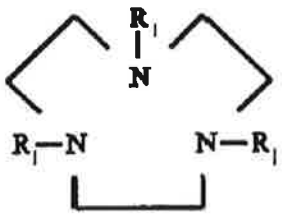
Claims

1. An air-drying auto-oxidisable resin composition comprising:

a) a drier, said drier being obtainable by:

providing a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is selected from PF_6^-, SbF_6^-, AsF_6^-, BF_4^-, $B(C_6F_5)_4^-$, Cl^-, Br^-, I^-, NO_3^-, or R_2COO^- in which case n=2, or the anion X is SO_4^{2-} in which case n=1, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue; and

providing 1,4,7–trisubstituted-1,4,7-triazacyclononane (L) wherein said 1,4,7–trialkyl-1,4,7-triazacyclononane (L) has the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

mixing said manganese salt with said 1,4,7–trialkyl-1,4,7-triazacyclononane;

wherein the 1,4,7–trialkyl-1,4,7-triazacyclononane (L) is provided in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1;

and,

b) a polymer comprising unsaturated aliphatic groups.

2. The resin composition according to claim 1, wherein R_1 is a C_1-C_6 alkyl, preferably methyl.

3. The resin composition according to any one of claims 1 to 2, wherein n=2 and anion X is R_2COO^-.

4. The resin composition according to claim 3, wherein R_2 is a C_1-C_{20} , preferably C_4-C_{12}, alkyl group, wherein the alkyl group is straight or branched chain, saturated or unsaturated.

5. The resin composition according to any one of claims 1-4 wherein the molar ratio of L:Mn is lower than 20:1, preferably lower than 12:1.

6. The resin composition according to any one of claims 1-5, wherein the polymer comprising unsaturated aliphatic groups is selected from alkyds, vinyl polymers, polyurethane resins, hyperbranched resins and mixtures thereof.

7. The resin composition according to claim 6, wherein the polymer comprises an alkyd.

8. A coating composition comprising the resin composition as defined in any one of claims 1 to 7.

9. The coating composition according to claim 8, wherein the composition contains one or more auxiliary and/or coordination driers in an amount not exceeding 10 wt%.

10. A method of coating a substrate comprising the steps of:

applying the coating composition as defined in claim 9 onto said substrate; and, drying the coating composition in the presence of air.

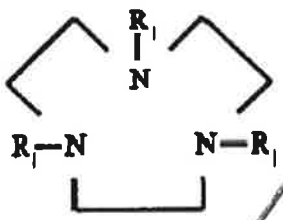
11. The method according to claim 10, wherein the drying occurs at ambient temperature.

12. A substrate provided with a composition as defined in any of claims 1 to 9.

13. Use of a composition as defined in any one of claims 1 to 9 in paints, adhesives, lacquers, inks and varnishes.

14. Use of a mixture as a drier for air-drying an auto-oxidizable resin composition, said mixture comprising:

1,4,7–trisubstituted-1,4,7-triazacyclononane (L) having the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

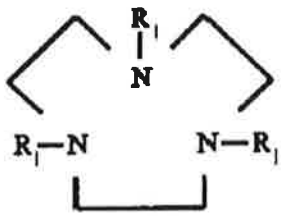
a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is selected from PF_6^-, SbF_6^-, AsF_6^-, BF_4^-, $B(C_6F_5)_4^-$, Cl^-, Br^-, I^-, NO_3^-, or R_2COO^- in which case n=2, or the anion X is SO_4^{2-} in which case n=1, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue;

wherein the 1,4,7–trialkyl-1,4,7-triazacyclononane (L) is present in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1.

15. A drier for air-drying auto-oxidisable resin composition, said drier being obtainable by:

providing a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is selected from PF_6^-, SbF_6^-, AsF_6^-, BF_4^-, $B(C_6F_5)_4^-$, Cl^-, Br^-, I^-, NO_3^-, or R_2COO^- in which case n=2, or the anion X is SO_4^{2-} in which case n=1, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue; and

providing 1,4,7–trisubstituted-1,4,7-triazacyclononane (L) wherein said 1,4,7–trialkyl-1,4,7-triazacyclononane (L) has the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

mixing said manganese salt with said 1,4,7–trialkyl-1,4,7-triazacyclononane;

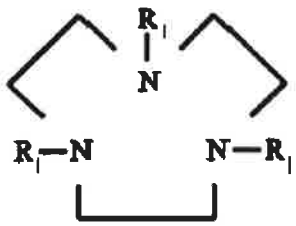
wherein the 1,4,7–trialkyl-1,4,7-triazacyclononane (L) is provided in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1, and wherein preferably the molar ratio of L:Mn is lower than 20:1, preferably lower than 12:1.

