

Demonstration corner

A CATALYST AT WORK

This reaction can be done as a demonstration but could also be done by pupils as an experiment.

There are many reactions that provide good examples of catalysis but the unique feature of this one is that it is possible to actually see the activated complex appearing and then disappearing.

Hydrogen peroxide oxidises potassium sodium tartrate (Rochelle salt) to carbon dioxide. When solutions of hydrogen peroxide and Rochelle salt are mixed, carbon dioxide is slowly evolved. The reaction can be catalysed by cobalt (II) chloride the addition of which causes the reaction to froth, indicating a large increase in the reaction rate. At the same time the colour of the cobalt (II) chloride turns from pink to green (an activated complex), returning to pink again within a few seconds as the reaction dies down.

This shows that the catalyst actually takes part in the reaction and is returned unchanged when the reaction is complete.

What you will need

- Bunsen burner, tripod, gauze and heat-proof mat.
- One 250 cm³ beaker.
- One 0-100°C thermometer.
- One 25 cm³ measuring cylinder.
- One dropping pipette.
- Access to visualiser (optional)
- 5 g of potassium sodium tartrate-4-water (Rochelle salt, potassium sodium 2, 3-dihydroxybutanedioate, KNaC₄H₄O₆·4H₂O).



- 0.2 g of cobalt (II) chloride-6-water (CoCl₂·6H₂O) (**harmful**).
- 20 cm³ of 20 volume (i.e. approximately 6%) hydrogen peroxide solution (H₂O₂ (aq)) (**corrosive and irritant**).
- 65 cm³ of deionised water.

What you do

Preparation

- 1) Make a solution of 0.2 g of cobalt chloride-6-water in 5 cm³ of deionised water.
- 2) Make a solution of 5 g of Rochelle salt in 60 cm³ of deionised water in 250 cm³ beaker.

The demonstration

- 1) Add 20 cm³ of 20 volume hydrogen peroxide to the solution of Rochelle salt and heat the mixture to about 75°C over a Bunsen burner.
- 2) There will be a slow evolution of gas showing that the reaction is proceeding.
- 3) Stirring the solution makes the evolution of gas more obvious.

- 4) Now add the cobalt chloride solution to the mixture. Almost immediately the pink solution will turn green and after a few seconds vigorous evolution of gas starts and the froth will rise almost to the top of the beaker.

- 5) Within about 30 seconds, the frothing subsides and the pink colour returns.

- 6) You can get the reaction to repeat by simply adding more hydrogen peroxide. ◀

