

The chemistry of limestone

Introduction

Limestone is a common rock. You may have seen it in spectacular cliffs such as Malham Cove or High Tor near Matlock.



Limestone cliffs, Verdon Gorge, France.

It is also a very useful material. It is used for building and road making, for example, and also as a starting material for making many other products. This activity illustrates some of the chemistry of **limestone** (calcium carbonate) and other materials made from it.

What you will need

Apparatus

- eye protection
- Bunsen burner, tripod and gauze
- heatproof mat
- tongs
- 3 test-tubes
- test-tube rack
- dropping pipette
- drinking straw

Chemicals

- a few small lumps of limestone (each about 1cm³)
- deionised / distilled water
- Universal Indicator solution and colour chart

Safety notes

- Wear eye protection.

Do not touch the lime that is formed from heating limestone. It will be hot after heating and lime is an irritant even when it is cool.

What to do

1. Take about half a dozen lumps of limestone. Examine the stone and describe its colour, texture and any other notable features briefly. Things to look for include any evidence of fossils.
2. Place a couple of lumps on a tripod and gauze and heat with a roaring Bunsen flame for 15 minutes. Take care; the lumps will become extremely hot.
3. While the lumps are being heated, take two more lumps of unheated limestone. Add a few drops of water and note any reaction.
4. Returning to the lumps being heated, note any changes - particularly in colour. Take care; the lumps will be extremely hot.
5. If possible, darken the room and note what happens when the flame is trained directly on the lumps. It may be possible to see the lumps glowing – this is the origin of the term ‘limelight’. Limelight was once used to illuminate theatre performances.
6. Remove the lumps from the heat and allow them to cool to room temperature on the heatproof mat. Then take one of the heated pieces with your tongs. Gently try to crush it on the heatproof mat with the tongs. Try the same with a lump that has not been heated. Record what you find.
7. Use tongs to place one of the lumps that has been heated in a test tube and then gently add a few drops of water with the dropping pipette. Make sure you are wearing eye protection. Note any evidence of reaction.
8. Now add more water to the test tube until it is about half full. Shake the test tube and pour off the clear liquid, half into one test tube and half into another. Add a few drops of Universal Indicator to one tube and record the pH using a colour chart.
9. Place a straw into the clear liquid in the second tube and blow gently into the liquid through the straw. What do you see?