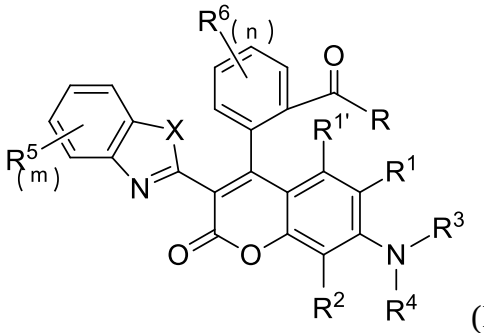
CLAIMS

1. A compound of Formula (I) or mesomeric forms thereof:



(I)

wherein R^1 is H or alkyl, and R^2 and $R^{1'}$ are H;

each R^3 and R^4 is independently selected from the group consisting of H, alkyl, substituted alkyl, alkenyl, alkynyl, aminoalkyl, haloalkyl, heteroalkyl, alkoxyalkyl, sulfonyl hydroxide, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

alternatively, R^1 and R^3 together with the atoms to which they are attached form a heterocyclyl;

alternatively, R^2 and R^4 together with the atoms to which they are attached form a heterocyclyl;

R^5 is selected from the group consisting of halide, sulfo, sulfonyl halide, and S-sulfonamido; and R^6 is selected from the group consisting of alkyl, substituted alkyl, alkoxy, alkenyl, alkynyl, haloalkyl, haloalkoxy, alkoxyalkyl, amino, aminoalkyl, aminosulfonyl, halo, cyano, hydroxy, hydroxyalkyl, heteroalkyl, C-carboxy, O-carboxy, C-amido, N-amido, nitro, sulfonyl, sulfo, sulfino, sulfonate, sulfonyl halide, S-sulfonamido, and N-sulfonamido

R is $-OR^7$ or $-NR^8R^9$;

R^7 is selected from the group consisting of H, alkyl, substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

each R^8 and R^9 is independently selected from the group consisting of H, alkyl, substituted alkyl, alkenyl, alkynyl, aminoalkyl, carboxyalkyl, sulfonatoalkyl, haloalkyl,

heteroalkyl, alkoxyalkyl, sulfo, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

X is selected from the group consisting of O, S, NR^{10}, and Se;

R^{10} is selected from the group consisting of H, alkyl, substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

m is 1; and

n is 0;

when each R^1, $R^{1'}$ and R^2 is H; each R^3 and R^4 is ethyl; m is 1 and R^5 is methyl; n is 0; R is -OH or -OEt; then X is S, NR^{10} or Se; and

when each R^1, $R^{1'}$ and R^2 is H; each R^3 and R^4 is ethyl; m is 1 and R^5 is $-S(O_2)Et$; n is 0; R is -OH or -OEt; then X is S, NR^{10} or Se.

2. The compound of claim 1, wherein X is S or O.

3. The compound of claim 1, wherein R is $-OR^7$.

4. The compound of claim 1, wherein R^7 is H or alkyl.

5. The compound of claim 1, wherein R is $-NR^8R^9$.

6. The compound of claim 5, wherein each R^8 and R^9 is H.

7. The compound of claim 5, wherein R^8 is H and R^9 is alkyl or substituted alkyl.

8. The compound of claim 5, wherein both R^8 and R^9 are alkyl or substituted alkyl.

9. The compound of claim 7, wherein substituted alkyl is selected from alkyl substituted with carboxyl or sulfonyl hydroxide.

10. The compound of claim 1, wherein each R^1, $R^{1'}$ and R^2 is H.

11. The compound of claim 1, wherein at least one of R^1, $R^{1'}$ and R^2 is an alkyl.

12. The compound of claim 1, wherein each R^3 and R^4 is an alkyl.

13. The compound of claim 12, wherein each R^3 and R^4 is selected from methyl or ethyl.

14. The compound of claim 1, wherein R^3 is H and R^4 is an alkyl.

15. The compound of claim 1, wherein R^1 and R^3 together with the atoms to which they are attached form an optionally substituted 3 to 7 membered heterocyclyl.

16. The compound of claim 15, wherein R^1 and R^3 together with the atoms to which they are attached form an optionally substituted 6 membered heterocyclyl.

