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Lumonil Compounds in Criminal Chemistry (A Review)

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DESPITE the development and progress in the detection of the significance of crimes, and after more than eighty years of discovery is a luminol is the basic chemical in the detection of crimes previously and now, was addressed the theoretical aspects of the compound of the luminol preparation methods and some of its chemical reactions as well as discuss the phenomenon of scintillation and transfer Energy, and then addressing some of the applications of chemical flash and receptor tests, DNA investigations were discussed, and the sensitivity of these reactions.

Keyword: Criminal chemistry,Chemiluminescence, Luminol, Isoluminol.

Introduction

Criminal Chemistry

General definition of criminal chemistry "The use of chemical analyzes of various types on the samples of physical effects in order to identify the nature and components and the extent of belonging to a particular person and use it to serve justice", Criminal chemistry is usually associated with the law and its men.The definition of chemical chemistry: It is the use of chemical analyzes of various types on the samples of physical effects in order to identify the nature and components and the extent of belonging to a particular person and use it to serve justice[1-3]. He adds that there are many applications in the various criminal sciences, including counterfeiting and forgery where the banknotes are the most important documents Which is subject to forgery because it consists of the finest components of paper and ink and printing in addition to the existence of safeguards to prevent counterfeiting. Criminal Chemistry is divided into:Chemistry of the examination of legal document, Chemistry of toxins, drugs and forensic blood, Tissue, thread, fire, ballistics, firefighting, explosives, Chemistry of Fingerprint, Foot, Lips and Car Tires, Chemistry of measurement and forensic calibration [2-4].

Luminol

The luminal compound invented in 1937 by German forensic scientist Walter Specht, although it was known that blood would interact for 10 years. Specht found that the older the stain, the brighter the reaction and the light-producing reaction. Because blood only known as a catalyst, the small hidden effects of the eye are sufficient to stimulate interaction, so use luminol to show blood spray and even ponds after removing [5-7]. Reaction lasts for a short time relative, resulting in half-minute glow, requiring low light conditions to capture, but strong enough to be recorded using images with a good camera. Luminol is a simple chemical compound containing a ring of gasoline, oxygen and nitrogen Fig. (1). It is used to detect the blood effects at the crime scene by the police or the forensic team, where they are placed in the crime scene, lights are turned off and glare is

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detected. The only bad thing is that they destroy other evidence at the crime scene. For this reason, it is used by forensic investigators after other evidence is explored and is not used by many police officers to protect material evidence. For this reason scientists have been able to develop a new technique that can replace luminol, which relies on thermal steam, giving the crime zone 20 additional temperatures, which will not harm the rest of the evidence, such as DNA at the crime scene. It also requires a special camera, capable of recording the infrared light that appears above the blood [8-10].

Luminescence Phenomenon

The visual animals were known by ancient Greek civilization, and the "artificial" chemical fusion described by Radziszewski, notice the emission of yellow light when oxygen jumped on alkaline ethanol of 2,4,5-trifenylamidazole (80-year-old lophine), Soon after Albertin et al. recorded the luminance properties of the 5-amino-2,3-dihydrophthalazine-1,4-dione (luminol). Gleuand explained starting light blue or green from the derivatives of Acridinium (chemiluminogenic) in 1935, tobis (N-methylacridinium) nitratelucigenin. In 1964 McCapra, a mechanism showing cycle formation of dioxetanone to illustrate the chemical flow of acridinium salts, dioxin derivatives and dioxetanedione (pyruxy oxalate) was prepared and tested [12]. The luminescence phenomenon is a translation of the term luster. We know luminescence as the emission of some materials at a relatively low temperature. It is a light different from the light emitted by incandescent objects resulting from burning wood or charcoal or light from molten iron orthe power supply passes through a wire. The luminescence can watch in neon or fluorescent lamps, television screens and organic materials such as luminol or Luciferins, a chemical compound responsible for living organisms that glow in the deep sea, as well as some organic pigments used in billboards. As can be seen in some natural electrical phenomena such as lightning and polar twilight. Light is emitted in all these phenomena not because of the heat and therefore the phenomenon of lighting is sometimes known as cold light. Glowing materials have the ability to transform invisible forms of energy into visible [9-14].

