

Investigating luminol

Background

Luminol is a substance that can emit visible light during a chemical reaction. One such reaction involves the reaction with hydrogen peroxide (which acts as an oxidant) and potassium hexacyanoferrate(III) (which acts as a catalyst).

Practical Techniques

You need to find out how to make up accurate solutions. You will also need to find out about using a light meter.

Where to start

This investigation is based on an article in Chemistry Review by Derek Denby in March 1996.

One of the suggested areas for exploration is the oxidation of luminol with potassium hexacyanoferrate(III) in the presence of sodium hydroxide.

You should dissolve 0.1g of luminol in 20 cm³ of sodium hydroxide solution (0.5M) and make up to 100 cm³ with water.

You also need to make 100 cm³ of a 5% solution of potassium hexacyanoferrate(III).

You should then add small portions of each solution to a beaker and observe the light emitted. You will probably need to darken the room or build an enclosed darkened area. You will also need to measure the amount of light emitted with a light meter.

You will need to devise a way of adding the solutions quickly and measuring the light emitted.

Possible investigations

- Investigate the effects of changing the amounts of each component on the rate of reaction.
- Investigate the effects of changing the temperature on the rate of reaction.
- Investigate the effects of using other transition metal salts on the reaction on the rate of reaction.

Sources of Information

- Denby D., Making light of project work, *Chemistry Review*, March 1996.
- Declan Fleming, Chemiluminescence of Luminol,
<http://www.tlchm.bris.ac.uk/webprojects2002/fleming/index.htm>
- Thorpe A., Making a standard solution, *Chemistry Review*, November 2002
- The Chemistry Video Consortium and The Royal Society of Chemistry (2000) *Practical Chemistry for Schools and Colleges* CD ROM
- Thorpe A., Assessing the risks in practical work, *Chemistry Review*, September 2000
- Thorpe A., Experimental error and error analysis: just how good are those results, *Chemistry Review*, November 2001

Teachers' Notes

General

Students will probably need to spend some time setting up the practical procedure and experimenting with suitable quantities before they actually start making rate measurements. Teachers should remember that this is an equally important part of the investigative process.

Luminol decays quite quickly so solutions should be made up on the day of the experiment.

Chemical Principles

Kinetics, redox, chemiluminescence

Essential Equipment

Burettes, pipettes, light meter

Essential Chemicals

Sodium hydroxide, luminol, potassium hexacyanoferrate(III)

Safety

No risk assessment has been given. It is essential that students prepare a detailed risk assessment before they start. Teachers should check all plans and must be satisfied that this is suitable for the proposed investigation.