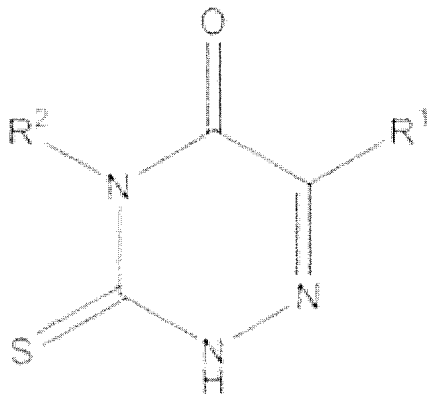


(I),

[0014] wherein

[0015] R^1 is hydrogen, alkyl, substituted alkyl, alkyl-aryl, alkyl-heteroaryl, cycloalkyl, aryl, heteroaryl, carboxylic acid, ester, NR^aR^b, imine, hydroxyl, or oxo;

[0016] R^2 is hydrogen, NR^aR^b, imine, alkyl, or aryl; and

[0017] R^a and R^b are each independently hydrogen, alkyl, or aryl.

[0017a] The present disclosure also provides a kit comprising the composition as described herein in a single container, wherein the compound of formula (I) stabilizes the luminogenic substrate.

BRIEF DESCRIPTION OF THE DRAWINGS

[0018] Figure 1 shows the stability of coelenterazine in the presence (A) and absence (B) of ATT.

[0019] Figure 2 shows the stability of coelenterazine-h in the presence (A) and absence (B) of ATT.

[0020] Figure 3 shows the stability of coelenterazine-h-h in the presence (A) and absence (B) of ATT.

[0021] Figure 4 shows the stability of furimazine in the presence (A) and absence (B) of ATT.

[0022] Figure 5 shows in (A) the stability of furimazine in the presence and absence of ATT; and in (B), (C), and (D), the formation of decomposition products in the presence and absence of ATT.

[0023] Figure 6 shows an Arrhenius plot for furimazine in the presence of ATT.

[0024] Figure 7 shows an Arrhenius plot for furimazine in the absence of ATT.

[0025] Figure 8 shows an Arrhenius plot for coelenterazine in the presence of ATT.

[0026] Figure 9 shows an Arrhenius plot for coelenterazine in the absence of ATT.

[0027] Figure 10 shows an Arrhenius plot for coelenterazine-h in the presence of ATT.

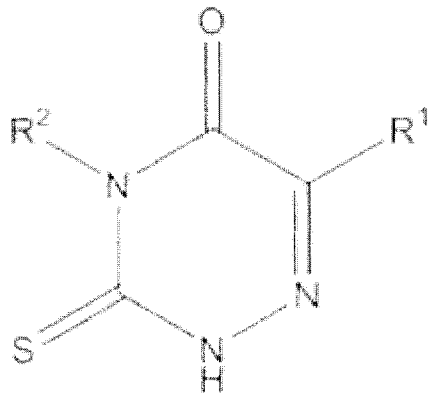
CLAIMS

What is claimed is:

1. A composition comprising

(a) a luminogenic substrate;

(b) an effective amount of a compound of formula (I) or a tautomer thereof,



(I),

wherein

R^1 is hydrogen, alkyl, substituted alkyl, alkyl-aryl, alkyl-heteroaryl, cycloalkyl, aryl, heteroaryl, carboxylic acid, ester, NR^aR^b, imine, hydroxyl, or oxo;

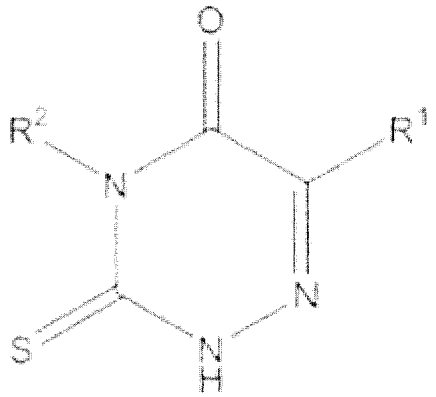
R^2 is hydrogen, NR^aR^b, imine, alkyl, or aryl;

R^a and R^b are each independently hydrogen, alkyl, or aryl; and

(c) an organic solvent.