Fig. 1. Structure of Luminol Compound.

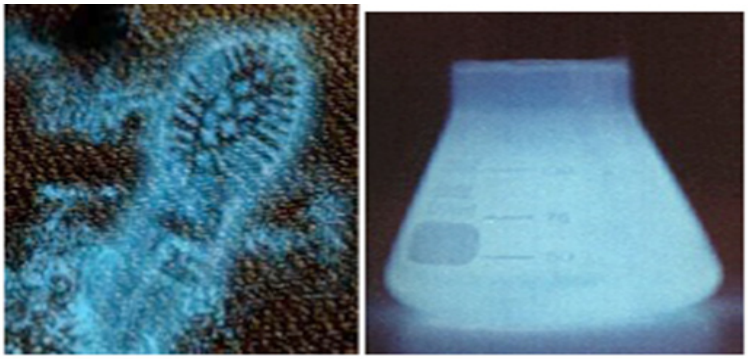
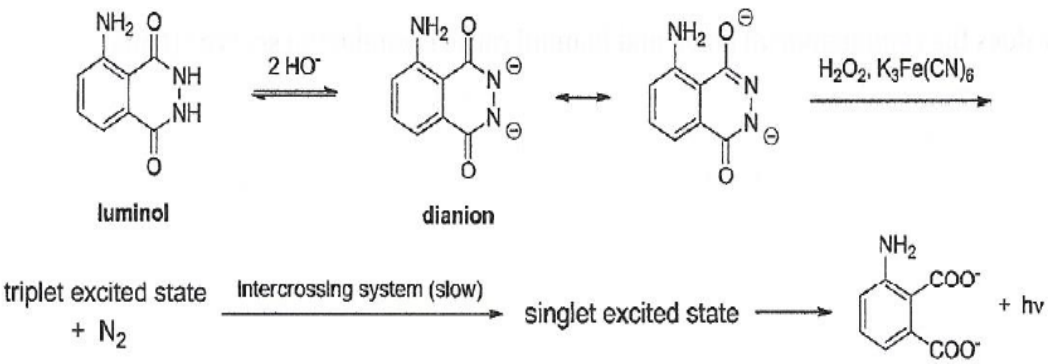


Fig. 2. Picture of Luminescence Phenomenon.

Many types of luminance can be distinguished according to the source of excitation energy. When photovoltaic energy is produced by a chemical reaction, as in the case of slow oxidation of phosphorus at normal temperatures, this type is called chemiluminescence. When a chemical reaction produces light in living systems, such as in the glare of living organisms in the deep sea and oceans, light releases light on a biological scintillation. There are other types of lightings that arise as a result of the flow of some forms of energy from outside the body into it. Depending on the source of this catalytic energy, optical luminescence is described by cathode rays when energy comes from electronic ejaculation, and is described by optical radiation in the case of excitation from X-rays or gamma rays. If the excitation is by UV or visible light or infrared light, it is called optical light, which is called photoelectric if the excitation source is an electric field [15].

