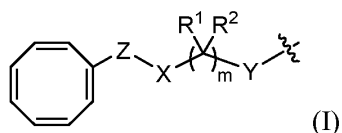


WHAT IS CLAIMED IS:

1. A fluorescent compound comprising a photo-protecting cyclooctatetraene moiety comprises the structure of formula (I):



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wherein:

each of R^1 and R^2 are each independently selected from the group consisting of H, hydroxyl, halogen, azido, thiol, nitro, cyano, optionally substituted amino, carboxyl, $-C(O)OR^5$, $-C(O)NR^6R^7$, optionally substituted C_{1-6} alkyl, optionally substituted C_{1-6} alkoxy, optionally substituted C_{1-6} haloalkyl, optionally substituted C_{1-6} haloalkoxy, optionally substituted C_{2-6} alkenyl, optionally substituted C_{2-6} alkynyl, optionally substituted C_{6-10} aryl, optionally substituted C_{7-14} aralkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 5 to 10 membered heteroaryl, and optionally substituted 3 to 10 membered heterocyclyl;

X and Y are each independently selected from the group consisting of a bond, $-O-$, $-S-$, $-NR^3-$, $-C(=O)-$, $-C(=O)-O-$, $-C(=O)-NR^4-$, $-S(O)_2-$, $-NR^3-C(=O)-NR^4$, $-NR^3-C(=S)-NR^4-$, optionally substituted C_{1-6} alkylene, and optionally substituted heteroalkylene where at least one carbon atom is replaced with O, S, or N;

Z is absent, optionally substituted C_{2-6} alkenylene, or optionally substituted C_{2-6} alkynylene;

each of R^3 and R^4 is independently H, optionally substituted C_{1-6} alkyl, or optionally substituted C_{6-10} aryl;

R^5 is optionally substituted C_{1-6} alkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{7-14} aralkyl, optionally substituted C_{3-7} carbocyclyl, optionally substituted 5 to 10 membered heteroaryl, or optionally substituted 3 to 10 membered heterocyclyl;

each of R^6 and R^7 is independently H, optionally substituted C_{1-6} alkyl, optionally substituted C_{6-10} aryl, optionally substituted C_{7-14} aralkyl, optionally

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substituted C₃₋₇ carbocyclyl, optionally substituted 5 to 10 membered heteroaryl, or optionally substituted 3 to 10 membered heterocyclyl;

the carbon atom to which R¹ and R² are attached in  is optionally replaced with O, S, or N, provided that when said carbon atom is replaced with O or S, then R¹ and R² are both absent; when said carbon atom is replaced with N, then R² is absent; and

m is an integral number between 0 and 10;

provided that the fluorescent compound is not a cyanine dye.

2. The fluorescent compound of Claim 1, wherein Z is absent.

3. The fluorescent compound of Claim 1, wherein Z is C₂₋₆ alkenylene.

4. The fluorescent compound of any one of Claims 1 to 3, wherein X is -C(=O)- or -C(=O)NR⁴-.

5. The fluorescent compound of Claim 4, wherein R⁴ is H.

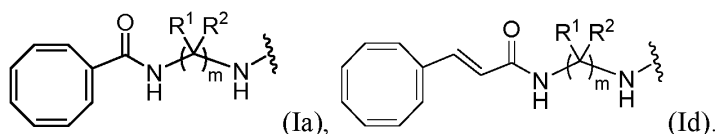
6. The fluorescent compound of Claim 4, wherein R⁴ is C₁₋₆ alkyl substituted with amino, carboxyl, -C(O)OR⁵, or -C(O)NR⁶R⁷.

7. The fluorescent compound of any one of Claims 1 to 5, wherein Y is -C(=O)O-, -NR³- or -S(O)₂-.

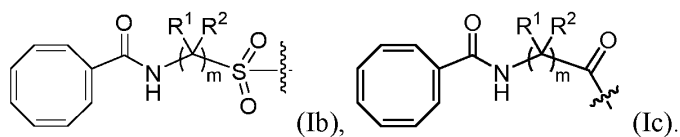
8. The fluorescent compound of Claim 6, wherein Y is -NR³- and R³ is H.

9. The fluorescent compound of Claim 6, wherein Y is -NR³- and R³ is C₁₋₆ alkyl substituted with amino, carboxyl, -SO₃H, -SO₃⁻, -O-SO₃⁻ -C(O)OR⁵, or -C(O)NR⁶R⁷.

