



WHAT IS A MATERIAL SAFETY DATA SHEET (MSDS)?

The federal Occupational Safety and Health Administration (OSHA) Hazard Communication Standard requires manufacturers or distributors of hazardous materials to assess the physical and health hazards of the chemical or product. This information must be included in the Material Safety Data Sheet (MSDS), which must be provided to the purchaser of the product with at least the initial shipment of the chemical. Per the OSHA Occupational Exposure to Hazardous Chemicals in the Laboratories standard, employers shall maintain any material safety data sheets that are received with incoming shipments of hazardous chemicals, and ensure that they are readily accessible to laboratory employees.

Laboratory personnel should recognize the **limitations of MSDSs** as applied to laboratory-scale operations:

- MSDSs may provide generalizations that do not provide very useful information to the researcher, e.g. the disposal section may state to dispose of in accordance with City & County, State and Federal regulations.
- MSDSs may provide information about control measures and PPE for work in production-scale manufacturing operations; therefore, some control measures and PPE may be unnecessary or inappropriate for laboratory-scale operations.
- Many MSDSs list all conceivable health hazards associated with a substance without differentiating which are most significant and which are most likely to actually be encountered. This can make it difficult for laboratory personnel to distinguish highly hazardous materials from moderately hazardous and relatively harmless ones.

WHAT TO DO WITH MSDSs AND WHERE TO FIND THEM:

A system should be in place to catalog MSDSs when received. If an MSDS is not received with a shipment, it may easily be obtained by requesting one from the manufacturer or you can contact JABSOM EHSO for assistance. Many MSDSs are available via the Internet.

UNDERSTANDING MSDS INFORMATION:

The following is an explanation which is provided to help you interpret the information found on manufacturers' MSDSs. While the format of these data sheets varies from manufacturer to manufacturer, certain components appear on each MSDS.

NAME OF SUPPLIER (address and phone number) and date MSDS was prepared or revised. This section gives the name and address of the manufacturer or supplier and an emergency phone number where questions about toxicity and chemical hazards can be directed.

PRODUCT IDENTIFICATION

Product Name: Commercial or marketing name.

Synonym: Approved chemical name and/or synonyms.

Chemical Family: Group of chemicals with related physical and chemical properties.

Formula: Chemical formula, if applicable; i.e., the conventional scientific definition for a material. CAS

Number: Number assigned to chemicals or materials by the Chemical Abstracts Service.

HAZARDOUS INGREDIENTS OF MIXTURES

This section describes the percent composition of the substance, listing chemicals present in the mixture. If it was tested as a mixture, lists chemicals which contribute to its hazardous nature. Otherwise, lists ingredients making up more than 1% and all carcinogens.

The [OSHA permissible exposure limit \(PEL\)](#), [National Institute for Occupational Safety and Health \(NIOSH\) recommended exposure limit \(REL\)](#), and/or the [American Conference of Governmental Industrial Hygienists \(ACGIH\) threshold limit value \(TLV\)](#) will also be listed, if appropriate.



The OSHA PEL is the regulated standard, while the others are recommended limits. The PEL is usually expressed in parts per million parts of air (ppm) or milligrams of dust or vapor per cubic meter of air (mg/m³). It is usually a **time weighted average (TWA)** - concentration averaged over an eight hour day. Sometimes, a **STEL or short term exposure limit** may be listed. The STEL is a 15 minute TWA which should not be exceeded. A **ceiling limit (c)** is a concentration which may not be exceeded at any time. A **skin notation** means that skin exposure is significant in contributing to the overall exposure.

PHYSICAL DATA

This section outlines the physical properties of the material. The information may be used to determine conditions for exposure. For example, one can determine whether or not a chemical will form a vapor (vapor pressure), whether this vapor will rise or fall (vapor density), and what the vapor should smell like (appearance and odor). This could help determine whether to use a fume hood or where to place ventilators. The following information is usually included:

Boiling Point: temperature at which liquid changes to vapor state

Melting Point: temperature at which a solid begins to change to liquid

Vapor Pressure: a measure of how volatile a substance is and how quickly it evaporates. For comparison, the VP of water (at 20o C) is 17.5 mm Hg, Vaseline (non-volatile) is close to 0 mm Hg, and diethyl ether (very volatile) is 440 mm Hg.