Since its discovery in 1928, luminol has been the basis of much research because of the strong blue light emission when exposed to oxidation factors. Of all applications, the most appropriate species is the determination of chemical iron from clean blood spots. Even with this favorable background, the search for both the most general chemical derivatives and the search for structures with different chromatic emission has not stopped. Both the aromatic range and the introduction of known chromophores are the most common derivatives. We therefore investigated and analyzed the effect of acetylene from luminol in the absorption and chemical absorption properties of the chromophere. The absorption spectra of some N-ethoxy carbonyl luminol, N-trifluoroacetylluminol, N-benzoyl luminol, and two non-specific compounds obtained with dimethyl carbamic chloride in DMF in both high temperature and chamber were shown to be derivatives Most affected by derivation, with new patterns emerging. Fluorescence was also changed but the overall side of the spectra was preserved in almost all media. As for chemical gloss, the only difference observed was the relative density that was reduced in all lemonsl derivatives, which meant that the induced substitution was inefficient and improved chemical or shift in the wavelength of the incident. In addition, luminol has been the subject of many automatic studies because of the controversial A steps. We therefore conducted studies of the basic physical properties of images on luminol and on the emitted species of light emitted in a chemical reaction of diphthalate using theoretical calculations of MP2 as background. It was observed that luminol was found as a mixture of two main tautomer and determining the relative acidity of the luminol protons. The nature of transitions in protein derivatives and innovation, the most suitable mix of ethanol and methanol, has been studied because it allowed us to reach variance variability. Therefore, we have noticed that experimental data does not appear to be in conflict with the results of our calculations. It was found that the chemical decay analysis showed that the oxidizing conditions used were consistent with a two-step mechanism. In short, along with the synthesis of many lactic derivatives that reduced the synthesis of chemical luminol and did not change the maximum emission wavelength, then measured the basic physical properties of luminol and diphthalateamipin, and found that the results shown through the search is identical with theoretical calculations. Two types of chemiluminescence , Fluorescence and Phosphorescence [16-17].



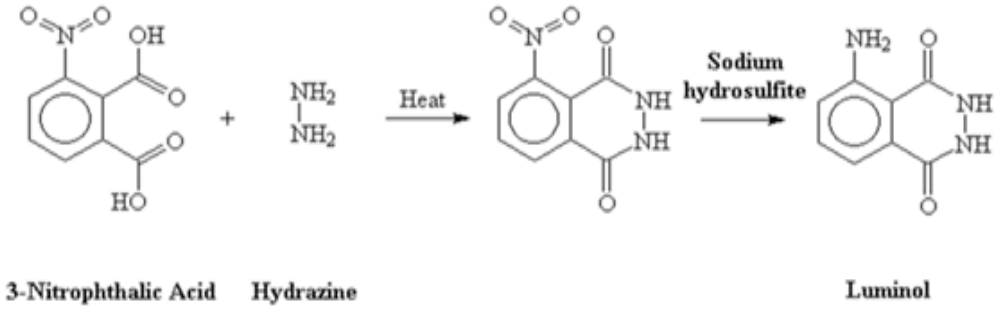
Scheme 1. Luminol Reaction in Basic Media.

Mechanism of Action

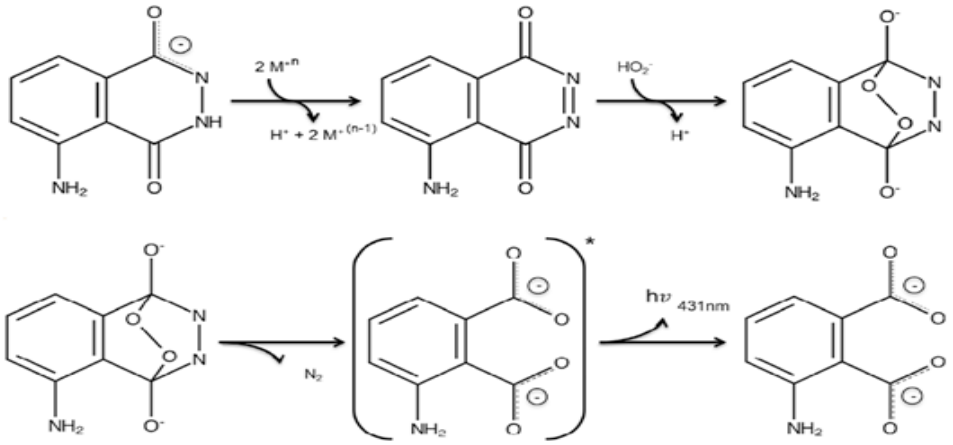
Albertin et al. Observed that light emission is associated with 3-aminophthalic conversion to 3-aminophthalate. They explained the mechanism of the reaction from two steps to the formation of Luminol as shown in Scheme 2 and 3, respectively [18].