2. A method for stabilizing a luminogenic substrate, the method comprising contacting the luminogenic substrate with an effective amount of a compound of formula (I) or a tautomer thereof in the presence of an organic solvent, whereby the luminogenic substrate is stabilized against decomposition,

wherein the compound of formula (I) is



(I),

wherein

R^1 is hydrogen, alkyl, substituted alkyl, alkyl-aryl, alkyl-heteroaryl, cycloalkyl, aryl, heteroaryl, carboxylic acid, ester, NR^aR^b, imine, hydroxyl, or oxo;

R^2 is hydrogen, NR^aR^b, imine, alkyl, or aryl; and

R^a and R^b are each independently hydrogen, alkyl, or aryl.

3. The composition of claim 1, wherein the composition does not contain a luminogenic enzyme.

4. The composition of claim 1 or the method of claim 2, wherein the luminogenic substrate is coelenterazine or a functional analog thereof.

5. The composition of claim 1 or the method of claim 2, wherein the luminogenic substrate is furimazine (a functional analog of coelenterazine).

6. The composition of claim 1 or 4, wherein the luminogenic substrate is stabilized against decomposition.

7. The composition of claim 1, 4 or 5 or the method of claim 2, 4 or 5, wherein the luminogenic substrate is stabilized against decomposition in the presence of light.

8. The composition of claim 1, 4 or 5 or the mthod of claim 2, 4 or 5, wherein the luminogenic substrate is stabilized against decomposition in the absence of light.

9. The composition of claim 1 or 4 or the method of claim 2 or 4, wherein the luminogenic substrate is stabilized against decomposition at temperatures from -80°C to 60°C.

10. The composition or the method of claim 7 or 8, wherein the luminogenic substrate is stabilized against decomposition as compared to a composition that does not include the compound of formula (I) or tautomer thereof.

11. The composition of claim 1 or the method of claim 2, wherein the effective amount of the compound of formula (I) is greater than 0.1 mM, optionally greater than 1 mM.

12. The composition of claim 1 or the method of claim 2, wherein the compound of formula (I) is selected from the group consisting of: ATT, ATCA, 3-(4-Amino-5-oxo-3-thioxo-2,3,4,5-tetrahydro-1,2,4-triazin-6-yl)propanoic acid, t\, 4-((2-furylmethylene)amino)-3-mercapto-6-methyl-1,2,4-triazin-5(4H)-one, 6-benzyl-3-sulfanyl-1,2,4-triazin-5-ol, 4-amino-3-mercapto-6-methyl-1,2,4-triazin-5(4H)-one, 3-(5-oxo-3-thioxo-2,3,4,5-tetrahydro-1,2,4-triazin-6-yl)propanoic acid, (*E*)-6-methyl-4-((thiophen-2-ylmethylene)amino)-3-thioxo-3,4-dihydro-1,2,4-triazin-5(2*H*)-one, (*E*)-6-methyl-4-((3-nitrobenzylidene)amino)-3-thioxo-3,4-dihydro-1,2,4-triazin-5(2*H*)-one, (*E*)-4-((4-(diethylamino)benzylidene)amino)-6-methyl-3-thioxo-3,4-dihydro-1,2,4-triazin-5(2*H*)-one, ATCA ethyl ester, TAK-0014, TAK-0002, TAK-0021, TAK-0020, TAK-0018, TAK-0009, TAK-0007, TAK-0008, TAK-0003, TAK-0004, 3-thioxo-6-(trifluoromethyl)-3,4-dihydro-1,2,4-triazin-5(*2H*)-one, 6-cyclopropyl-3-thioxo-3,4-dihydro-1,2,4-triazin-5(*2H*)-one, and 6-(hydroxymethyl)-3-thioxo-3,4-dihydro-1,2,4-triazin-5(*2H*)-one.

13. The composition of claim 22 or the method of claim 2, wherein the compound of formula (I) is ATT and wherein the effective amount of ATT is greater than 32mM, optionally wherein the effective amount of ATT is 225mM.

14. The composition of claim 1 or the method of claim 2, wherein the organic solvent is selected from the group consisting of alcohol, propylene glycol, dimethyl sulfoxide (DMSO), acetonitrile, glycerol, and any combination thereof, optionally wherein the organic solvent is a combination of either (i) ethanol and propylene glycol, or (ii)

ethanol and glycerol.

15. A kit comprising the composition of claim 1, 4, 5, or 11-14 in a single container, wherein the compound of formula (I) stabilizes the luminogenic substrate.