



## Guidance Document

### Safe Handling of Sulfides and Hydrogen Sulfide

[This is a brief summary. Read the full MSDS for more details before handling.]

**Introduction:** Sulfides are broad spectrum poisons, meaning that they can poison several different body systems. The nervous system is usually most affected. Of greatest concern would be hydrogen sulfide, whether handling in the pure gaseous form or by generation from various sulfide salts. Sulfide toxicity is comparable with that of cyanide. In the body sulfides can form complex bonds with iron, blocking oxygen uptake and stopping cellular respiration. The body can detoxify sulfide, oxidizing it to sulfate. Very low levels of sulfide can be tolerated indefinitely. However, at some threshold level, the oxidative enzymes would be overwhelmed.

**Uses:** Sulfides and hydrogen sulfide are used in Chemistry teaching and research labs. Hydrogen sulfide may be present in natural gas samples (sour gas) received from offsite sources. Some research with sulfate-reducing bacteria uses small quantities of sulfide. It is commonly found as a product of decaying organic matter which contains sulfur. Thus, it might be found in sewers, sewer water samples or manure samples.

**Chemical and Physical Properties:** Most, but not all, of the metallic sulfides are insoluble in dilute acid solutions. However, the risk of producing hydrogen sulfide gas must be known with any lab procedure. Hydrogen sulfide is a colorless, flammable gas that can be identified in low concentrations by its characteristic rotten egg odor. Hydrogen sulfide has a very low odor threshold (<1 ppm). The odor increases with concentration, up to about 30 ppm. Between about 30 and 100 ppm, the gas is reported to have a sickening sweet odor. At concentrations above 100 ppm, the olfactory nerves in the nose are temporarily paralyzed, leading to a loss of the sense of smell. Therefore, dangerously high concentrations may be present with no perceivable odor. Prolonged exposure to lower concentrations

can also result in similar effects of olfactory fatigue. This unusual property of hydrogen sulfide makes it extremely dangerous to rely totally on the sense of smell to warn of the presence of the gas.

**Health Hazards:** Sulfides and hydrogen sulfide are chemical asphyxiants, similar to carbon monoxide and cyanides. Usually the route of entry of greatest concern is inhalation of hydrogen sulfide gas. At high levels, hydrogen sulfide may paralyze the lungs, prohibiting a victim from escaping without assistance. Other symptoms at high exposure include respiratory tract irritation, eye irritation, shock, convulsion, coma and death. Lower exposures can cause irritation, headache, dizziness, nausea and difficulty breathing. Less likely but still important would be poisoning via ingestion. Hydrogen sulfide is highly flammable.

**Exposure Control:** Always handle with adequate ventilation, as in a fume hood. Always wear safety glasses or goggles. Wear nitrile or other resistant gloves. Wear a long-sleeved, buttoned lab coat, long pants and closed-toe shoes. Other PPE may be required, such as face shield, foot coverings, apron, etc.

**Safe Handling:** Users of sulfides or hydrogen sulfide must be trained in the hazards and in procedures for use and disposal. Sulfides are toxic. Hydrogen sulfide is toxic and flammable. Hydrogen sulfide exposure can lead to olfactory fatigue, leading to loss of the sense of smell. Do not rely totally on sense of smell to warn of the presence of the gas. Always employ adequate engineering controls (fume hood, hydrogen sulfide monitor, etc.) and safe working practices. Wear all required PPE. Collect all waste for disposal by EHS. Call EHS (ext. 3316) for assistance with any spill.

**First Aid:**

**Inhalation** - Because hydrogen sulfide can cause the nose to stop perceiving its presence, rescue workers must be properly protected. A rescuer could be very easily overcome at levels above 200 ppm. Collapse, coma and death can occur within seconds after only a few inhalations. Ensuring your own safety, move victim to safe area and seek immediate medical attention.

**Eye contact** - For eye contact, flush the eye with copious quantity of water for at least 15 minutes. Call for medical help.

Skin contact - For skin contact wash with plenty of soap and water. Remove all contaminated clothing while flushing with water. If the skin reddens or appears damaged, get medical attention.

Ingestion - If swallowed, do not induce vomiting. Rinse out the mouth of a conscious victim. Give large quantity of water to a conscious victim. Immediately call for medical help.