17. The compound of claim 15, wherein R^4 is selected from H or alkyl.

18. The compound of claim 15, wherein at least one of $R^{1'}$ and R^2 is H.

19. The compound of claim 1, wherein R^2 and R^4 together with the atoms to which they are attached form an optionally substituted 3 to 7 membered heterocyclyl.

20. The compound of claim 19, wherein R^2 and R^4 together with the atoms to which they are attached form an optionally substituted 6 membered heterocyclyl.

21. The compound of claim 19, wherein R^3 is selected from H or alkyl.

22. The compound of claim 19, wherein at least one of $R^{1'}$ and R^1 is H.

23. The compound of claim 1, wherein R^1 and R^3 together with the atoms to which they are attached form an optionally substituted 3 to 7 membered heterocyclyl, and wherein R^2 and R^4 together with the atoms to which they are attached form an optionally substituted 3 to 7 membered heterocyclyl.

24. The compound of claim 23, wherein R^1 and R^3 together with the atoms to which they are attached form an optionally substituted 3 to 7 membered heterocyclyl, and wherein R^2 and R^4 together with the atoms to which they are attached form an optionally substituted 6 membered heterocyclyl.

25. The compound of claim 15, wherein the heterocyclyl contains one heteroatom.

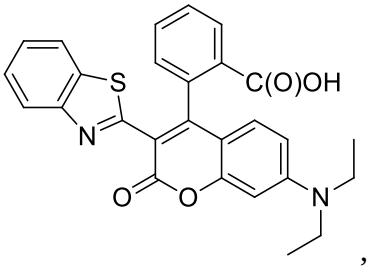
26. The compound of claim 24, wherein the heterocyclyl is substituted with one or more alkyl.

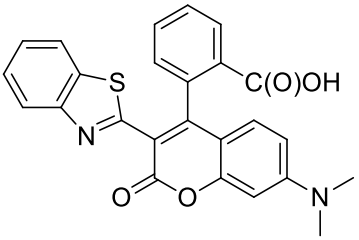
27. The compound of claim 1, wherein m is 0.

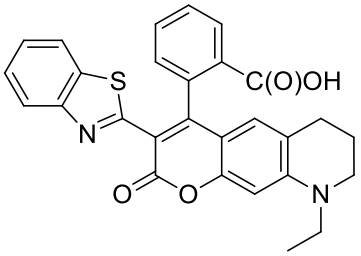
28. The compound of claim 1, wherein m is 1 and R^5 is selected from halo, sulfo, aminosulfonyl, or sulfonyl halide.

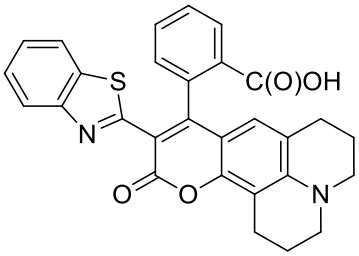
29. The compound of claim 1, wherein n is 0.

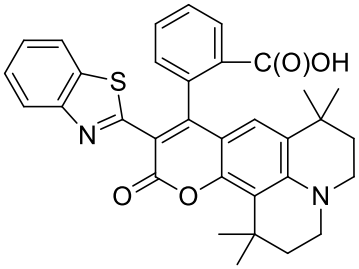
30. The compound of claim 1, selected from the group consisting of:

