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"Bioluminescent Colours" : and its composition

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Abstract:

Light produce when electron gain extra energy and move up to a higher energy level around an atom . Different colors are due to release of different amount of energy. Bioluminescene is chemiluminescence that takes place inside a living organism. In the luminescence (like fireflies) the substance ATP (aminotriphophate) initially reacts with luciferase, ionic magnesium and luciferin to form a complex luciferase-luciferyle-adenylate and pyrophosphate. In the firefly, the energy released is very efficiently directed into the production of an electronically excited state of the bioluminescence product oxyluciferin. Luminescene intensity is direct measure of ATP present.

Keywords: *Bioluminescene, Chemiluminescence, luciferase, luciferin*

Introduction:

Many living things on the earth emits radiation of light. All they are refer as Bioluminescent". Bioluminescence is the production of light by chemical reaction within a living organism. Bioluminescent are those living organisms who emits bioluminescence. Bioluminescene is simply the term for a chemical reaction where the light is produce. Bioluminescene is chemiluminescence that takes place inside a living organism. Bioluminescene is a cold light means less than 20% of the light generates from thermal radiation or heat. For the production of light through Bioluminescent two unique chemicals luciferin and luciferase are required. For some species luciferase requires other cofactor like calcium and magnesium ion and ATP. Instead of luciferase some living organs makes use of another type of protein called photoprotein. The color production is due to either excitation of energy or release the energy from a chemical reaction known as chemiluminescence (1).

Light is a type of energy. Its is form of electromagnetic radiation of wavelength which can be detected by the human eye. Light produce when electron gain extra energy and move up to a higher energy level around an atom . When it drops back down to its lower energy state, it looses that energy by emitting a photon (2).

Specific color or the wavelength is the property of specific energy transformation(3). Luciferin is the most important factor for emitting light through living organism and with the use of extra ions it releases the light energy in different wavelength or color (4).

Mehodology:

The essential light emitting component in bioluminescent organism are the oxidizable organic molecule luciferrin and the enzyme luciferase, which are specific for different organism. The luciferin or luciferase reation is actually an enzyme substrate reaction in which luciferin the substrate is oxidized by molecular oxygen, the reaction being catalyzed by the enzyme luciferase, with the consequence emission of light. The light emission continuous until all the luciferin is oxidized.

In the luminescence (like fireflies) the substance ATP (aminotriphophate) initially reacts with luciferase, ionic magnesium and luciferin to form a complex luciferase-luciferyle-adenylate and pyrophosphate. that complex then react with molecular oxygen to emit radiation. The energy liberated in the last step to convert the electronic configuration of luciferase-luciferyle-adenylate complex from a low energy state to a high energy state. The high energy complex then loses energy by radiating a photon of visible light and returns to the ground state.

Experimental:

Light produce when electron transition takes place. Luciferin is a variable chemical, it is different for fireflies and different for bacteria. Luciferin is the chemical whose oxidation in presence of luciferase produce the luminescence.

For firefly luciferin
Molecular formula : $C_{11}H_8N_2O_3S_2$
Chemical name: D- luciferin
Molecular weight: 280.3 g/mol

An electronically excited state oxyluciferin molecule and carbon dioxide are produced from a highly reactive dioxetanone. According to the original mechanism based predominantly on chemiluminescence model studies, red light emission (λmax 615 nm), which is observed at pH 6.0, at pH 8, the yellow-green light emission (λmax 560 nm) is produced In nature, beetle luciferases display various colors of light from green (λmax ~535 nm) to red (λmax ~630 nm).

Luciferase modulates emission color by altering the resonance-based charge delocalization of the excited state. A relatively large amount of excitation energy is required to produce visible light, on the order of 40-70 kcal/mol.

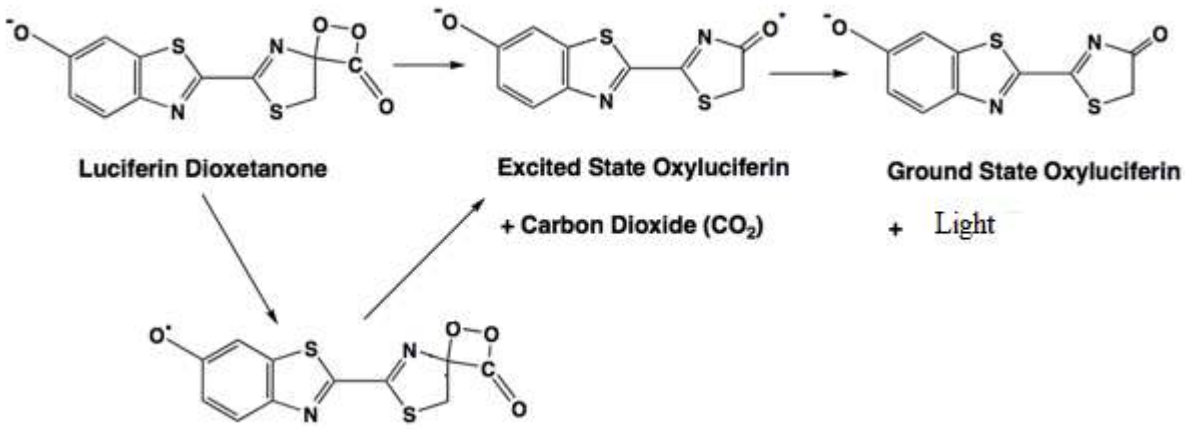

Figure . Production of bioluminescence in fireflys.

In the firefly, the energy released is very efficiently directed into the production of an electronically excited state of the bioluminescence product oxyluciferin(Figure). Subsequent rapid relaxation of the excited state to the ground state is then accompanied by the emission of a photon of light. One detailed mechanistic view of this process is termed the CIEEL (Chemically Initiated Electron Exchange Luminescence) mechanism(5). In firefly bioluminescence, intramolecular electron transfer from the heterocyclic portion of the molecule to the dioxetanone produces a radical ion pair, and the radical anion of carbon dioxide. Next, the back transfer of an electron from the radical anion of carbon dioxide to the radical form of oxyluciferin results in the formation of electronically excited oxyluciferin and carbon dioxide.

Result and Discussion:

1) Luminescent reaction has been used to determination of ATP.
2) Luminescence is dims and disappears as ATP is broken down.
3) The use of ATP, either as a pure chemical or as a constituent, immediately restores the luminescence.
4) Luminescene intensity is direct measure of ATP present.

Conclusion:

Specific color or the wavelength is the property of specific energy transformation. Luciferin is the most important factor for emitting light through living organism and with the use of extra ions it releases the light energy in different wavelength or color

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