

Decomposition of hydrogen peroxide

Education in Chemistry

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rsc.li/EiC617-catalysts-get-helping-hands

The ‘Elephant’s toothpaste’ demonstration, ages 11–14 and 14–16

The decomposition of hydrogen peroxide is a classic demonstration which can be used to compare catalyst effectiveness when time and logistics mean a whole class investigation is impractical. The reaction forms the basis of the demonstration known as ‘elephant’s toothpaste’. Mix hydrogen peroxide in a measuring cylinder with washing up liquid and add a catalyst. The hydrogen peroxide decomposes to oxygen and water, producing bubbles which make the mixture shoot up the measuring cylinder.

Using the above article, ‘Catalysts get helping hands’ as a stimulus, compare traditional chemical catalysts (like potassium iodide, manganese dioxide and iron(III)oxide) and enzyme based catalysts found in yeast, lettuce, potato, liver, and blood.

Emphasise to pupils that the hydrogen peroxide is decomposing without any catalyst, but very slowly. The catalysts added just speed it up. A common misconception is that added catalysts make the reaction happen, rather than making an existing reaction happen quicker (in this case, much quicker). This demonstration also provides a useful opportunity to revisit the test for oxygen: a glowing splint placed near the top of the foam should relight.

This demonstration is simple and effective, but it is worth practising beforehand as hydrogen peroxide can be temperamental. Quantities found in guidance documents may need adjusting depending on the age of your hydrogen peroxide and where it has been stored.

Suggested lesson order

1. Demonstrate the reaction and prompt pupils to suggest ways the best catalyst could be judged.
2. Carry out the series of reactions with pupils recording their observations on the pupil sheet provided as you go along.
3. Give pupils copies of the article ‘Catalysts get helping hands’ to help them complete the follow up questions

Further guidance

The Decomposing hydrogen peroxide article (rsc.li/hydrogenperoxidedemo) and Learn Chemistry (rsc.li/H2O2decompose) give further guidance for this demonstration. Additionally, Learn Chemistry has a class practical resource for detecting the presence of enzymes in liver, potato and celery: rsc.li/detecting-enzymes-practical.