The reaction of metals with acids

Topic

Metals – reactions with acids; reactivity series.

Timing

20 min.

Description

In this experiment students observe the reactions between metals and acids.

Apparatus (per group)

- One student worksheet
- One clear plastic sheet (*eg* ohp sheet)
- Magnifying glass- A petri dish and lid

Chemicals (per group)

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

- Hydrochloric acid 1 mol dm^{-3}
- Dilute nitric acid 1 mol dm^{-3}
- Concentrated nitric acid 5 mol dm^{-3}
- Sulfuric acid 1 mol dm^{-3}
- Magnesium ribbon
- Zinc metal – small granules
- Iron filings
- Tin granules
- Copper turnings.

Observations

The magnesium ribbon reacts vigorously with each acid. The zinc and iron also react, but less vigorously. In each case hydrogen gas is produced as well as the metal salt. The reaction between iron and nitric acid eventually produces a red-brown rust colour (iron(III) oxide). Students could link this with corrosion and acid rain. Tin and copper do not react with the hydrochloric and sulphuric acids but a few bubbles may be seen (using the magnifying glass) with the nitric acid.

In a petri dish, add 5 mol dm^{-3} nitric acid to the copper. This produces a blue solution and bubbles (of brown nitrogen dioxide). Put the lid over the petri dish as soon as you add the acid. Nitrogen dioxide is very toxic.

Students can write word and symbol equations for these reactions.

Health & Safety

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

Hydrochloric acid, 1 mol dm^{-3} HCl (aq), is low hazard.

Nitric acid, dilute 1 mol dm^{-3} is CORROSIVE, and concentrated 5 mol dm^{-3} HNO_3 (aq), is OXIDISING and CORROSIVE and gives off toxic fumes.

Sulfuric acid, 1 mol dm^{-3} H_2SO_4 (aq), is CORROSIVE.

Nitrogen oxides are formed, gases are CORROSIVE and very TOXIC (Fatal if inhaled). Do not increase quantities mentioned and work in a well-ventilated laboratory.

Magnesium ribbon is FLAMMABLE.

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

Credits

Health & safety checked May 2018

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