

Some reactions of nitrogen dioxide

Topic

Gases.

Timing

20 min.

Apparatus (per group)

- Student information sheet and worksheet
- One clear plastic sheet (eg ohp sheet)
- One 9 cm plastic petri dish (base + lid)
- One plastic pipette
- Scissors.

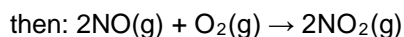
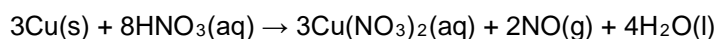
Chemicals (per group)

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

- Nitric acid (concentrated HNO₃) diluted 1:1 with water ca 5M
- Full-range indicator solution diluted 1:1 with deionised water
- Potassium iodide 0.2 mol dm⁻³
- Potassium iodate(V) 0.1 mol dm⁻³
- Potassium bromide 0.2 mol dm⁻³
- Potassium bromate(V) 0.1 mol dm⁻³
- Ammonia solution 3 mol dm⁻³
- Copper turnings.

Method

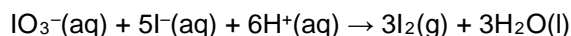
Copper turnings + nitric acid generates first nitric oxide which then reacts with air to give nitrogen dioxide:



Results

Full-range indicator turns from green to yellow-red indicating that nitrogen dioxide is an acidic gas.

The iodate/iodide solution turns black due to:



Also indicating the acidic nature of the gas.

A similar reaction occurs with bromide/bromate.



Health & Safety

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

Nitrogen dioxide is extremely toxic and corrosive if inhaled with sometimes delayed effects. It is important to ensure that the amount of NO_2 generated does not result in significant leakage from the petri dish. No more than 2 copper turnings should be used.

Concentrated Nitric acid, $5 \text{ mol dm}^{-3} \text{ HNO}_3 \text{ (aq)}$, is CORROSIVE and gives off toxic fumes

Potassium iodate(V), $0.1 \text{ mol dm}^{-3} \text{ KIO}_3 \text{ (aq)}$, Potassium bromate(V), $0.1 \text{ mol dm}^{-3} \text{ KBrO}_3 \text{ (aq)}$, Potassium bromide, $0.2 \text{ mol dm}^{-3} \text{ KBr (aq)}$ and Potassium iodide, $0.2 \text{ mol dm}^{-3} \text{ KI (aq)}$ are low hazard.

Ammonia solution, $3 \text{ mol dm}^{-3} \text{ NH}_3 \text{ (aq)}$ is corrosive and a respiratory IRRITANT.

Credits

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Health & safety checked May 2018

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