Systematic studies on phenolic derivatives facilitate an explanation for the enhancement or inhibition of chemilumcenscenceluminol ± H_2O_2 ± turquoise radish. The factors that control the optimization are the electron potential of PhO / PhOH (phenoxy radical PhO / PhOH) versus luminol radicals (L/LH) and phenolic derivative reactions with HRP-I and HRP-II. Only compounds with similar or larger luminol roots can act as boosters at pH = 8.5 (0.8 V). Roots with low potential abilities of luminol behavior in a different way, because they destroy luminol roots and inhibit chemiluminescence. The relationship between reduction potential and reaction rates and Hammett constant in the phenol substituted indicates that the phenols substituted with the homite (s) of their substitutes are the same or greater than 0.20 that are chemo-chemical boosters of luminol ± H_2O_2 ± radicose peroxidase. In contrast, these phenols were substituted in position 4 for substitutes with HMI (less than 0.20 chemical inhibitors) based on these studies, the structure of potential new enhancers was predicted [19].

The chemistry of the luminol-H_2O_2-radish system is increased by fluorescein. Fluorescein is produced to enhance the chemical luminosity of a similar right to phenol phthalates, by transferring energy from luminol to fluorescein. The maximum radiation intensity and radiation (between 380 and 580 nm) of lumionls with fluorins, which is three times greater than fluorinsin, has a shorter emission period. Emission is emitted in the presence of maximum fluorine (wavelength 425 and 535 nm) Accumulation depends on the concentration of pH and fluorine. Fig. (4) shows the mechanization of the free radicals of the luminol peroxide [20].



Scheme 2. Preparation of Luminol Compound.



Scheme 3. Mechanism of Luminol Compound

The methods of preparation and purification of lumionl and its derivatives are very expensive on the one hand, and on the other hand difficult because, of the use of very high purity reagents when preparing, because any impurities can affect the manufacture of the material, or may lead to chemical reactions side, in addition to the impact on the reactions generated by light () where the lumionl exists in the form of isomer and as shown in Figure (3) and the Scheme (5) Fig. [21].

$$HRP + H_2O_2 \text{ -----> } HRP\text{-}I + H_2O \quad (1)$$

1a. Unenhanced.

$$HRP\text{-}I + LH^- \text{ --------> } HRP\text{-}II + L^{\cdot-} + H_2O \quad (2)$$

(luminol) (luminol radical)

$$HRP\text{-}II + LH^- \text{ --------> } HRP + L^{\cdot-} \quad (3)$$

1b. Enhanced.

$$HRP\text{-}I + FH^- \text{ -------> } HRP\text{-}II + F^{\cdot-} + H_2O \quad (4)$$

(Fluorescein) (Fluorescein radical)

$$HRP\text{-}II + FH^- \text{ -------> } HRP + F^{\cdot-} \quad (5)$$

$$LH^- + F^{\cdot-} \text{ --------> } L^{\cdot-} + FH^- \quad (6)$$

2a. Without energy transfer.

$$2\,L^{\cdot-} \text{ -------> } L + LH^- \quad (7)$$

(Diazaquinone)

$$L + H_2O_2 \text{ -------> } LO_2^{2-} \quad (8)$$

(Luminol endoperoxide)

$$LO_2^{2-} \text{ --------> } (AP^{2-})^* + N_2 \quad (9)$$

(3-Aminophthalate excited)

$$(AP^{2-})^* \text{ ---------> } AP^{2-} + h\nu \ (425\text{ nm}) \quad (10)$$

(3-Aminophthalate dianion)

2b. With energy transfer by physical mechanism.

$$(AP^{2-})^* + F^{2-} \text{ --------> } AP^{2-} + (F^{2-})^* \quad (11)$$

$$(F^{2-})^* \text{ ---------> } F^{2-} + h\nu \ (535\text{ nm}) \quad (12)$$

2c. With energy transfer by peroxide transference.

$$LO_2^{2-} + F^{\cdot-} \text{ --------> } L^{\cdot-} + FO_2^{2-} \quad (13)$$

(Fluorescein endoperoxide)

$$FO_2^{2-} \text{ ---------> } (F^{2-})^* + O_2 \quad (14)$$

$$(F^{2-})^* \text{ ----------> } (F^{2-}) + h\nu \ (535\text{ nm}) \quad (15)$$

Scheme 4. Mechanism effects luminol-H_2O_2-radish system.

