














Hydrogen sulfide & other sulfides

including carbon disulfide, ammonium sulfide and most metal sulfides

Substance	Hazard	Comment
Hydrogen sulfide Gas	 FLAMM.  TOXIC  ENVIRON. HAZ.	DANGER: extremely flammable gas; fatal if inhaled; very toxic to aquatic organisms. Mixtures of hydrogen sulfide with air containing between 4% and 45% hydrogen sulfide are explosive. For a 15-minute exposure, the concentration of the gas in the atmosphere should not exceed 14 mg m^{-3} . It has a very strong smell of rotten eggs and the human nose can detect as little as 0.01 mg m^{-3} . At higher concentrations it anaesthetises (deadens) the sense of smell and so the danger may not be realised. It may sometimes be found in coal mines (<i>stinkdamp</i>) and is produced by rotting seaweed and is the commonest cause of death in sewer workers.
Hydrogen sulphide Solution in water	 TOXIC	DANGER: hydrogen sulfide gas is acutely toxic by inhalation and diffuses readily from solutions. However, use of solutions of hydrogen sulfide is safer than using the gas.
Carbon disulfide Liquid	 FLAMM.  IRRIT.  HEALTH HAZARD	DANGER: highly flammable liquid & vapour; causes skin and serious eye irritation; suspected of damaging fertility and the unborn child; causes damage to organs through prolonged or repeated exposure. For a 15-minute exposure, the concentration of the gas in the atmosphere should not exceed 45 mg m^{-3} ; flash point $-30 \text{ }^\circ\text{C}$. Very volatile. The demonstration involving the reaction with nitrogen monoxide (the 'barking dog') is very dangerous, especially if the oxide is not pure.
Ammonium sulfide Solution in water	 FLAMM.  CORROS.  ENVIRON. HAZ.	DANGER (if more than 20%, $\sim 3\text{M}$): flammable liquid & vapour; causes severe skin burns & eye damage; contact with acids liberates toxic gas; very toxic to aquatic organisms. DANGER (if more than 0.4 M but less than $\sim 3\text{M}$): causes severe skin burns & eye damage; contact with acids liberates toxic gas. WARNING (if more than 0.1 M but less than 0.4M): irritating to eyes & skin; contact with acids liberates toxic gas. All the solutions are strongly alkaline. Dilute acid reacts to produce hydrogen sulfide. Absorbs carbon dioxide from the atmosphere, producing hydrogen sulfide.
Sodium sulfide Hydrated solid & solutions in water	 CORROS.  TOXIC  ENVIRON. HAZ.	DANGER (solid): harmful if swallowed; toxic in contact with skin; causes severe skin burns & eye damage; contact with acid liberates toxic gas; very toxic to aquatic organisms. DANGER (solution if more than 0.4M): harmful if swallowed; causes severe skin burns & eye damage; contact with acid liberates toxic gas. WARNING (solution if more than 0.1M but less than 0.4M): irritating to skin and eyes; contact with acid liberates toxic gas. All the solutions are strongly alkaline. Absorbs carbon dioxide from the atmosphere, producing hydrogen sulfide.
Most metal sulfides Insoluble solids	LOW HAZARD	Includes copper(II) sulfide , copper pyrites , iron(II) sulfide , iron pyrites ('fool's gold') , zinc sulfide . Dilute acid reacts to produce hydrogen sulfide. If heated strongly in air, may produce toxic sulfur dioxide (see CLEAPSS Student Safety Sheet 52).

Typical control measures to reduce risk

- If producing the gas, use the smallest amounts possible, eg no more than a few drops of acid on excess sulfide.
- Wear eye protection.
- Use a fume cupboard if adding more than a few drops of dilute acid to excess sulfide; ensure good laboratory ventilation and quickly dispose of solutions containing hydrogen sulfide.
- If smelling the gas, follow the safe technique: use your hand to waft the gas towards your nose.

Assessing the risks

- **What are the details of the activity to be undertaken? What are the hazards?**
- **What is the chance of something going wrong?**
eg, a leak of gas into the laboratory from apparatus or a warmed solution.
- **How serious would it be if something did go wrong?**
- **How can the risk(s) be controlled for this activity?**
eg, can it be done safely? Does the procedure need to be altered? Should goggles or safety spectacles be worn?

Emergency action

- **In the eye** Flood the eye with gently-running tap water for 10 minutes. Consult a medic.
- **Vapour breathed in** Remove the casualty to fresh air. Consult a medic if breathing is difficult.
- **Gas escape in lab.** Open all windows. If over 1 litre of gas is released, evacuate the laboratory.