

Microscale reactions of hydrogen sulphide – teacher notes

Topic

Gases

Timing

20 minutes

Equipment

Apparatus

- Eye protection (goggles)
- Student information sheet and worksheet
- Clear plastic sheet (eg ohp sheet)
- Plastic Petri dish (base + lid), 9 cm diameter
- Plastic pipette
- Scissors

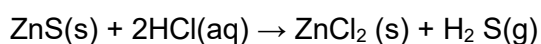
Chemicals

Solutions should be contained in plastic pipettes – see the accompanying guidance on apparatus and techniques for microscale chemistry (<https://rsc.li/2QTycSj>), which includes instructions for preparing solutions.

- Hydrochloric acid, 1 mol dm⁻³
- Lead nitrate, 0.5 mol dm⁻³
- Potassium manganate(VII), 0.01 mol dm⁻³
- Silver nitrate, 0.2 mol dm⁻³
- Sulfuric acid, 1 mol dm⁻³
- Zinc sulfide powder

Method

Zinc sulfide + hydrochloric acid generates hydrogen sulfide:



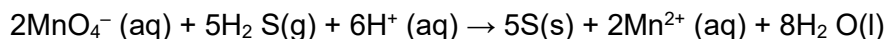
No bubbles of gas are seen and only small quantities of hydrogen sulfide are given off – sufficient, however, to carry out the tests.

Results

The lead nitrate solution gradually turns silvery due to the formation of lead sulfide by reaction of hydrogen sulfide and lead nitrate.

The silver nitrate solution reacts in a similar fashion although the reaction appears to be slower and the silver sulfide is less reflective than the lead sulfide.

The potassium manganate(VII) solution turns first brown and then, if sufficient gas is present, colourless, as it is reduced by the hydrogen sulfide:



Health, safety and technical notes

- Read our standard health and safety guidance (<https://rsc.li/3ybzMjh>).
- Wear eye protection throughout (splash-resistant goggles to BS EN166 3) and work in a well-ventilated room.
- Hydrogen sulfide – see CLEAPSS Hazcard HC051A. Hydrogen sulfide is an extremely poisonous gas but because it can be detected by smell at very low concentrations it is much less dangerous than other gases such as carbon monoxide which, although less poisonous, cannot be detected by smell.
- Sulfuric acid – see CLEAPSS Hazcard HC098a and CLEAPSS Recipe Book RB098. At the concentration used, sulfuric acid is a skin/eye irritant.
- Lead nitrate, $\text{Pb}(\text{NO}_3)_2(\text{aq})$ – see CLEAPSS Hazcard HC057a and CLEAPSS Recipe Book RB053. At the concentration used, lead nitrate is a reproductive toxin, causes eye damage, causes damage to organs (especially the CNS) and is harmful to the aquatic environment. Avoid inhalation and skin contact.
- Silver nitrate – see CLEAPSS Hazcard HC087 and CLEAPSS Recipe Book RB077. At the concentration used, silver nitrate causes eye damage and is harmful to the aquatic environment.
- The following chemicals are of low hazard:
 - Zinc sulfide – see CLEAPSS Hazcard HC108b.
 - Hydrochloric acid – see CLEAPSS Hazcard HC047a and CLEAPSS Recipe Book RB043.
 - Potassium manganate(VII), at the concentration used – see CLEAPSS Hazcard HC081 and CLEAPSS Recipe Book RB073.