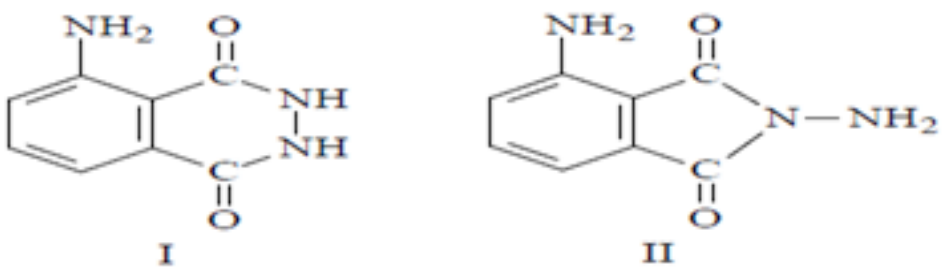
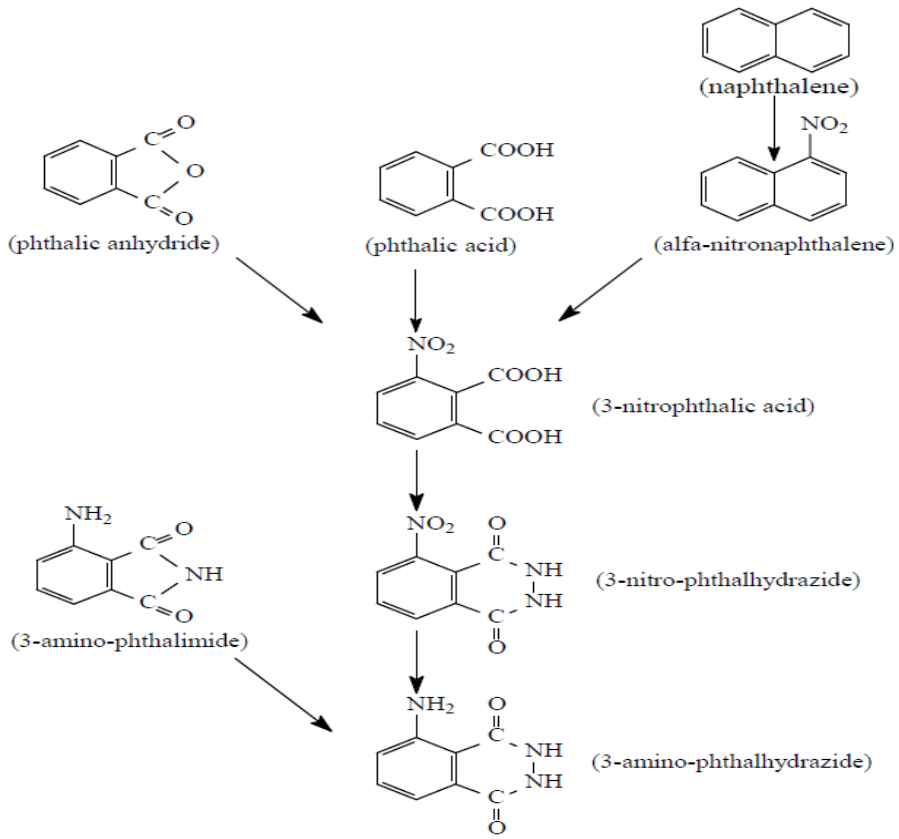
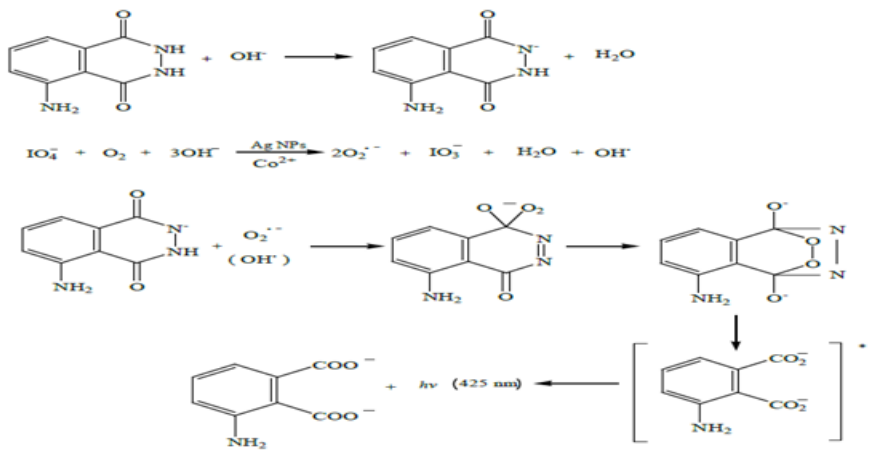


