

EH-0395, Hydrogen Sulfide

ENVIRONMENT, SAFETY & HEALTH
HEALTH HAZARDS ALERT

Assistant Secretary for Environment, Safety & Health
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Hydrogen Sulfide

EXPOSURE TO HYDROGEN SULFIDE

Hydrogen sulfide is a colorless, poisonous gas with the characteristic odor of rotten eggs. It is generated as a common by-product of many industrial and manufacturing processes and during the decomposition of sulfur-containing compounds. Hydrogen sulfide is found in natural gas, volcanic gas, and certain natural spring waters. It may be encountered in the manufacture of dyes and pigments, synthetic petroleum products, and mining processes. Exposures may occur during hydrocarbon research and development activities, in certain utility confined spaces, and at sewage and various waste treatment plants.

The Occupational Safety and Health Administration (OSHA) permissible exposure limit (PEL) for hydrogen sulfide of 10 ppm is set 30 times lower than the "immediately dangerous to life and health" level of 300 ppm set by the National Institute for Occupational Safety and Health (NIOSH). Despite a low human odor threshold for the gas in air (<< 1 ppm), hydrogen sulfide is considered to be an insidious poison because our sense of smell rapidly fatigues, and therefore, fails to provide a good warning of gas concentration.

The principal route of exposure to hydrogen sulfide is inhalation. Like carbon monoxide and the cyanides, hydrogen sulfide is classified as a chemical asphyxiant. Exposures to this gas can interfere with cellular respiration and cause death if an individual's cells are deprived of oxygen (biochemical suffocation). At low concentrations (i.e., < 10 ppm), hydrogen sulfide causes irritation of the eyes, mucous membranes, and upper respiratory system. When exposed to higher concentrations (10-50 ppm), persons tend to experience mild eye and upper respiratory irritation, headaches, and dizziness. Concentrations from about 50-200 ppm can cause severe eye and respiratory tract irritation, acute conjunctivitis, lacrimation, and difficulty breathing, as well as a sudden loss of consciousness. Prolonged exposures at these levels may lead to bronchitis, pneumonitis, and migraine headaches. At higher levels, hydrogen sulfide can cause a severe loss of motor coordination, coma, pulmonary edema, respiratory paralysis, and ultimately death.

PROTECTION REQUIRED

The best protection from overexposure to hydrogen sulfide is regular monitoring to identify areas and operations likely to exceed OSHA's PEL. Work procedures should include the use of direct reading

instruments when entering confined spaces such as man-holes, tanks, pits, and large reaction vessels that may contain or accumulate hydrogen sulfide gas. Areas that routinely pose overexposure hazards should be equipped with continuous monitoring instruments. Where exposures cannot be otherwise reduced with engineering equipment and ventilation systems, it may be necessary to use supplied air respirators (i.e., airline type or self-contained breathing apparatus).

If you have any questions about your workplace procedures, potential exposures, or the use of personal protective equipment, contact your local safety and health officer or Carlos Coffman, Industrial Hygiene Program Division, EH-412, at (301) 903-5493.

This Safety & Health Hazards Alert is one in a series of publications issued by EH to share occupational safety and health information throughout the DOE complex. To be added to the Distribution List or to obtain copies of the publication, call (301) 916-4444. For additional information regarding the publications, call Barbara Bowers, (301) 903-3016.