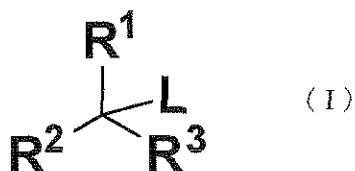


completing the present invention.

[0012]

Specifically, the present invention relates to a method for detecting a multi-stranded nucleic acid, comprising a step of bringing a chromogenic leuco dye into contact with a multi-stranded nucleic acid, wherein a color formed by interaction between the leuco dye and the multi-stranded nucleic acid is detected under visible light, and wherein the leuco dye is a compound represented by General Formula (I):



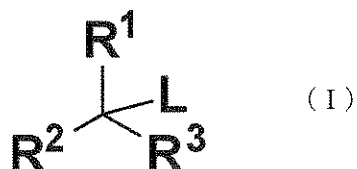
wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents $-\text{SO}_3\text{R}^4$, $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, $-\text{SSR}^9$, $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group.

Also disclosed is a method for detecting a multi-stranded nucleic acid, comprising a step of bringing a chromogenic leuco dye into contact with a multi-stranded nucleic acid, wherein a color formed by interaction between the leuco dye and the multi-stranded nucleic acid is detected under visible light.

[0013]

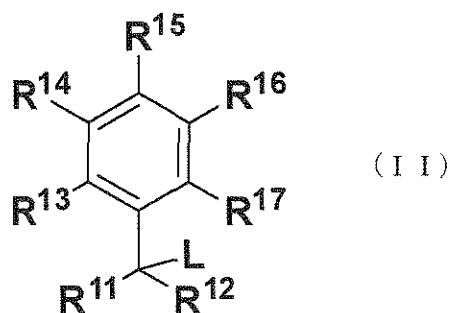
Preferably, the leuco dye is a compound represented by General Formula (I):



- 5 wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents -
 SO_3R^4 , $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, -
 SSR^9 , $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an
 10 alkali metal or a hydrogen atom; X representing a halogen
 atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently
 representing an alkyl group, aryl group, acyl group,
 alkenyl group or alkynyl group, wherein a leaving group of
 the leuco dye is dissociated by interaction between the
 leuco dye and the multi-stranded nucleic acid, and a color
 15 that can be detected under visible light is then formed by
 dissociation of the leaving group.

[0014]

The compound represented by General Formula (I) is preferably a compound represented by General Formula (II):



wherein L is defined as above; R¹¹ and R¹² each independently represent a substituted or unsubstituted aryl group; and R¹³, R¹⁴, R¹⁵, R¹⁶ and R¹⁷ each independently represent a halogen atom or a carboxyl group, sulfo group, nitro group, cyano group, amido group, amino group, alkyl group, aryl group, alkenyl group, alkynyl group, hydroxy group, alkoxy group, aryloxy group, alkylthio group, arylthio group, alkylamino group, arylamino group, acyl group, alkoxycarbonyl group, aryloxycarbonyl group, alkylsulfonyl group or arylsulfonyl group.

[0015]

The leuco dye is preferably a reaction product of a triarylmethane dye and a nucleophile.

[0016]

The triarylmethane dye is preferably one or more dyes selected from the group consisting of gentian violet, crystal violet, methyl green, malachite green, victoria blue and pararosaniline, and derivatives thereof.

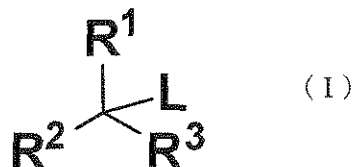
[0017]

The nucleophile is preferably one or more nucleophiles selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

[0018]

The present invention also relates to a device or kit for detecting a multi-stranded nucleic acid, comprising:

(a) a carrier carrying a leuco dye, wherein the leuco dye is a compound represented by General Formula (I):



wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents -
 SO_3R^4 , $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, $-\text{SSR}^9$, $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group;

(b) a pathway for a test sample to pass through the carrier (a); and

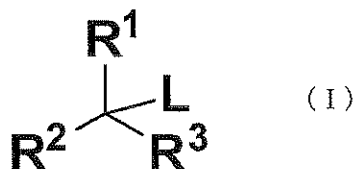
(c) a part for detecting under visible light a color formed by interaction between the test sample and the leuco dye to determine the presence of a multi-stranded nucleic acid.