Fig. 3. Luminol Isomer.

It has been observed that nanoparticles can enhance the chemical fusion strength (CL) of the citron-bound luminol-KIO4 with the presence of a carbon dioxide root, giving more intense signals with nanoparticles for silver and a 22 nm diameter. Ultraviolet spectra and fusion strength (CL) spectra have been measured to determine the mechanism of enhancing the potential fusion force. In addition, 17 amino acids and 25 organic compounds with luminol-KIO4were studied through a flow injection of the citric acid which gave an effective method for detecting acid acids. As shown in Scheme (6), which shows the proposed reaction mechanism [22].



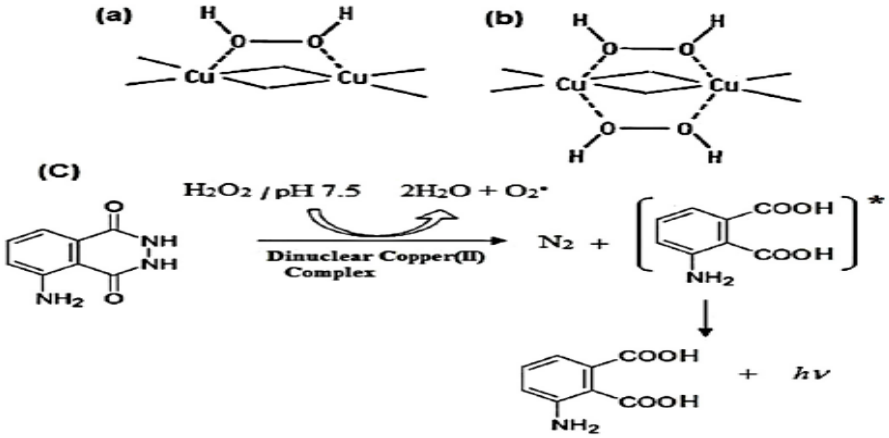
Scheme 5. The relationship between reduction potential and reaction rates and Hammett constant in the phenol substituted.



Scheme 6. Suggest Mechanism ofLuminol with KIO_4.

Beneficial effects of catalysis of dinuclear compounds (II) on the chemical reaction of the luminol (CL) were found. copper compounds (II), The luminol-H_2O_2CL reaction of the biodegradable catalyst is the optimal level observed by the research, especially when the pH is high (at least 10). Since the work of biological media, it is necessary to reduce pH values. Therefore, the experiment found that the two-core copper nuclei (II) affect different pH values from 6.5 to 11. Where the measurements were made and compared in the case of copper stimulation (II) once, and in the absence of copper compounds (II) again And comparing the values of pH. PH was found to have a radical effect on the promotion of CL values. Interestingly, anenhancement of the CL signal occurred in the presence of clear copper complexes (II). However, in the absence of the catalyst CL was observed neutral. After the reaction of Luminol with the H_2O_2in solution mentioned in theabsence of the Ultraweak CL catalyst, it is assumed that the nucleic acid (dinuclear) II may interact with thereactants or the medium of the luminol reaction with H_2O_2. It was expected that these complex mineral-free materials (L = N, N--dibenylethylenediamine, (L = N, N-dimethyl-N -Benzylethylenediamine and TAE) would have no catalytic effect. The Dynamic Copper Compounds (II), which have been found to have strong catalytic action, have a co-ordination of the copper with four residues. It is clear that the composition is sufficient to make the material active in a potential catalyst and other factors (side chains, ligament structure) also affect the movement and density of the CL chromium, the dynamic copper complexes (II) have a unique and powerful ability to promote LuminolCl emission, Even in the absence of H_2O_2 in the primary media. This is useful ininvestigating new and effective molecules as an artificial peroxidase model to produce luminol efficiency [23].

