CLAIMS

1. A sensor molecule for detecting a hydrolase, the sensor molecule having a general formula selected from:

R^1-L-R^2-B (I), or

B-R^2-L-R^1 (II)

wherein

R^1 is a bioluminescent protein;

L is a linking element;

R^2 is a non-protein acceptor domain; and

B is a blocking group,

wherein R^2 bound to B comprises a hydrolysable bond and hydrolysis of the hydrolysable bond by the hydrolase produces a change in bioluminescence resonance energy transfer (BRET).

2. The sensor molecule of claim 1, wherein the blocking group stabilises the acceptor domain in a low-fluorescent or non-fluorescent state.

3. The sensor molecule of claim 1 or claim 2, wherein the blocking group comprises a phosphate containing moiety, sugar containing moiety, amino acid containing moiety, nucleotide, nucleoside, ester or ether.

4. The sensor molecule of any one of claims 1 to 3, wherein the linking element comprises an alkyl chain, glycol, ether, polyether, polyamide, polyester, peptide, polypeptide, amino acid or polynucleotide.

5. The sensor molecule of claim 4, wherein the linking element comprises a polypeptide.

6. The sensor molecule of claim 5, wherein R^1-L or L-R^1 are a single polypeptide.

7. The sensor molecule of claim 5 or claim 6, wherein the linking element comprises a cysteine residue and/or a lysine residue.

8. The sensor molecule of claim 7, wherein R^2 is attached to the linking element via the cysteine residue.

9. The sensor molecule of any one of claims 1 to 8, wherein R^2 is selected from an Alexa Fluor dye, Bodipy dye, Cy dye, fluorescein, dansyl, umbelliferone, fluorescent microsphere, luminescent microsphere, fluorescent nanocrystal, Marina Blue, Cascade Blue, Cascade Yellow, Pacific Blue, Oregon Green, Tetramethylrhodamine, Rhodamine, coumarin, BODIPY, resorufin, Texas Red, rare earth element chelates, or any combination or derivative thereof.

10. The sensor molecule of any one of claims 1 to 9, wherein R^1 is selected from a luciferase, a β-galactosidase, a lactamase, a horseradish peroxidase, an alkaline phosphatase, a β-glucuronidase or a β-glucosidase.

11. The sensor molecule of claim 10, wherein the luciferase is a *Renilla* luciferase, a Firefly luciferase, a Coelenterate luciferase, a North American glow worm luciferase, a click beetle luciferase, a railroad worm luciferase, a bacterial luciferase, a Gaussia luciferase, Aequorin, an Arachnocampa luciferase, or a biologically active variant or fragment of any one, or chimera of two or more, thereof.

12. The sensor molecule of any one of claims 1 to 11, wherein the hydrolase is an esterase, lipase, protease, phosphatase, nuclease, glycosidase, DNA glycosylases or an acid anhydride hydrolase.

13. The sensor molecule of any one of claims 1 to 12, wherein the separation and relative orientation of R^1 and R^2, in the presence and/or the absence of hydrolase, is within ± 50% of the Förster distance.

14. The sensor molecule of claim 13, wherein the Förster distance of R^1 and R^2 is at least 4.0nm.

15. The sensor molecule of claim 14, wherein the Förster distance of R^1 and R^2 is between about 4.0nm and about 10nm.

16. The sensor molecule of any one of claims 1 to 15, wherein R^1 is selected from the group consisting of:

(i) a variant bioluminescent protein comprising at least one less cysteine residue when compared to the corresponding naturally occurring protein;

(ii) a variant bioluminescent protein which lacks a cysteine residue at a position corresponding position 24 or position 73 of RLuc8 (SEQ ID NO: 50); and

(iii) a variant bioluminescent protein which lacks a cysteine residue at a position corresponding to amino acid position 24 and position 73 of RLuc8 (SEQ ID NO: 50).

17. A method of detecting a hydrolase in a sample, the method comprising

i) contacting a sample with the sensor molecule of any one of claims 1 to 16; and

ii) detecting a change in BRET ratio, wherein the change in the BRET ratio corresponds to the presence of a hydrolase in the sample.

18. A method of detecting a hydrolase in a sample, the method comprising:

i) contacting a sample with a blocked non-protein acceptor domain having the structure B-R^2 to form a treated sample;

ii) contacting the treated sample with a compound of formula R^1-L or L-R^1 under conditions to cause attaching of R^2 to L; and

iii) detecting a change in BRET ratio, wherein the change in the BRET ratio corresponds to the presence of a hydrolase in the sample and the formation of a compound of formula R^1-L-R^2 or R^2-L-R^1,

and wherein

R^1 is a bioluminescent protein;

L is a linking element;

R^2 is a non-protein acceptor domain; and

B is a blocking group and R^2 bound to B comprises a hydrolysable bond.

19. The method of claim 18, wherein R^2 comprises a cysteine specific electrophile or an amine specific electrophile.

20. The method of claim 18 or claim 19, wherein L comprises a cysteine and/or a lysine residue.

21. The method of any one of claims 17 to 20, further comprising determining the concentration of the hydrolase in the sample and/or activity of the hydrolase in the sample.

22. The method of any one of claims 17 to 21 which is performed on a microfluidic device.

23. The method of any one of claims 17 to 22, wherein the sample is any one of air, liquid, biological material or soil.

24 The method of claim 23, wherein the sample comprises a biological material selected from the group consisting of milk, blood, serum, sputum, mucus, pus and peritoneal fluid.