Also disclosed is a device or kit for detecting a multi-stranded nucleic acid, comprising:

CLAIMS

Claim 1. A method for detecting a multi-stranded nucleic acid, comprising a step of bringing a chromogenic leuco dye into contact with a multi-stranded nucleic acid, wherein a color formed by interaction between the leuco dye and the multi-stranded nucleic acid is detected under visible light.

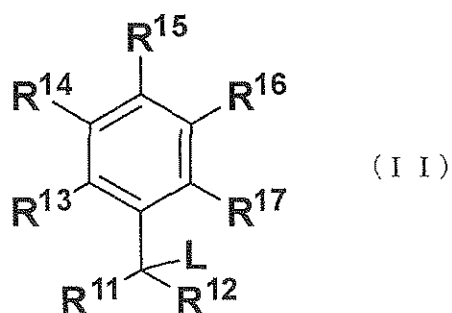
Claim 2. The detection method according to Claim 1, wherein the leuco dye is a compound represented by General Formula (I):



wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents $-\text{SO}_3\text{R}^4$, $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, $-\text{SSR}^9$, $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group.

Claim 3. The detection method according to Claim 2, wherein the compound represented by General Formula (I) is a compound represented by General Formula (II):



wherein L is defined as above; R¹¹ and R¹² each independently represent a substituted or unsubstituted aryl group; and R¹³, R¹⁴, R¹⁵, R¹⁶ and R¹⁷ each independently
 5 represent a halogen atom or a carboxyl group, sulfo group, nitro group, cyano group, amido group, amino group, alkyl group, aryl group, alkenyl group, alkynyl group, hydroxy group, alkoxy group, aryloxy group, alkylthio group, arylthio group, alkylamino group, arylamino group, acyl
 10 group, alkoxycarbonyl group, aryloxycarbonyl group, alkylsulfonyl group or arylsulfonyl group.

Claim 4. The detection method according to any of Claims 1 to 3, wherein the leuco dye is a reaction product
 15 of a triarylmethane dye and a nucleophile.

Claim 5. The detection method according to Claim 4, wherein the triarylmethane dye is one or more dyes selected from the group consisting of gentian violet, crystal violet,
 20 methyl green, malachite green, victoria blue and pararosaniline, and derivatives thereof.

Claim 6. The detection method according to Claim 4 or 5, wherein the nucleophile is one or more nucleophiles
 25 selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

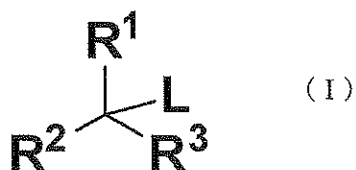
Claim 7. A device or kit for detecting a multi-stranded nucleic acid, comprising:

(d) a carrier carrying a leuco dye;

5 (e) a pathway for a test sample to pass through the carrier (d); and

(f) a part for detecting under visible light a color formed by interaction between the test sample and the leuco dye to determine the presence of a multi-stranded nucleic acid.

Claim 8. The device or kit according to Claim 7, wherein the leuco dye is a compound represented by General Formula (I):



15 wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents $-\text{SO}_3\text{R}^4$, $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, $-\text{SSR}^9$, $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

25 wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group.

30 Claim 9. The device or kit according to Claim 7 or 8, wherein the carrier (d) carries a liquid mixture of a

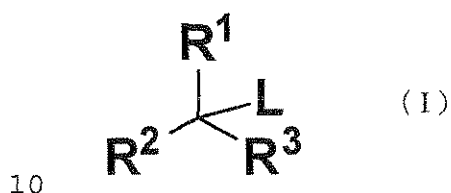
triarylmethane dye and a nucleophile.

