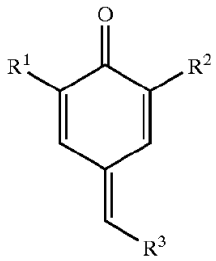
CLAIMS

1. A high temperature-stable composition for inhibiting polymerization in a high temperature ethylene fractionation train comprising:

an effective amount of one or more quinone methides of the formula:



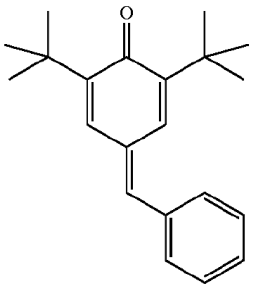
(I)

wherein R^1, R^2, and R^3 are independently selected from the group consisting of H, -OH, -SH, $-NH_2$, alkyl, cycloalkyl, heterocyclo, and aryl;

an effective amount of one or more phenylene diamines; and

optionally, one or more hindered phenols.

2. The high temperature-stable composition of claim 1, wherein the one or more quinone methides comprises 4-benzylidene-2,6-di-tert-butyl-cyclohexa-2,5-dienone of formula (II):



(II)

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3. The high temperature-stable composition of claim 1, wherein the one or more phenylene diamines comprises an asymmetrical phenylene diamine.

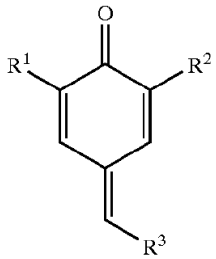
4. The high temperature-stable composition of claim 3, wherein the asymmetrical phenylene diamine is N-(1,4-dimethylpentyl)-N-phenyl-p-phenylenediamine.

5. The high temperature-stable composition of claim 1, wherein the composition comprises one or more hindered phenols and the one or more hindered phenols comprises 2,6-di-tert-butyl phenol.

6. The high temperature-stable composition of claim 1, wherein the composition comprises at least one of: (i) the one or more quinone methides in an amount of between about 1 ppm to about 10,000 ppm; (ii) the one or more phenylene diamines in an amount of between about 1 ppm to about 10,000 ppm; and (iii) the composition comprises one or more hindered phenols in an amount of between about 0.1 ppm to about 10,000 ppm.

7. A method of inhibiting polymerization in an ethylene fractionation train comprising:

adding an effective amount of one or more quinone methides of the formula:

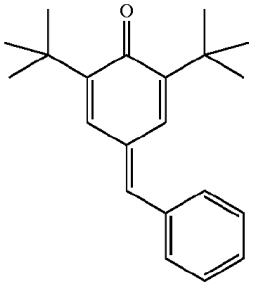


(I)

wherein R^1, R^2, and R^3 are independently selected from the group consisting of H, -OH, -SH, $-NH_2$, alkyl, cycloalkyl, heterocyclo, and aryl; and

optionally, (i) adding an effective amount of one or more phenylene diamines; and/or (ii) adding an effective amount of one or more hindered phenols.

8. The method of claim 7, wherein the one or more quinone methides comprises 4-benzylidene-2,6-di-tert-butyl-cyclohexa-2,5-dienone of formula (II):



(II)

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9. The method of claim 7, wherein the method comprises (i) adding an effective amount of one or more phenylene diamines and the one or more phenylene diamines comprises an asymmetrical phenylene diamine.

10. The method of claim 9, wherein the asymmetrical phenylene diamine is N-(1,4-dimethylpentyl)-N-phenyl-p-phenylenediamine.

11. The method of claim 7, where the method comprises (ii) adding an effective amount of one or more hindered phenols and the one or more hindered phenols comprises 2,6-di-tert-butyl phenol.

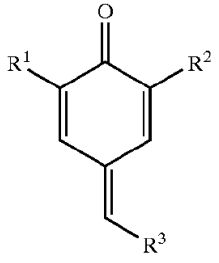
12. The method of claim 7, wherein the method comprises at least one of: (a) adding the one or more quinone methides in an amount of between about 1 ppm to about 10,000 ppm; (b) the method comprises adding an effective amount of one or more phenylene diamines in an amount of between about 1 ppm to about 10,000 ppm; and (c) the method comprises adding an effective amount of one or more hindered phenols in an amount of between about 0.1 ppm to about 10,000 ppm.

13. The method of claim 7, wherein the ethylene fractionation train operates at a high temperature of about 120°C to about 160°C.

14. The method of claim 7, wherein the polymerization is free radical polymerization.

15. A method of inhibiting gum formation and fouling in a high temperature ethylene fractionation train comprising:

adding an effective amount of one or more quinone methides of the formula:

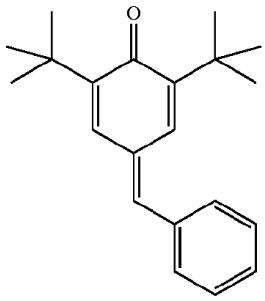


(I)

wherein R^1, R^2, and R^3 are independently selected from the group consisting of H, -OH, -SH, $-NH_2$, alkyl, cycloalkyl, heterocyclo, and aryl; and

optionally, (i) adding an effective amount of one or more phenylene diamines; and/or (ii) adding an effective amount of one or more hindered phenols.

16. The method of claim 15, wherein the one or more quinone methides comprises 4-benzylidene-2,6-di-tert-butyl-cyclohexa-2,5-dienone of formula (II):



(II)

17. The method of claim 15, wherein the method comprises (i) adding an effective amount of one or more phenylene diamines and the one or more phenylene diamines comprises an asymmetrical phenylene diamine.

18. The method of claim 17, wherein the asymmetrical phenylene diamine is N-(1,4-dimethylpentyl)-N-phenyl-p-phenylenediamine.

19. The method of claim 15, where the method comprises (ii) adding an effective amount of one or more hindered phenols and the one or more hindered phenols comprises 2,6-di-tert-butyl phenol.

20. The method of claim 15, wherein the method comprises at least one of (a) adding the one or more quinone methides in an amount of between about 1 ppm to about 10,000 ppm; (b) the method comprises adding an effective amount of one or more phenylene diamines in an amount of between about 1 ppm to about 10,000 ppm; and (c) the method comprises adding an effective amount of one or more hindered phenols in an amount of between about 0.1 ppm to about 10,000 ppm.