Claims

1. An air-drying auto-oxidisable resin composition comprising:
a) a drier, said drier being obtainable by:

providing a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is selected from PF_6^-, SbF_6^-, AsF_6^-, BF_4^-, $B(C_6F_5)_4^-$, Cl^-, Br^-, I^-, NO_3^-, or R_2COO^- in which case n=2, or the anion X is SO_4^{2-} in which case n=1, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue; and

providing 1,4,7–trisubstituted-1,4,7-triazacyclononane (L) wherein said 1,4,7–trialkyl-1,4,7-triazacyclononane (L) has the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

mixing said manganese salt with said 1,4,7–trialkyl-1,4,7-triazacyclononane;

wherein the 1,4,7–trialkyl-1,4,7-triazacyclononane (L) is provided in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1;

and,

b) a polymer comprising unsaturated aliphatic groups.

2. The resin composition according to claim 1, wherein R_1 is a C_1-C_6 alkyl, preferably methyl.

3. The resin composition according to any one of claims 1 to 2, wherein n=2 and anion X is R_2COO^-.

4. The resin composition according to claim 3, wherein R_2 is a C_1-C_{20} , preferably C_4-C_{12}, alkyl group, wherein the alkyl group is straight or branched chain, saturated or unsaturated.

5. The resin composition according to any one of claims 1-4 wherein the molar ratio of L:Mn is lower than 20:1, preferably lower than 12:1.

6. The resin composition according to any one of claims 1-5, wherein the polymer comprising unsaturated aliphatic groups is selected from alkyds, vinyl polymers, polyurethane resins, hyperbranched resins and mixtures thereof.

7. The resin composition according to claim 6, wherein the polymer comprises an alkyd.

8. A coating composition comprising the resin composition as defined in any one of claims 1 to 7.

9. The coating composition according to claim 8, wherein the composition contains one or more auxiliary and/or coordination driers in an amount not exceeding 10 wt%.

10. A method of coating a substrate comprising the steps of:

applying the coating composition as defined in claim 9 onto said substrate; and, drying the coating composition in the presence of air.

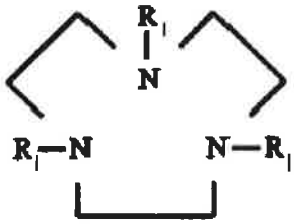
11. The method according to claim 10, wherein the drying occurs at ambient temperature.

12. A substrate provided with a composition as defined in any of claims 1 to 9.

13. Use of a composition as defined in any one of claims 1 to 9 in paints, adhesives, lacquers, inks and varnishes.

14. Use of a mixture as a drier for air-drying an auto-oxidizable resin composition, said mixture comprising:

1,4,7–trisubstituted-1,4,7-triazacyclononane (L) having the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

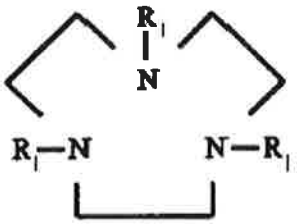
a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is selected from PF_6^-, SbF_6^-, AsF_6^-, BF_4^-, $B(C_6F_5)_4^-$, Cl^-, Br^-, I^-, NO_3^-, or R_2COO^- in which case n=2, or the anion X is SO_4^{2-} in which case n=1, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue;

wherein the 1,4,7–trialkyl-1,4,7-triazacyclononane (L) is present in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1.

15. A drier for air-drying auto-oxidisable resin composition, said drier being obtainable by:

providing a manganese salt having the general formula $Mn^{2+}[X]_n$, wherein anion X is R_2COO^- and n=2, and wherein R_2= C_1-C_{20} alkyl optionally substituted with heteroatoms, C_6-C_{20} aryl optionally substituted with heteroatoms, or a polymeric residue; and

providing 1,4,7–trisubstituted-1,4,7-triazacyclononane (L) wherein said 1,4,7–trialkyl-1,4,7-triazacyclononane (L) has the general structure



in which R_1 is C_1-C_{20} alkyl optionally substituted with heteroatoms, or C_6-C_{20} aryl optionally substituted with heteroatoms; and,

mixing said manganese salt with said 1,4,7–trisubstituted -1,4,7-triazacyclononane;

wherein the 1,4,7–trisubstitued -1,4,7-triazacyclononane (L) is provided in an amount such that the molar ratio of L:Mn is at least 1.25:1 and preferably at least 1.5:1, and wherein preferably the molar ratio of L:Mn is lower than 20:1, preferably lower than 12:1.