Preparation of copper(II) ethanoate

Student worksheet

Copper(II) ethanoate is one of the various forms in which the micronutrient copper is supplied in a fertiliser. It is produced by reacting basic copper(II) carbonate with ethanoic acid.

$$CuCO_3(s) + 2CH_3COOH(aq) \rightarrow Cu(CH_3COO)_2(aq) + H_2O(l) + CO_2(g)$$

Copper(II) ethanoate crystallises from aqueous solution as a monohydrate, $Cu(CH_3COO)_2.H_2O$.

You can make copper(II) ethanoate-1-water in the laboratory by reacting basic copper(II) carbonate with dilute ethanoic acid.

Equipment and materials

- Weighing bottle (or small beaker)
- 100 cm^3 beaker
- Bunsen burner, tripod and gauze
- 25 cm^3 measuring cylinder
- Hot water bath
- Filter funnel and filter paper
- Thermometer (0 – 110°C)
- Evaporating basin
- Spatula
- Sample bottle
- 1 mol dm^{-3} ethanoic acid
- Basic copper(II) carbonate

Method

Care: wear eye protection. Basic copper(II) carbonate is harmful if swallowed. Copper(II) ethanoate is harmful if swallowed, may cause serious damage to eyes and is very toxic to aquatic organisms.

1. Weigh out about 1 g of basic copper(II) carbonate.
2. Measure out 15 cm^3 of 1.0 mol dm^{-3} ethanoic acid into a 100 cm^3 beaker.
3. Warm the acid to about 50°C. Remove the beaker from the heat, and turn off the Bunsen burner.
4. Use a spatula to add the basic copper(II) carbonate to the acid. Do this a little at a time, stirring between additions and allowing any effervescence to die away before adding more.
5. Filter the solution into an evaporating basin. This removes any unreacted basic copper(II) carbonate from the mixture.
6. Put the evaporating basin on a tripod and gauze. Slowly evaporate the solution until it is about one-fifth of its original volume. Caution: do not boil the solution as it may spit.
7. Allow the concentrated solution to cool until crystals form then filter the crystals and put the filter paper and crystals on a watch glass and dab dry with another piece of filter paper. Cover them with a piece of clean filter paper and leave them to dry at room temperature.
8. Weigh the product and store it in a suitably labelled sample tube.

Calculations

Calculate the theoretical yield and percentage yield of copper(II) ethanoate-1-water.