

Investigating the rate of decomposition of hydrogen peroxide

Background

Hydrogen peroxide decomposes to produce oxygen gas and water. The reaction can be catalysed by yeast.



One way of measuring the rate is to time how long it takes for a disc of filter paper to rise a specific distance in a test tube containing hydrogen peroxide solution.

Practical Techniques

You will need to find out about how to make up accurate solutions.

Where to start

Plan an experiment to investigate the effect of changing the concentration of the hydrogen peroxide and the yeast on the rate of the reaction.

Possible Investigations

- Investigate the reaction at different temperatures to determine the effect of temperature on the rate and hence determine the activation enthalpy for the reaction.
- Investigate the effect of other potential catalysts.
- Investigate the effect of pH on the reaction.
- Investigate a different technique for monitoring the rate of the reaction – possibilities are – titration, measurement of oxygen production

Sources of Information

- Woods G., Hydrogen Peroxide, *Chemistry Review*, September 1996
- Denby D., Decomposing Hydrogen Peroxide, *Chemistry Review*, (early issue –exact date unknown)

- Lindsey D., Measuring pH. *Chemistry Review*, September 1998
- Thorpe A., Making a standard solution, *Chemistry Review*, November 2002
- <http://users.erols.com/merosen/kinetics.htm>
- 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

This investigation is based around the article by Derek Denby that appeared in Chemistry Review.

If more demanding manipulative skills are required then students should investigate the other techniques that are suggested.

Chemical Principles

Reaction Kinetics.

Essential Equipment

Burettes, pipettes

Essential Chemicals

Hydrogen peroxide, yeast

Safety

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

Starter Experiment - Investigating the rate of decomposition of hydrogen peroxide

Here is a suggested method to investigate the effect of a catalyst on the rate of the reaction.

Prepare the following solutions

- Hydrogen peroxide 0.25 mol dm^{-3}
- Yeast 10 g dm^{-3}

You will need to think about how much of each solution to prepare. This will depend on how much of each solution is used in each experiment and how many experiments you do (including any repeats).

Set up the following apparatus

The rate of the reaction can be determined by measuring the time it takes for the disc to rise a specific distance.