The first forensic laboratory was established in Turnaya, Canada - 1 in 1913-1914. In 1916 a criminal laboratory was established in Berlin, Germany. In the same year, the first criminal laboratory was established in Los Angeles, United States of America, and then a laboratory was created for the FBI, one of the world's largest criminal laboratories. The first laboratory was established in the Arab States in 1957 in 1957, followed by Jordan, Saudi Arabia, Kuwait and the United Arab Emirates. In 1962, it was a center of national security. The first scientific police laboratory was conducted in 22 by analyzing the physical effects of the examination conducted by the Judicial Police of the National Security or the National Gendarmerie [24].



Scheme 7. Suggest mechanism of luminol-H_2O_2CL system withdinuclear copper (II).

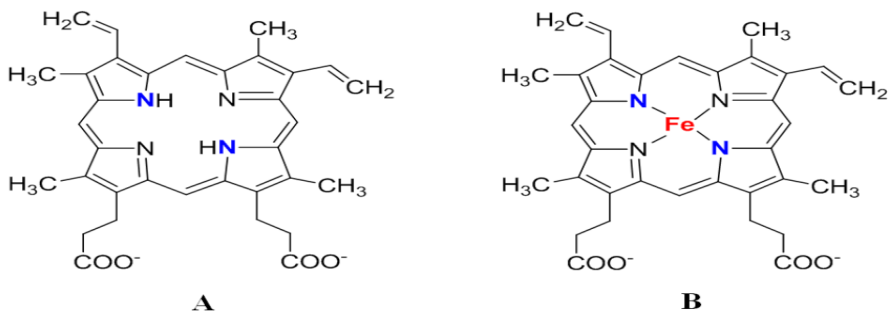


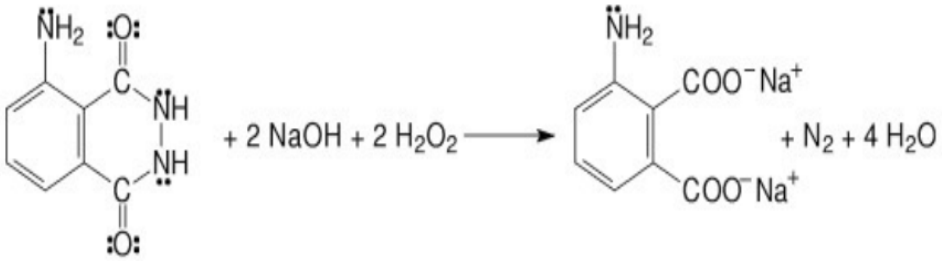
Fig. 4. luminol reagent in the crime scene.

Hidden blood can be detected when a crime occurs, using a device that uses a luminol-colored substance, which is the most accurate and sensitive to the ancient blood spots and the limits of nano-grams. It was found that when contact with this detector of blood shows a brilliant glow and the phenomenon known as chemiluminescence, researchers have been able to use other compounds give a glow also, but cause other interference spoils the detection of crime, and despite the above, but investigators are indispensable for the use of luminol in Investigation [25].

Luminol = 3-Aminophthalacidhydrazid alkaline hydrogen peroxide works on Luminol according to nitrogen oxidation N2 is released free of Luminol The reaction is stimulated by potassium hexacyanoferrat now for a long time, chemical weakness can still be seen not the full mechanism of interaction well known [26].

