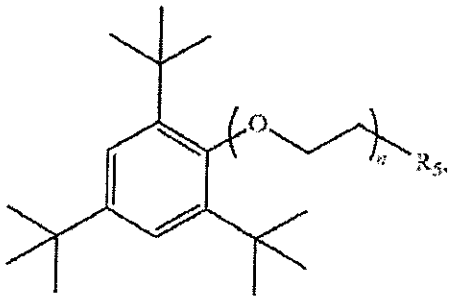
wherein the drying time additive is present in an amount greater than about 1% by weight of the polymer.

53. The coating composition of claim 52, wherein the drying time additive has structural formula:

IIA-1



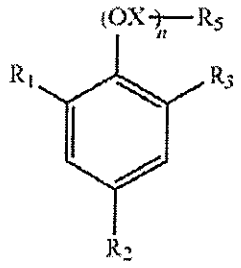
IIA-2



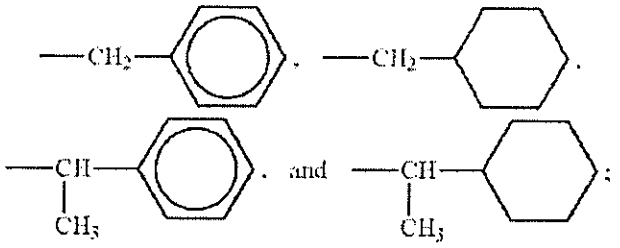
wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

54. A method for decreasing drying time for a low VOC or zero VOC coating composition comprising adding to the composition, during formulation of the coating composition, an effective amount of a drying time additive, wherein the drying time additive comprises at least one compound according to structural formula:

IIA



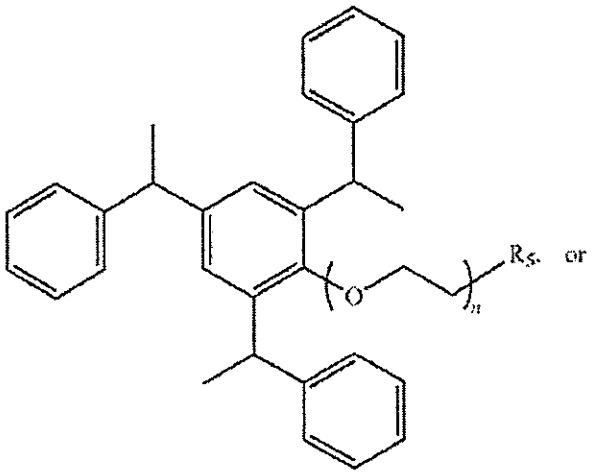
wherein R_1, R_2 and R_3 are independently selected from the group consisting of:
butyl, tert-butyl, isobutyl,



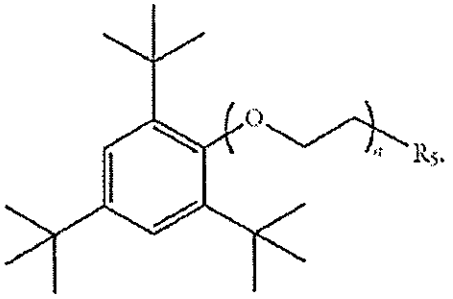
wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; R_5 is selected from the group consisting of a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, alkylphosphonate, alkylphosphate, alkylsulfate, alkylsulfonate, phosphonate, phosphate, sulfate, sulfonate, carboxylate, a nonionic group, a quaternary ammonium ion, and any salt thereof,
wherein the drying time additive is present in an amount greater than about 1% by weight of the polymer.

55. The method of claim 54 wherein the drying time additive has structural formula:

IIA-1



IIA-2



wherein, n is an integer of from 1 to 100, wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^-$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a nonionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group, and a quaternary ammonium ion, wherein M+ is a cation.

56. The coating composition according to claim 1, wherein the open time additive is present in an amount greater than about 1.6% by weight of the polymer.

57. A low VOC coating composition comprising:

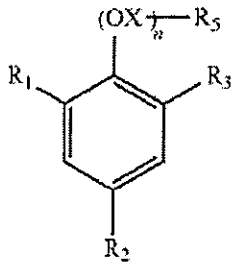
(a) at least one latex polymer;

(b) water; and

(c) at least one open time additive post-added to the coating composition in an amount effective to increase the open

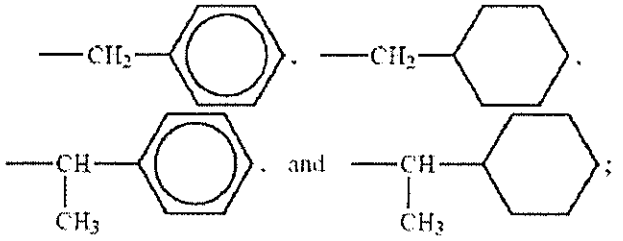
time of the coating composition to greater than about 4 minutes, the at least one open time additive having structural formula IIA:

IIA



wherein R_1, R_2 and R_3 are independently selected from the group consisting of:

a C_1-C_{18} alkyl, hydroxyalkyl, cycloalkyl, aryl or aralkyl, —H, butyl, tert-butyl, isobutyl,



wherein X is a divalent hydrocarbon radical comprising a linear or branched alkylene radical having from about 2 to 8 carbon atoms; wherein n is an integer of from 1 to 100; wherein R_5 is selected from the group consisting of —OH, —OCH_3, —OC_2H_5, —OC_3H_7, —OC_4H_9, —OC_5H_{11}, —OC_6H_{13}, —Cl, —Br, —CN, Phosphonate (—$PO_3^-M^+$), Phosphate ($PO_4^-M^+$), Sulfate ($SO_4^-M^+$), Sulfonate ($SO_3^-M^+$), carboxylate (COO^-M^+), a non-ionic group, a C_1-C_{12} alkyl group, a C_1-C_{12} hydroxyalkyl group, a C_1-C_{12} cycloalkyl group, a C_1-C_{12} aryl group, a C_1-C_{12} aralkyl group and a quaternary ammonium ion, wherein M+ is a cation, wherein the amount effective to increase the open time is an amount the additive greater than about 1% by weight of the polymer.