

## 24: Making and Colouring Glass Beads

Glass is made from white sand. If you look through a thick sheet from the side you will see it has a greenish colour. The green comes from traces of iron in the sand. Glass of different colours is made by adding other metal salts or oxides to the molten glass. You can make coloured beads of borax glass using the flame of a Bunsen burner.

### What you will need

lengths of nichrome (heat resistant) wire in cork holders  
 Bunsen burner  
 pliers  
 safety screen  
 powdered borax (**dust irritant**) in a watch glass  
 spatula  
 metal compounds (fine powders) (Note: some of these compounds are **hazardous**)  
 watch glasses  
 250 cm<sup>3</sup> glass beaker  
 water  
 eye protection

### What you do

- 1  Put some tap water into the beaker and stand it near the burner.
- 2 Take a watch glass containing powdered borax. Put this near the burner.
- 3 Light the Bunsen burner. Make the flame 'roaring' hot.
- 4 Pick up the wire using its cork 'holder'. Hold so that the free end of the wire is in the flame. The tip of the wire should be on the far side of the flame (see diagram). Heat it until the end is red hot - this also cleans the wire.
- 5 Place the hot wire in powdered borax. Some of the borax will stick to the wire. You may need to dip the wire in water to make the borax stick.
- 6 Reheat the end of the wire in the flame. The borax will swell up and then shrink onto the wire forming a colourless glass bead. Repeat the process if the bead is too small. It should be more than 2 mm in diameter. If the bead is NOT colourless, the wire was probably not clean enough (see step 4).

**Hazard: very hot concentrated material may drop off the wire.**

- 7  Use your spatula to put a very small amount of one of the metal compounds on another clean watch glass.
- 8 Dip the bead into the powder. The aim is to pick up a *tiny* amount. You may need to dip the bead in water to pick up the powder, but be careful. Do not pick up too much!
- 9 Reheat the bead in the outer purple part of the Bunsen flame (see diagram). This is called the 'oxidising region'. Remember to put the wire through the centre of the flame. The bead will melt and should take on a colour. Take the wire out of the flame and allow the bead to cool and solidify. It should be coloured.



eye protection  
must be worn



**HARMFUL**

copper(II)  
sulphate  
manganese(II)  
sulphate  
iron(II) sulphate  
nickel(II) sulphate



**TOXIC**

cobalt(II) chloride  
or cobalt(II)  
nitrate



**IRRITANT**

powdered borax

**24: Making and Colouring Glass Beads (contd)**

eye protection  
must be worn



**HARMFUL**

copper(II)  
sulphate  
manganese(II)  
sulphate  
iron(II) sulphate  
nickel(II) sulphate



**TOXIC**

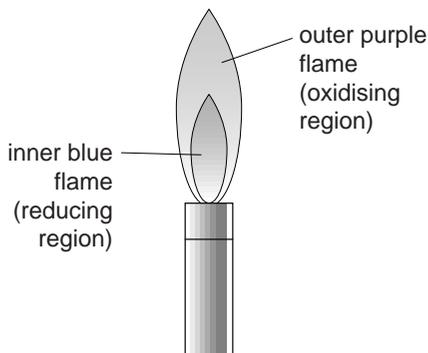
cobalt(II) chloride  
or cobalt(II)  
nitrate



**IRRITANT**

powdered borax

- 10 You can only see the colour clearly by letting the bead cool and solidify. You may try to improve the colour by reheating. It may be necessary to take another 'dip' of the mixture.
- 11 When you are satisfied with the result put the length of wire with its bead in a safe place. Pick up another wire with a cork 'holder'.
- 12 Repeat the process from step 4 using the same metal salt, but this time heat it in the inner part of the Bunsen flame. This is the *reducing* flame (see diagram). At the blue centre cold gas makes the flame cool. After you have heated the bead in the reducing flame let it 'cool' in the centre and then take it out quickly. Put the length of wire with the bead in a safe place when you have finished.
- 13 Try repeating step 12 if you are not satisfied with the result. BUT note that compounds of copper and manganese do not give a colour in a hot reducing flame.
- 14 Now try with other metal salts, starting from step 4. Find what happens in both regions of the burner flame.



Eye protection must be worn.