

GCSE-4-3

Exothermic metal displacement reactions

0.5 M CuSO₄ solution - 75 ml per pair

Grab pots of

- Magnesium powder**
- Zinc powder**
- Iron filings**

25 ml measuring cylinder

Polystyrene cups x3 per pair

-10 to 110^oC thermometer

250ml beakers

Weighing boats

Spatulas

Waste buckets

Exothermic metal displacement reactions

Safety

- Eye protection should be worn at all times.

Procedure

1. Measure 25 cm³ of copper(II) sulfate solution into a polystyrene cup.
2. Put the cup into a beaker so that it does not fall over.
3. Measure and record the temperature of the solution.
4. Weigh 0.49g of magnesium powder into a weighing boat.
5. Add the powdered metal to the cup and stir the mixture with the thermometer.
6. Observe the temperature over the next few minutes until a maximum temperature is reached.
7. Record the maximum temperature and calculate the temperature rise.
8. Tip the reaction mixture into the waste bucket.
9. Repeat the procedure with fresh polystyrene cups using 1.30g of zinc powder and then 1.12g of iron filings.

Results

Metal	Initial temperature °C	Final temperature °C	Temperature difference °C
Magnesium			
Zinc			
Iron			




Experiment Hazard Assessment

Experiment: Exothermic metal displacement reaction

Reference: R/4/10

Based on RSC procedure found at

<http://www.rsc.org/learn-chemistry/resource/res00001730/exothermic-metal-displacement-reactions>

Chemical hazards			
Copper (II) sulfate (VI) solution 0.5M  DANGER	Corrosive (eyes). Irritant (skin)	Wear eye protection	CLEAPSS Hazcard 27C
Magnesium powder  DANGER	Flammable solid	Wear eye protection. Ensure no naked flames	CLEAPSS Hazcard 59A
Iron metal filings	Currently not classified as hazardous	Wear eye protection	CLEAPSS Hazcard 55A
Zinc powder  DANGER	Flammable solid. Toxic to aquatic life.	Wear eye protection Ensure no naked flames	CLEAPSS Hazcard 107

Health and safety associated with carrying out the practical

- Wear safety glasses at all times
- Warn students not to press too hard with the thermometer as holes are easily made in the base of the polystyrene cups
- Reaction waste should be poured in the waste buckets and not down the sink

Disposal

- Leave bucket of waste in fume cupboard to finish reacting
- Filter
- Aqueous waste can then go down the sink with dilution W7
- Save filtered solid waste for disposal W2