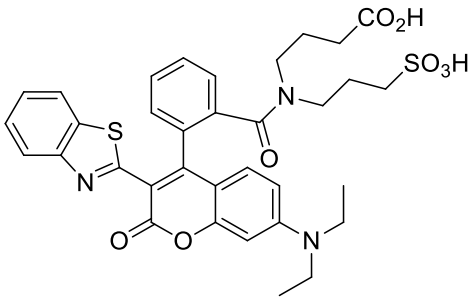


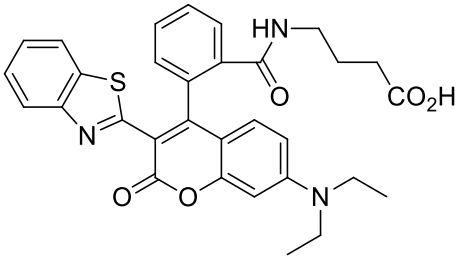
,


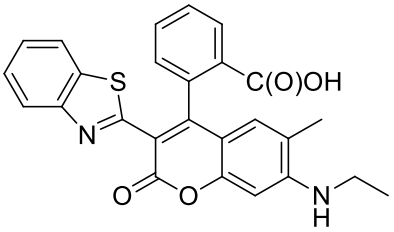
,


,


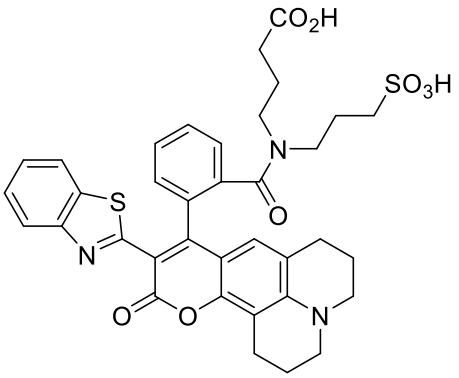
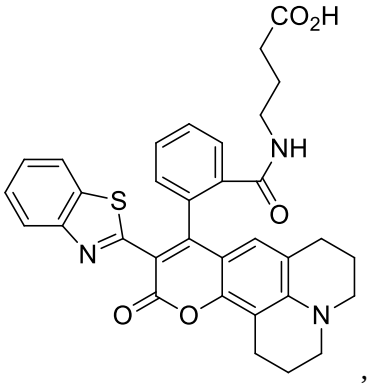
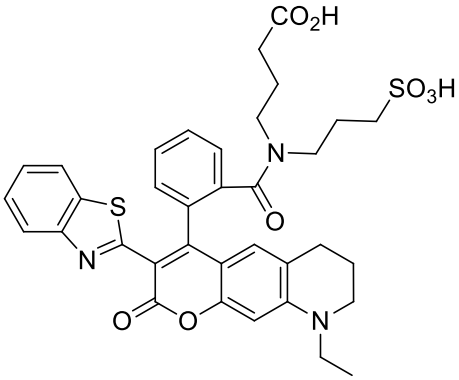
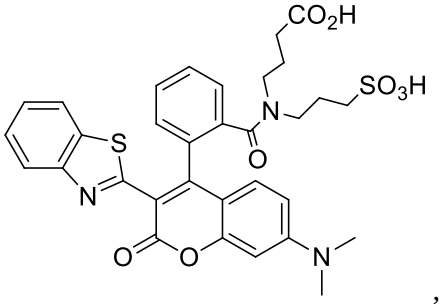
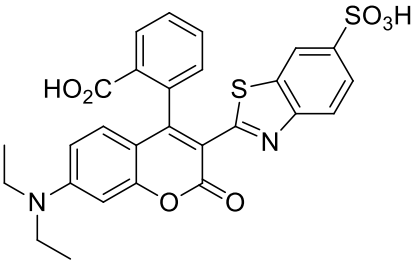
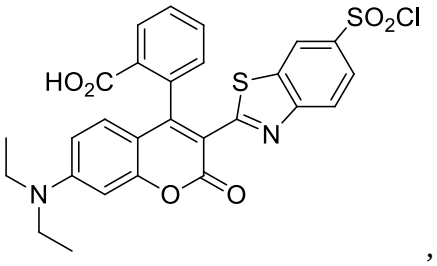
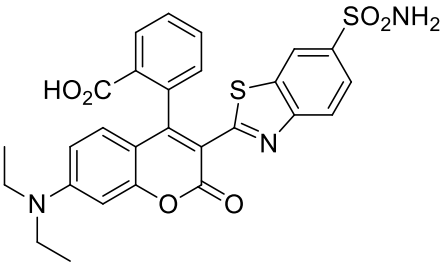
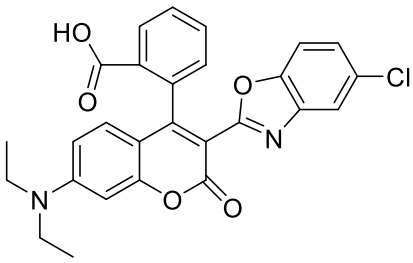
,


,


,


,


,


,

,

,

,

,

,

, and

, and mesomeric isomers thereof.

