

Edexcel Chemistry GCSE

CP 3: Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath

Notes



Preparing Copper Sulfate

Aim

Investigate the preparation of pure, dry hydrated copper sulfate crystals starting from copper oxide including the use of a water bath.

Equipment list

- 25 cm³ measuring cylinder
- Two 250 cm³ beakers
- Glass rod
- Evaporating basin
- Spatula
- Funnel and filter paper
- Water bath
- Bunsen burner
- Tripod and gauze

Chemicals required

- Sulfuric acid
- Copper oxide

Method

1. Using a measuring cylinder, measure 25 cm³ of sulfuric acid into a beaker. Place the beaker in a water bath to warm the sulfuric acid.
2. Add copper oxide to the acid, 1 spatula at a time, stirring with a glass rod between additions. Continue adding copper oxide until it is in excess and the solid doesn't disappear when stirred.
3. Put a piece of filter paper in a funnel over a beaker. Pour the solution through the funnel to remove excess copper oxide.
4. Pour the filtrate (the filtered solution containing soluble copper sulfate) into an evaporating basin. Place on a tripod with gauze and heat with a bunsen burner to start evaporation.
5. When almost all the water has evaporated, turn off the heat and leave to dry. Blue copper sulfate crystals will remain in the basin.

Key points

- The equation for this reaction is:
$$\text{CuO} + \text{H}_2\text{SO}_4 \rightarrow \text{CuSO}_4 + \text{H}_2\text{O}$$
- Copper sulfate decomposes if continually heated so, during evaporation, turn off the Bunsen burner before all water has evaporated. This process is called crystallisation.
- The sulfuric acid is warmed to increase the rate of reaction and ensure all the sulfuric acid reacts.
- Copper oxide is added in excess to ensure all the sulfuric acid reacts. As copper oxide is insoluble, it can be filtered out the solution.



Safety precautions

- Hot copper sulfate crystals can spit out the evaporating basin during evaporation. Turn the Bunsen burner off before all water is evaporated to reduce this risk.
- Sulfuric acid is corrosive so wear eye protection and wash hands immediately if any skin comes into contact with the chemical.
- When using a Bunsen burner, tie hair back and keep flammable chemicals away from the flame. When not in use, turn the gas off or leave the Bunsen burner on the orange safety flame.
- Water bath contains hot/boiling water which can cause burns. Ensure the water bath is stable before using.

Analysis of results

The mass of copper oxide produced can be calculated by weighing the mass of the evaporating basin before the copper oxide is added and subtracting this value from the final mass of the basin with the copper oxide in.

The percentage yield can be calculated if you know, or can calculate from the quantities you used, the theoretical yield:

$$\text{Percentage yield} = \frac{\text{Yield}}{\text{Theoretical yield}} \times 100$$

