



PRACTICAL WORK: LUMINOL AND FORENSIC ANALYSIS

The practical work is carried out in small group; each group-mate has a role: *coordinator* (responsible for the coordination of all the different roles and of the respect of the time), *secretary* (responsible to keep records of all the information and observations), *technician* (responsible to take care of all the operations needed for the sample preparation and apparatus use), or *ambassador* (responsible for communication within the group, with other groups and with the teacher).

Materials and reactants

Animal blood bought at the butcher's shop; disposable rubber gloves; a torch; a glass stick; filter paper; 100 mL glass beaker, 150 mL round-bottomed flask; balance; two graduate pipettes; H_2O_2 3% solution; NaOH 10% solution; luminol powder; distilled water.

Preparation of the luminol solution: weight 0.10 g of luminol, add 3 mL of NaOH 10% solution and then bring the volume to 150 mL by using distilled water.

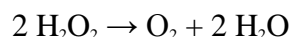
Procedure

Wear the disposable gloves and with the glass stick deposit traces of blood on the filter paper that will be put into the solution of luminol contained in the beaker; darken the room and switch on the torch. Add 4-5 mL of hydrogen peroxide and switch off the torch. After a short period of time a blue light (luminescence) emission appears that persists for a few minutes.

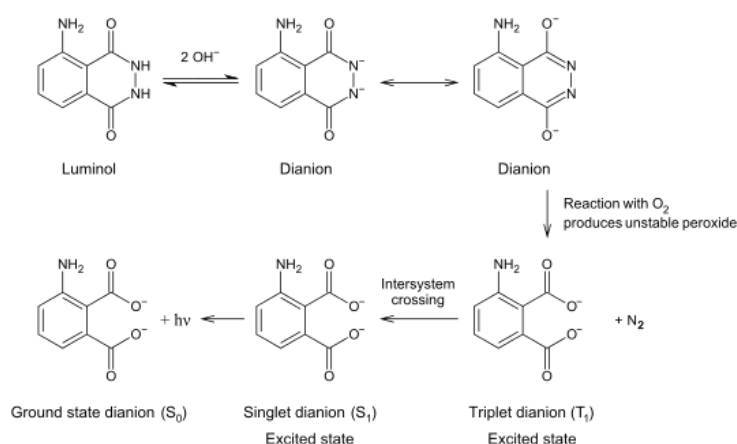
Remember to carry out a control test using a "stain" of water.

Explanation

To exhibit its luminescence, the luminol must be activated with an oxidant. Usually, a solution containing hydrogen peroxide (H_2O_2) and hydroxide ions in water is used as the activator. In the presence of a catalyst such as an iron compound, the hydrogen peroxide is decomposed to form oxygen and water:



When luminol reacts with the hydroxide ion, a dianion is formed that reacts with the oxygen obtained by the decomposition of hydrogen peroxide giving, by the loss of a nitrogen molecule, an organic peroxide in the electronically excited state. This species is very unstable and deactivates to the ground state emitting blue light.



This reaction occurs in the presence of blood because it contains hemoglobin in which a iron ion is present and acts as a catalyst for the hydrogen peroxide decomposition. For this reason the luminol emission is commonly used in forensic test to reveal blood stains.



Luminol at work at the crime scenes



Note of Caution

Do not look at the light emitted by the Wood lamp

Wear the safety goggles, the white coat and disposable rubber gloves while using the animal blood

To avoid dangerous situation for students, all the needed solutions are prepared by the laboratory technicians