31. The compound of claim 1, wherein the compound is covalently attached to a nucleotide or oligonucleotide via C(=O)R, wherein R is -OR^7, and wherein R^7 is H or a substituted alkyl.

32. The compound of claim 1, wherein the compound is covalently attached to a nucleotide or oligonucleotide via C(=O)R, wherein R is $-NR^8R^9$, and wherein at least one of R^8 or R^9 is a substituted alkyl.

33. A nucleotide or oligonucleotide labeled with a compound according to claim 1.

34. The labeled nucleotide or oligonucleotide of claim 33, wherein the compound is covalently attached to the nucleotide or oligonucleotide via -C(=O)R, wherein R is $-OR^7$, and R^7 is H or a substituted alkyl.

35. The labeled nucleotide or oligonucleotide of claim 33, wherein the compound is covalently attached to the nucleotide or oligonucleotide via -C(=O)R, wherein R is $-NR^8R^9$, and wherein at least one of R^8 or R^9 is a substituted alkyl.

36. The labeled nucleotide or oligonucleotide of claim 33, wherein the compound is attached to the C5 position of a pyrimidine base or the C7 position of a 7-deaza purine base of the nucleotide or oligonucleotide through a cleavable linker.

37. The labeled nucleotide or oligonucleotide of claim 33, further comprising a 3'-OH blocking group covalently attached to the ribose or deoxyribose sugar of the nucleotide or oligonucleotide.

38. A kit comprising one or more nucleotides wherein at least one nucleotide is a labeled nucleotide according to claim 33.

39. The kit of claim 38, comprising two or more labeled nucleotides.

40. The kit of claim 39, wherein the two labeled nucleotides are excited using a single laser.

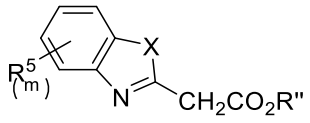
41. The kit of claim 38, further comprising a third and a fourth nucleotide, wherein each of the second, third and fourth nucleotide is labeled with a different compound, wherein each compound has a distinct absorbance maximum and each of the compound is distinguishable from the other compounds.

42. A method of sequencing comprising incorporating a labeled nucleotide according to claim 33 in a sequencing assay.

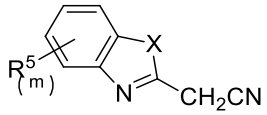
43. The method of claim 42, further comprising detecting the nucleotide.

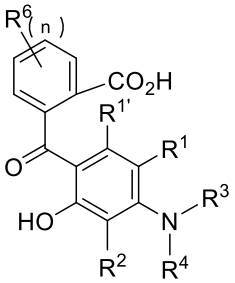
44. The method of claim 42, wherein the sequencing assay is performed on an automated sequencing instrument, and wherein the automated sequencing instrument comprises two light sources operating at different wavelengths.

45. A method of preparing a compound of Formula (Ia), comprising:

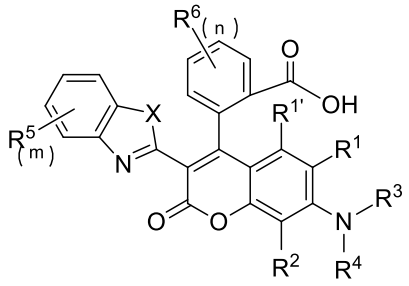
reacting a compound of Formula (IIa) 

(IIa) or (IIb)



(IIb) with a compound of Formula (III) 

(III) to form



(Ia),

R^1 is H or alkyl, and R^2 and $R^{1'}$ are Heach R^3 and R^4 is independently selected from the group consisting of H, alkyl, substituted alkyl, alkenyl, alkynyl, aminoalkyl, haloalkyl, heteroalkyl, alkoxyalkyl, sulfonyl hydroxide, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

alternatively, R^1 and R^3 together with the atoms to which they are attached form a heterocyclyl;

alternatively, R^2 and R^4 together with the atoms to which they are attached form a heterocyclyl;

