

The influence of temperature on the intensity of chemiluminescence from commercial lightsticks

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Practical:

Abstract

Introduction

The aim of this experiment is to investigate the influence of temperature on the luminescence intensity of commercial chemiluminescent lightsticks and to obtain the 'apparent' (see Atkins' Physical Chemistry for meaning of 'apparent' in this context) activation energy for the overall chemical reaction (figure 1).

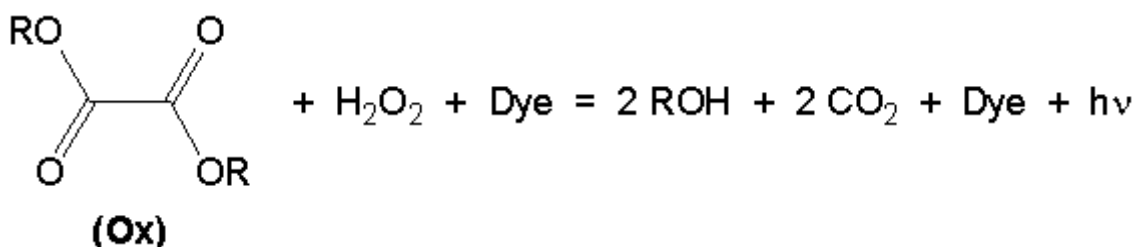


Figure 1. The overall chemical reaction that takes place in chemiluminescent lightsticks. Ox is an oxalate ester and the reaction is base catalysed.

Intended academic level

First Year University Level

Duration

2 hours laboratory work + 3-4 hours 'pre/post-lab' activities

Outcomes

- Be able to define 'chemiluminescence'.
- Be able to use a search engine to locate information on the WWW.
- Be able to use a spreadsheet to perform simple data manipulation, construct Arrhenius type plots and extract slopes and intercepts.
- Be able to use a chemical structure drawing package to draw organic structures and curly arrow mechanisms.
- Be able to use the University Library online catalogue.
- Be able to locate a research paper in the University library.
- Be able to write a summary of the main findings of a research paper.

The objectives of the experiment are to provide experience in:

- Designing and planning an experiment.
- Plotting graphs and extracting information from graphs using Excel.
- Drawing chemical structures and curly arrow mechanisms using ISIS Draw or ChemDraw.
- Information retrieval using a variety of resources including the WWW.

Materials

Two differently coloured Cyalume lightsticks; photodiode light meter; digital voltmeter; light-tight container; water bath; thermometer (-10⁰C to 110⁰C).

Costs

A pack of 10 lightsticks cost ~£17 inc. VAT. See <http://www.omniglow.co.uk/> Light tight boxes and diode detectors can be constructed in-house at small cost. Other equipment is standard.

Further comments

The following skills are introduced or enhanced in this laboratory exercise:

- Working in a team
- Planning your work
- COSHH risk assessment
- Recording experimental data
- Critical Reflection
- Use of chemical structure drawing packages
- Plotting and extracting information from graphs using Excel
- Information retrieval using the WWW
- Use of University Online Catalogue
- Locating a research paper in the University Library
- Extracting information from research papers

Reading

1. P W Atkins, *Physical Chemistry*, 7th Edition, Chapters 10, 25 & 27, Oxford University Press, 2002. ISBN: 0-198-79285-9.

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