10. The fluorescent compound of any one of Claims 1 to 9, wherein the photo-protecting moiety comprises the structure of formula (Ia) or (Id):



11. The fluorescent compound of any one of Claims 1 to 9, wherein the photo-protecting moiety comprises the structure of formula (Ib) or (Ic):



12. The fluorescent compound of any one of Claims 1 to 11, wherein at least one of R^1 and R^2 is hydrogen.

13. The fluorescent compound of any one of Claims 1 to 12, wherein both R^1 and R^2 is hydrogen.

14. The fluorescent compound of any one of Claims 1 to 12, wherein R^1 is H and R^2 is amino or carboxyl.

15. The fluorescent compound of any one of Claims 1 to 12, wherein at least

one carbon atom to which R^1 and R^2 are attached in  is replaced with O, S, or N.

16. The fluorescent compound of any one of Claims 10 to 15, wherein m is 1, 2, 3, 4, 5, or 6.

17. The fluorescent compound of any one of Claims 1 to 11, wherein m is 2, 3, 4, 5 or 6, and each one of R^1 and R^2 is hydrogen.

18. The fluorescent compound of any one of Claims 1 to 11, wherein m is 2,

3, 4, 5, or 6 wherein each of R^1 and R^2 is hydrogen in ; and wherein R^1 is H, and R^2 is amino, carboxyl,

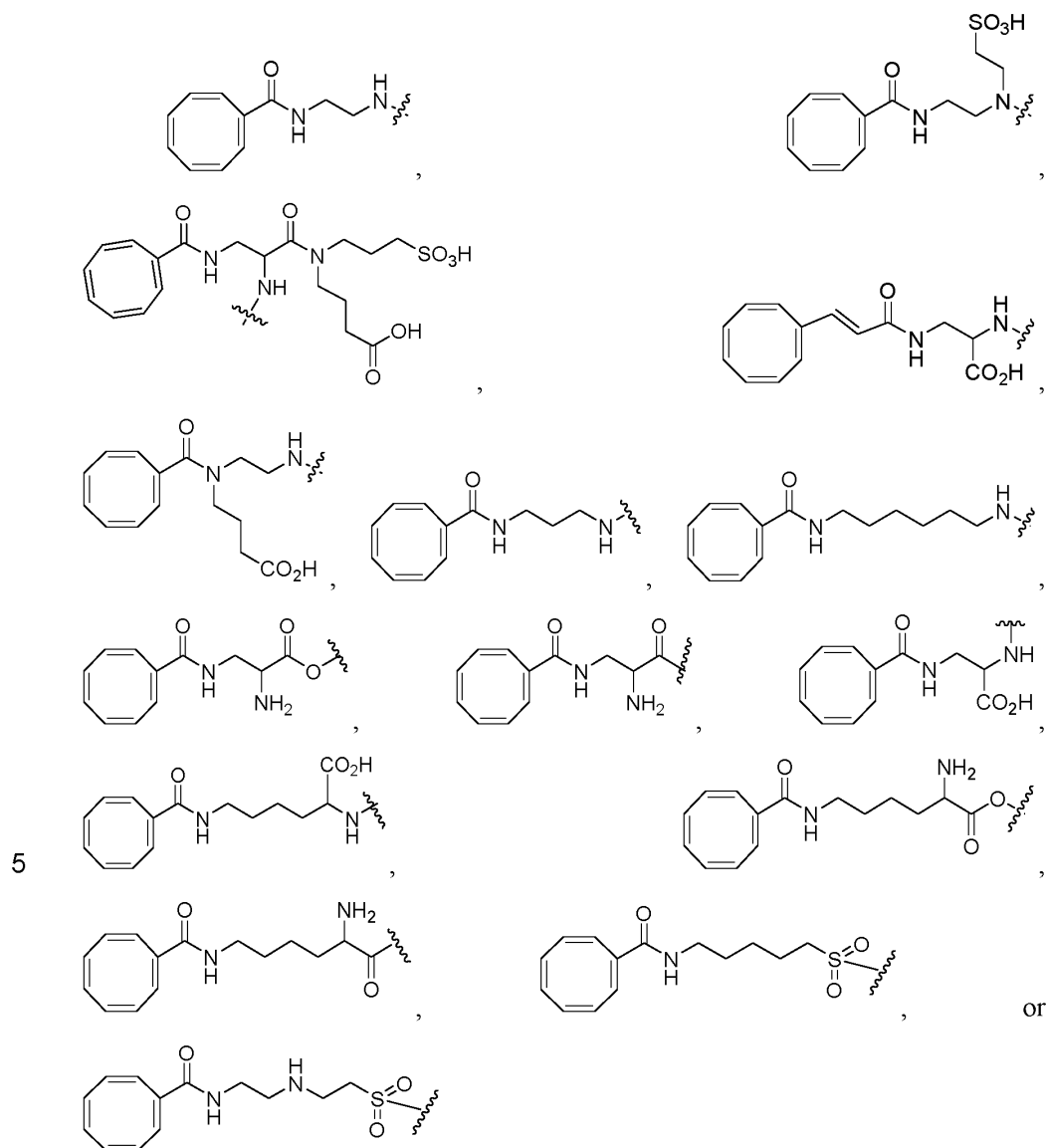
-C(O)OR⁵, or -C(O)NR⁶R⁷ in the remaining .