R^5 is selected from the group consisting of halide, sulfo, sulfonyl halide, and S-sulfonamido; and R^6 is selected from the group consisting of alkyl, substituted alkyl, alkoxy, alkenyl, alkynyl, haloalkyl, haloalkoxy, alkoxyalkyl, amino, aminoalkyl, aminosulfonyl, halo, cyano, hydroxy, hydroxyalkyl, heteroalkyl, C-carboxy, O-carboxy, C-amido, N-amido, nitro, sulfonyl, sulfo, sulfino, sulfonate, sulfonyl halide, S-sulfonamido, N-sulfonamido,X is selected from the group consisting of O, S, NR^{10}, and Se;

R^{10} is selected from the group consisting of H, alkyl, substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

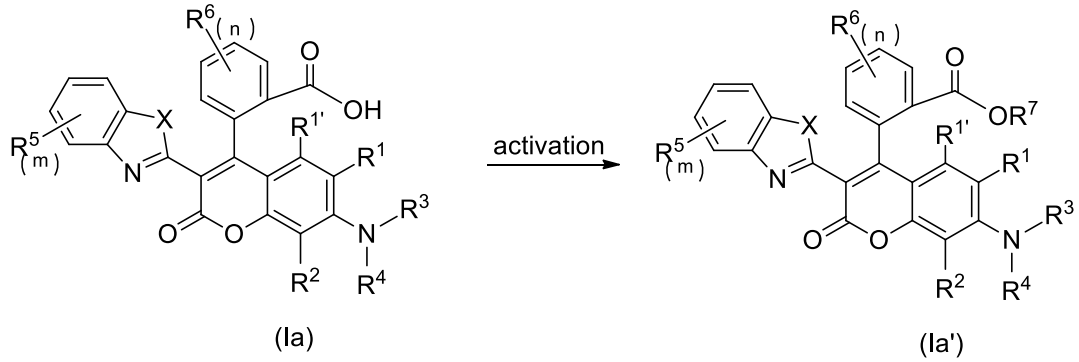
R" is selected from the group consisting of H, optionally substituted alkyl, alkenyl, alkynyl, aminoalkyl, haloalkyl, heteroalkyl, alkoxyalkyl, sulfo, optionally substituted aryl; optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl;

m is 1; and

n is 0.

46. A method for preparation a compound of Formula (Ib), comprising:

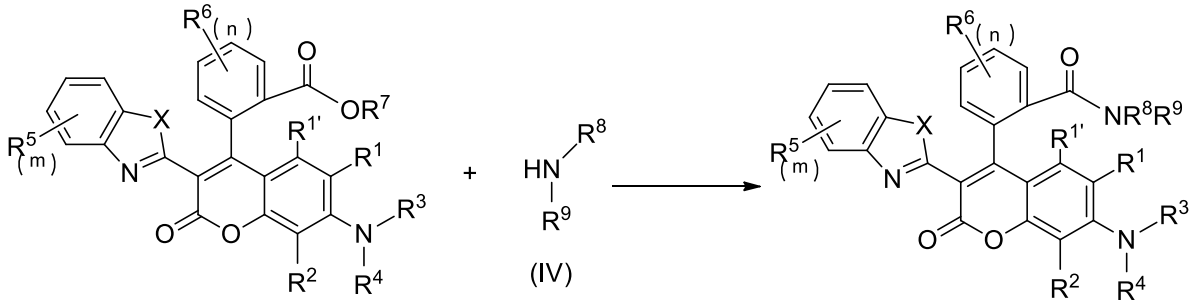
converting a compound of Formula (Ia) to a compound of Formula (Ia') through carboxylic acid activation;



(Ia) (Ia')

and

reacting the compound of Formula (Ia') with a primary or secondary amine of Formula (IV),



wherein the compound of Formula (Ia) is prepared according to Claim 45;

R^7 is selected from the group consisting of H, alkyl, substituted alkyl, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl; and

each R^8 and R^9 is independently selected from the group consisting of H, alkyl, substituted alkyl, alkenyl, alkynyl, aminoalkyl, carboxyalkyl, sulfonatoalkyl, haloalkyl, heteroalkyl, alkoxyalkyl, sulfo, optionally substituted aryl, optionally substituted heteroaryl, optionally substituted carbocyclyl, and optionally substituted heterocyclyl.