Claim 10. The device or kit according to Claim 9,
wherein the triarylmethane dye is one or more dyes selected
5 from the group consisting of gentian violet, crystal violet,
methyl green, malachite green, victoria blue and
pararosaniline, and derivatives thereof.

Claim 11. The device or kit according to Claim 9 or
10 10, wherein the nucleophile is one or more nucleophiles
selected from the group consisting of sulfite ions,
hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide
ions, halide ions, nitrogen nucleophiles, sulfur
nucleophiles, alkali metal alkoxides, alkali metal
15 hydroxides and hydride nucleophiles.

CLAIMS

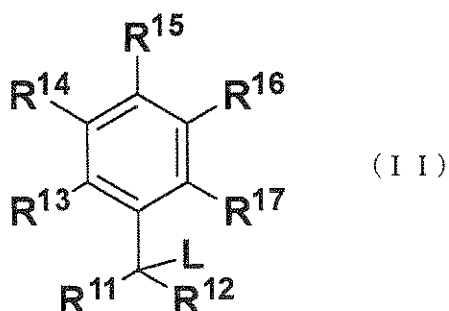
Claim 1. A method for detecting a multi-stranded nucleic acid, comprising a step of bringing a chromogenic leuco dye into contact with a multi-stranded nucleic acid, wherein a color formed by interaction between the leuco dye and the multi-stranded nucleic acid is detected under visible light, and wherein the leuco dye is a compound represented by General Formula (I):



wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents $-\text{SO}_3\text{R}^4$, $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, $-\text{SSR}^9$, $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group.

25 Claim 2. The detection method according to Claim 1, wherein the compound represented by General Formula (I) is a compound represented by General Formula (II):



wherein L is defined as in claim 1; R¹¹ and R¹² each independently represent a substituted or unsubstituted aryl group; and R¹³, R¹⁴, R¹⁵, R¹⁶ and R¹⁷ each independently
 5 represent a halogen atom or a carboxyl group, sulfo group, nitro group, cyano group, amido group, amino group, alkyl group, aryl group, alkenyl group, alkynyl group, hydroxy group, alkoxy group, aryloxy group, alkylthio group, arylthio group, alkylamino group, arylamino group, acyl
 10 group, alkoxycarbonyl group, aryloxycarbonyl group, alkylsulfonyl group or arylsulfonyl group.

Claim 3. The detection method according to Claim 2,
 wherein the leuco dye is a reaction product of a
 15 triarylmethane dye and a nucleophile.

Claim 4. The detection method according to Claim 3,
 wherein the triarylmethane dye is one or more dyes selected
 from the group consisting of gentian violet, crystal
 20 violet, methyl green, malachite green, victoria blue and pararosaniline, and derivatives thereof.

Claim 5. The detection method according to Claim 3,
 wherein the nucleophile is one or more nucleophiles
 25 selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

Claim 6. The detection method according to claim 1, wherein the leuco dye is a reaction product of a triarylmethane dye and a nucleophile.

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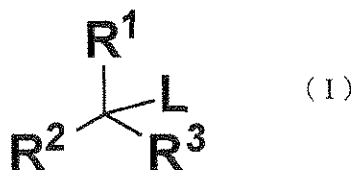
Claim 7. The detection method according to claim 6, wherein the triarylmethane dye is one or more dyes selected from the group consisting of gentian violet, crystal violet, methyl green, malachite green, victoria blue and
10 pararosaniline, and derivatives thereof.