Vapor Density (air=1): weight of a gas or vapor compared to weight of an equal volume of air. Density greater than 1 indicates it is heavier than air, less than 1 indicates it is lighter than air. Vapors heavier than air can flow along just above ground, where they may pose a fire or explosion hazard.

Specific Gravity (water=1): ratio of volume weight of material to equal volume weight of water. Solubility in Water: percentage of material that will dissolve in water, usually at ambient temperature. Since the much of the human body is made of water, water soluble substances more readily absorb and distribute.

Appearance/Odor: color, physical state at room temperature, size of particles, consistency, odor, as compared to common substances. Odor threshold refers to the concentration required in the air before vapors are detected or recognized.

% Volatile by Volume: Percentage of a liquid or solid, by volume, that evaporates at a temperature of 70oF.

Evaporation Rate: usually expressed as a time ratio with ethyl ether = 1, unless otherwise specified.

Viscosity: internal resistance to flow exhibited by a fluid, normally measured in centiStoke time or Saybolt Universal Secs.

Other Pertinent Physical Data: information such as freezing point is given, as appropriate.

FIRE AND EXPLOSION HAZARD DATA

This section includes information regarding the flammability of the material and information for fighting fires involving the material.

Flashpoint: the lowest temperature at which a liquid gives off enough vapor to ignite when a source of ignition is present.

Auto ignition Temperature: the approximate temperature at which a flammable gas-air mixture will ignite without spark or flame. Vapors and gases will spontaneously ignite at lower temperatures in oxygen than in air.

Flammable Limits: the lower explosive limit (LEL) and upper explosive limit (UEL) define the range of concentration of a gas or vapor in air at which combustion can occur. For instance, an automobile carburetor controls this mixture - too lean (not enough chemical) or too rich (not enough air, as when you flood your engine), will not ignite.

Extinguishing Media: appropriate extinguishing agent(s) for the material.

Fire-fighting Procedures: Appropriate equipment and methods are indicated for limiting hazards encountered in fire situations.

Fire or Explosion Hazards: Hazards and/or conditions which may cause fire or explosions are defined.

HEALTH HAZARD DATA



This section defines the medical signs and symptoms that may be encountered with normal exposure or overexposure to this material or its components. Information on the toxicity of the substance may also be presented. Results of animal studies are most often given. i.e. LD50 (mouse) = 250 mg/kg, and usually expressed in weight of chemical per kg of body weight. **LD50** or **lethal dose 50** is the dose of a substance which will cause the death of half the experimental animals. **LC50** is the concentration of the substance in air which will cause the death of half the experimental animals. Health hazard information may also distinguish the effects of acute (short term) and chronic (long-term) exposure.

EMERGENCY AND FIRST AID PROCEDURES

Based on the toxicity of the product, degree of exposure and route of contact (eye, skin, inhalation, ingestion, and injection), emergency and first aid procedures are recommended in this section. Additional cautionary statements, i.e., Note to Physician, for first aid procedures, when necessary, will also appear here.

REACTIVITY DATA

This section includes information regarding the stability of the material and any special storage or use considerations.

Stability: "unstable" indicates that a chemical may decompose spontaneously under normal temperatures, pressures, and mechanical shocks. Rapid decomposition produces heat and may cause fire or explosion. Conditions to avoid are listed in this section.

Incompatibility: certain chemicals, when mixed may create hazardous conditions. Incompatible chemicals should not be stored together.

Hazardous Decomposition Products: chemical substances which may be created when the chemical decomposes or burns.

Hazardous Polymerization: rapid polymerization may produce enough heat to cause containers to explode. Conditions to avoid are listed in this section.

SPILL, LEAK AND DISPOSAL PROCEDURES

This section outlines general procedures, precautions and methods for cleanup of spills. Appropriate waste disposal methods are provided for safety and environmental protection.

PERSONAL PROTECTION INFORMATION

This section includes general information about appropriate personal protective equipment for handling this material. Many times, this section of the MSDS is written for large scale use of the material. Appropriate personal protection may be determined by considering the amount of the material being used and the actual manipulations to be performed.

Eye Protection: recommendations are dependent upon the irritancy, corrosivity, and special handling procedures.

Skin Protection: describes the particular types of protective garments and appropriate glove materials to provide personnel protection.

Respiratory Protection: appropriate respirators for conditions exceeding the recommended occupational exposure limits.

Ventilation: air flow schemes (general, local) are listed to limit hazardous substances in the atmosphere.

References:

Adapted from Princeton EHS
Prudent Practices in the Laboratory