19. The fluorescent compound of any one of Claims 1 to 18, wherein R^5 is C₁₋₆ alkyl or optionally substituted phenyl.

20. The fluorescent compound of any one of Claims 1 to 18, wherein one or both of R^6 and R^7 is H.

21. The fluorescent compound of any one of Claims 1 to 18, wherein one or both of R^6 and R^7 is C₁₋₆ alkyl substituted with carboxyl, amino, -SO₃H, or -SO₃⁻.

22 The fluorescent compound of Claim 1, wherein the photo-protecting moiety comprises the structure:



23. The fluorescent compound of any one of Claims 1 to 22, wherein the fluorescent compound may be excited by a light source having a wavelength between about 350 nm and about 500 nm, or between about 420 nm and about 480 nm.

24. The fluorescent compound of Claim 23, wherein the fluorescent compound may be excited by a light source having a wavelength between about 450 nm and about 460 nm.

25. A nucleoside or nucleotide labeled with a fluorescent compound of any one of Claims 1 to 24.

26. A composition for preventing or reducing photobleaching of a fluorescent dye, comprising cyclooctatetraene or an optionally substituted derivative thereof, and one or more antioxidants selected from the group consisting of taxifolin, quercetin, allyl thiourea, dimethyl thiourea, silibinin, trolox, and optionally substituted derivatives and combinations thereof.

27. The composition of Claim 26, wherein the composition comprises cyclooctatetraene and quercetin, and optionally substituted derivatives and combinations thereof.

28. The composition of Claim 26 or 27, wherein the fluorescent dye may be excited by a light source having a wavelength between about 350 nm and about 500 nm, or between about 420 nm and about 480 nm.

29. The composition of Claim 28, wherein the fluorescent dye may be excited by a light source having a wavelength between about 450 nm and about 460 nm.

30. The composition of any one of Claims 26 to 29, wherein the composition is in an aqueous solution.

31. The composition of Claim 30, wherein cyclooctatetraene or the optionally substituted derivative is in a concentration from about 0.1 mM to about 100 mM.

32. The composition of Claim 31, wherein cyclooctatetraene or the optionally substituted derivative is in a concentration from about 1 mM to about 20 mM.

33. The composition of Claim 32, wherein cyclooctatetraene or the optionally substituted derivative is in a concentration of about 10 mM.

34. The composition of any one of Claims 31 to 33, wherein quercetin or the optionally substituted derivative is in a concentration from about 0.01 mM to about 10 mM.

35. The composition of Claim 34, wherein quercetin or the optionally substituted derivative is in a concentration from about 0.05 mM to about 2 mM.

36. The composition of Claim 35, wherein quercetin or the optionally substituted derivative is in a concentration of about 0.25 mM.

37. The composition of any one of Claims 26 to 36, further comprising one or more fluorescent dyes.

38. The composition of Claim 37, wherein fluorescent dye is covalently attached to a nucleoside or nucleotide.

39. A method of protecting a fluorescent dye from photobleaching, comprising covalently attaching the fluorescent dye to a photo-protecting cyclooctatetraene moiety comprises the structure of formula (I) according to any one of Claims 1 to 24.

5 40. A method of protecting a fluorescent dye from photobleaching, comprising contacting the fluorescent dye with a composition of any one of Claims 26 to 36.

 41. A method of protecting a nucleoside or nucleotide from light-induced degradation, comprising covalently attaching the nucleoside or nucleotide to a
10 fluorescent compound of any one of Claims 1 to 24.

 42. A method of protecting a labeled nucleoside or nucleotide from light-induced degradation, comprising contacting the labeled nucleoside or nucleotide with a composition of any one of Claims 26 to 36.