Claim 8. The detection method according to claim 7, wherein the nucleophile is one or more nucleophiles selected from the group consisting of sulfite ions,
15 hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

20 Claim 9. The detection method according to claim 6, wherein the nucleophile is one or more nucleophiles selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur
25 nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

Claim 10. A device or kit for detecting a multi-stranded nucleic acid, comprising:

30 (a) a carrier carrying a leuco dye, wherein the leuco dye is a compound represented by General Formula (I):



wherein R^1 , R^2 and R^3 each independently represent a substituted or unsubstituted aryl group, and L represents -
 SO_3R^4 , $-\text{NO}_3$, $-\text{NO}_2$, $-\text{CN}$, $-\text{X}$, $-\text{NHR}^5$, $-\text{N}(\text{COR}^6)(\text{COR}^7)$, $-\text{SR}^8$, -
 5 SSR^9 , $-\text{OR}^{10}$, $-\text{NHSNH}_2$, $-\text{OH}$ or $-\text{H}$, with R^4 representing an alkali metal or a hydrogen atom; X representing a halogen atom; and R^5 , R^6 , R^7 , R^8 , R^9 and R^{10} each independently representing an alkyl group, aryl group, acyl group, alkenyl group or alkynyl group, and

10 wherein a leaving group of the leuco dye is dissociated by interaction between the leuco dye and the multi-stranded nucleic acid, and a color that can be detected under visible light is then formed by dissociation of the leaving group;

15 (b) a pathway for a test sample to pass through the carrier (a); and

(c) a part for detecting under visible light a color formed by interaction between the test sample and the leuco dye to determine the presence of a multi-stranded nucleic
 20 acid.

Claim 11. The device or kit according to Claim 10,
 25 wherein the carrier (a) carries a liquid mixture of a triarylmethane dye and a nucleophile.

Claim 12. The device or kit according to Claim 11,
 wherein the triarylmethane dye is one or more dyes selected
 30 from the group consisting of gentian violet, crystal violet, methyl green, malachite green, victoria blue and

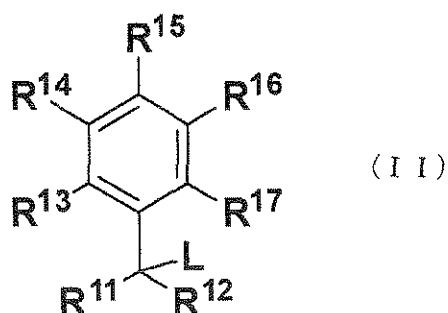
pararosaniline, and derivatives thereof.

Claim 13. The device or kit according to Claim 12, wherein the nucleophile is one or more nucleophiles
 5 selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

10

Claim 14. The device or kit according to claim 11, wherein the nucleophile is one or more nucleophiles selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide
 15 ions, halide ions, nitrogen nucleophiles, sulfur nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

Claim 15. The device or kit according to claim 10, wherein the compound represented by General Formula (I) is a compound represented by General Formula (II):



wherein L is defined as in claim 10; R¹¹ and R¹² each independently represent a substituted or unsubstituted aryl group; and R¹³, R¹⁴, R¹⁵, R¹⁶ and R¹⁷ each independently
 25 represent a halogen atom or a carboxyl group, sulfo group, nitro group, cyano group, amido group, amino group, alkyl group, aryl group, alkenyl group, alkynyl group, hydroxy group, alkoxy group, aryloxy group, alkylthio group,

arylthio group, alkylamino group, arylamino group, acyl group, alkoxycarbonyl group, aryloxycarbonyl group, alkylsulfonyl group or arylsulfonyl group.

5 Claim 16. The device or kit according to claim 15, wherein the carrier (a) carries a liquid mixture of a triarylmethane dye and a nucleophile.

10 Claim 17. The device or kit according to claim 16, wherein the triarylmethane dye is one or more dyes selected from the group consisting of gentian violet, crystal violet, methyl green, malachite green, victoria blue and pararosaniline, and derivatives thereof.

15 Claim 18. The device or kit according to claim 17, wherein the nucleophile is one or more nucleophiles selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur
20 nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

 Claim 19. The device or kit according to claim 16, wherein the nucleophile is one or more nucleophiles
25 selected from the group consisting of sulfite ions, hydrogen sulfite ions, nitrate ions, nitrite ions, cyanide ions, halide ions, nitrogen nucleophiles, sulfur
 nucleophiles, alkali metal alkoxides, alkali metal hydroxides and hydride nucleophiles.

30