Luminol is an organic compound with a general composition. Its interaction with some oxidants leads to the emission of blue light used in the field of photochemistry and usually uses water oxygen as an oxidizer to produce biodiesel and electrolyte. Water, where the aminophthalate electrolyte is in its excited state, seeks to settle its excess energy in the form of photons, Interaction. The interaction between oxygenated water and luminol is a very slow reaction that lasts for more than a month, but is more frequent in the presence of iron compounds compounded with iron oxide III. Hemoglobin in blood cells containing blood contains iron iron triad, using luminol to detect blood effects, even if they are small, diluted, salted or dry. Police technicians use luminol and oxygen water. When the mixture touches places that emit droplets of blood, it emits light chemical rays before disappearing after about 30 seconds, helping to detect the effects of blood [27-28].

The researchers note that the use of luminol-DPPH chemiluminescence (CL) system, better than the use of luminol solution stored in the dark for one weak, which needs to rebalance because of the free radicals formed and play an important role in the generation of a new luminol CL system. This study provided a new perspective on the process of chemiluminscence. The technique was developed using FL-CL methods and was considered an easy and rapid method of using inhibitors on the luminol system and could be applied in several areas. The accuracy, restoration and stability of the verified method were acceptable for estimating scutellarin in both mice injected with drugs and plasma Scheme (9) illustrates the formation of diazaquinone as intermediate products using two methods of reacting once with oxygen and hydroxide, and again with hydroxide only [29].



Scheme 8. Mechanism of interactionluminol with peroxide and sodium hydroxide.

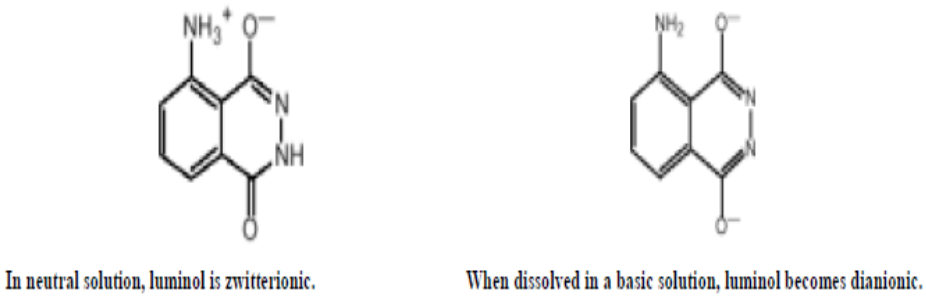
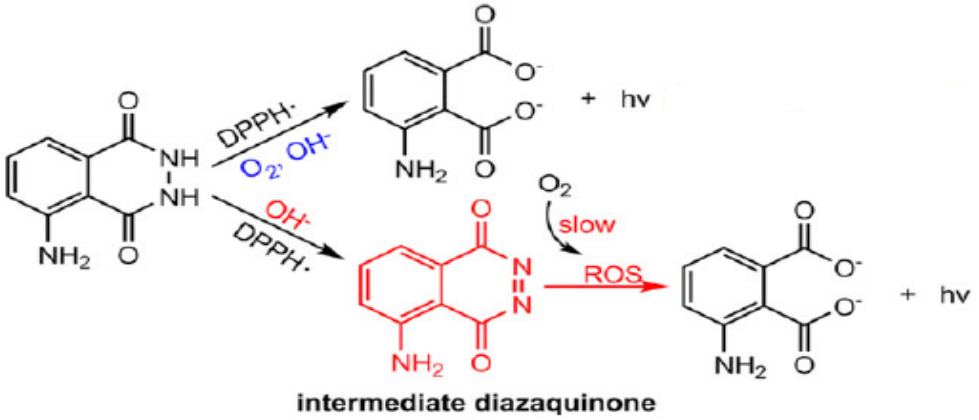


Fig. 5. Luminol structure in neutral and basic solution.



Scheme 9. luminol reaction with DPPH.·

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