 43. A method of reducing or preventing light-induced degradation of nucleic
15 acids during a nucleic acid sequencing reaction, comprising:

 (a) incorporating a nucleotide into a copy polynucleotide strand complementary to at least a portion of a template polynucleotide strand, wherein the nucleotide comprises a label and a 3' blocking group;

 (b) detecting the identity of the nucleotide incorporated into the copy
20 strand in the presence of a first buffer composition;

 (c) chemically removing the label and the 3' blocking group from the nucleotide incorporated into the copy polynucleotide strand; and

 (d) washing the chemically removed label and the 3' blocking group away from the copy strand with a wash solution;

25 wherein the first buffer composition comprises cyclooctatetraene or an optionally substituted derivative thereof, and one or more antioxidants selected from the group consisting of taxifolin, quercetin, allyl thiourea, dimethyl thiourea, silibinin, and trolox, and optionally substituted derivatives and combinations thereof.

30 44. The method of Claim 43, wherein the first buffer composition comprises cyclooctatetraene and quercetin, or optionally substituted derivatives thereof.

45. The method of Claim 44, wherein cyclooctatetraene or the optionally substituted derivative is in a concentration from about 0.1 mM to about 100 mM, from about 1 mM to about 20 mM, or about 10 mM.

46. The method of Claim 44 or 45, wherein quercetin or the optionally substituted derivative is in a concentration from about 0.01 mM to about 10 mM, from about 0.05 mM to about 2 mM, or about 0.25 mM.

47. A method of reducing or preventing light-induced degradation of nucleic acids during a nucleic acid sequencing reaction, comprising:

(a) incorporating a nucleotide into a copy polynucleotide strand complementary to at least a portion of a template polynucleotide strand, wherein the nucleotide comprises a 3' blocking group and is labeled with a fluorescent compound of any one of Claims 1 to 24;

(b) detecting the identity of the nucleotide incorporated into the copy strand in the presence of a first buffer composition;

(c) chemically removing the label and the 3' blocking group from the nucleotide incorporated into the copy polynucleotide strand; and

(d) washing the chemically removed label and the 3' blocking group away from the copy strand with a wash solution.

48. The method of any one of Claims 43 to 47, wherein the wash solution comprises the first buffer solution.

49. The method of any one of Claims 43 to 48, further comprising repeating steps (a) to (d) until a sequence of the portion of the template polynucleotide strand is determined.

50. The method of Claim 49, wherein the steps (a) to (d) is repeated at least 50 times.

51. The method of any one of Claims 43 to 50, wherein step (b) comprises irradiating the copy polynucleotide strand incorporated with the nucleotide with a light source in the presence of the first buffer composition.

52. The method of Claim 51, wherein the light source has a wavelength from about 400 nm to about 500 nm.

53. The method of any one of Claims 43 to 52, wherein removing the label and the 3' blocking group from the nucleotide incorporated into the copy polynucleotide strand comprises contacting the copy strand with a phosphine.

54. The method of Claim 51, wherein the phosphine is
5 tris(hydroxymethyl)phosphine, tris(2-hydroxyethyl)phosphine or
tris(hydroxypropyl)phosphine.

55. The method of any one of Claims 43 to 54, wherein the nucleotide is a nucleotide triphosphate.

56. The method of any one of Claims 43 to 55, wherein the first buffer
10 composition comprises ascorbic acid or a salt thereof.

57. The method of any one of Claims 43 to 54, wherein the template polynucleotide strand is attached to a solid support.

58. The method of Claim 55, wherein the template polynucleotide is attached to a flow cell.

15 59. A kit for use with a sequencing apparatus, comprising a plurality of chambers containing a plurality of compositions, wherein each chamber contains a single composition, wherein the plurality of compositions comprise:

reagents for incorporating a 3' blocked, labeled nucleotide into a copy polynucleotide strand complementary to at least a portion of a template polynucleotide strand;
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a buffer composition comprising a composition of any one of Claims 26 to 36;

reagents for chemically removing a label and blocking moiety from the blocked, labeled nucleotide incorporated into the copy strand; and
25 a wash solution.

60. A kit for use with a sequencing apparatus, comprising a plurality of chambers containing a plurality of compositions, wherein each chamber contains a single composition, wherein the plurality of compositions comprise:

reagents for incorporating a nucleotide into a copy polynucleotide strand complementary to at least a portion of a template polynucleotide strand, wherein the nucleotide comprises a 3' blocking group and is labeled with a fluorescent compound of any one of Claims 1 to 24;
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a buffer composition comprising at least one antioxidant;
reagents for chemically removing a label and blocking moiety from
the blocked, labeled nucleotide incorporated into the copy strand; and
a wash solution.