

# Displacement reactions of metals

## Topic

Metals – reactions with acids; reactivity series.

## Timing

20 min.

## Description

In this experiment students observe the reactions between metals and metal salt solutions.

## Apparatus (per group)

- One student worksheet
- One clear plastic sheet (eg ohp sheet)
- Magnifying glass.

## Chemicals (per group)

Solutions contained in plastic pipettes, see 'Apparatus and techniques for microscale chemistry' handout.

- Copper(II) sulphate  $0.2 \text{ mol dm}^{-3}$
- Iron(III) nitrate  $0.2 \text{ mol dm}^{-3}$
- Magnesium nitrate  $0.2 \text{ mol dm}^{-3}$
- Zinc chloride  $0.2 \text{ mol dm}^{-3}$
- Magnesium ribbon
- Zinc metal – small granules
- Iron filings or small nails
- Copper turnings.

## Observations

The zinc granules and magnesium ribbon rapidly darken in copper sulphate solution as they become covered with a layer of copper. Iron also reacts but the change is not so clear. Magnesium and zinc react with the iron(III) nitrate, the solution gradually darkens.

No reaction occurs between magnesium sulphate and any of the metals. Students should observe no change between any of the metals and a salt solution of the same metal.

## Health & Safety

Students must wear suitable eye protection (Splash resistant goggles to BS EN166 3).

Copper(II) sulphate solution,  $0.2 \text{ mol dm}^{-3}$ ,  $\text{CuSO}_4$  (aq) causes eye damage and is toxic to aquatic life.



Zinc chloride  $0.2 \text{ mol dm}^{-3}$ , Iron(III) nitrate,  $0.2 \text{ mol dm}^{-3} \text{Fe}(\text{NO}_3)_3 \cdot 9\text{H}_2\text{O} (\text{aq})$ , Magnesium nitrate,  $0.2 \text{ mol dm}^{-3} \text{MgNO}_3 \cdot 6\text{H}_2\text{O} (\text{aq})$  and all the metals apart from magnesium ribbon and zinc are of low hazard.

Magnesium ribbon is flammable and gives off highly flammable gases in contact with acids.

Zinc powder, Zn (s) is FLAMMABLE and hazardous to the aquatic environment.

## Credits

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*Health & safety checked May 2018*

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